

IFKAD 2014

9th International Forum on Knowledge Asset Dynamics

Knowledge and Management Models for Sustainable Growth

PROCEEDINGS

11 - 13 June 2014
Matera - Italy

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Organized by:

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University of Basilicata

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Edited by Daniela Carlucci, JC Spender, Giovanni Schiuma

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FOREWORD

A very warm welcome to the 9th edition of the International Forum on Knowledge Asset Dynamics (IFKAD2014). In the last nine years since we held our first conference in Matera, the IFKAD community has tremendously increased transforming IFKAD in one of the major and renowned international events focused on knowledge-based development.

Over the years the Forum, which has been attended by many of the world's leading experts in the Knowledge and Intellectual Capital Management, has been documented in conference proceedings and several special issues of high-quality journals.

This year the IFKAD conference brings together academicians, policy makers, practitioners and young researchers from different fields to provide an opportunity for discussion and debate regarding “Knowledge and management models for sustainable growth” from a wide range of perspectives – economic, social, environmental and cultural.

The aim is to explore the relevance of Knowledge and Intellectual Capital management for supporting organizations as well as regional and urban systems in their value creation dynamics according to a sustainable growth perspective. This involves the understanding and development of approaches, models and tools for effectively managing key-knowledge value drivers to support the sustainable growth of organizations and communities. Particular attention is paid on the role of the knowledge assets dynamics on the design and development of innovative models and interventions in order to provide solutions to problems at organizational, social and urban scale exploiting intangibles, skilled workforce, relationships, and advanced technologies.

The programme of this year's conference is just as rich and enlightening as previous conferences. We have an exceptional line of keynote speakers who will share their research and practical insights as well as inspire new reflections and research paths. We have over 200 speakers and 40 countries are represented at the conference. This is further characterised by an excellent combination of papers from academia and practice. Presentations will be on issues as wide ranging as Knowledge management models and strategies for sustainable growth of organizations and communities; Knowledge resources management for sustainable innovation; Models, approaches, methods and tools to support sharing, creation and exploitation of knowledge for sustainable value creation dynamics; Knowledge value drivers and sustainable health systems; Knowledge and social innovation models for sustainable development; Performance measurement and sustainable growth of organizations and communities as well as Arts-based initiatives and creativity as a resource for sustainability.

The IFKAD conference has made excellent progress. Behind this success there is the work and support of numerous people. In this regard, we would like to thank all the authors, chairs and reviewers for their valuable cooperation in building IFKAD 2014. A special thank to the organising committee that passionately has worked to make another excellent and memorable event.

We are really honoured for your participation and we look forward to meet you in occasion of IFKAD 2015.

Conference co-chairs

Daniela Carlucci, Giovanni Schiuma, JC Spender

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Knowledge specialization as driver of networks emergence in small firms' clusters

Cristina Ponsiglione *, Luca Iandoli, Lorella Cannavacciuolo

Department of Industrial Engineering
University of Naples Federico II
Piazzale Tecchio 80, 80125, Naples, Italy

Giuseppina D'Errico

Graduate in Managerial Engineering
University of Naples Federico II

* *Corresponding author*

Structured Abstract

Purpose – Due to the small size and to the high level of labour division, small firms in Industrial Districts need to establish horizontal and vertical cooperative relationships (Camuffo and Grandinetti, 2011; Malberg and Maskell, 1999) in order to share and combine complementary knowledge assets. Whilst the network approach (Granovetter 1985; Powell, 1991) has greatly contributed to the understanding of knowledge exchange processes in IDs and of their influence on performances, research on small firms' networks has mostly assumed the network structure as a given. According to this gap, the purpose of the paper is to answer to the following research questions: is knowledge complementariness among firms in an industrial district a sufficient condition to let supply networks to emerge? What is the effect of relational embeddedness in determining the structural properties of these networks?

Design/methodology/approach – We adopt an approach grounded on complexity science and consider the Industrial District as a Complex Adaptive System (Holland, 2002). The methodology used in the research is the agent-based simulation. We present an agent-based model of a stylized ID and build on it a virtual laboratory in which we perform generative experiments (Epstein and Axtell, 1996), in order to answer to the above research questions.

Originality/value – In the literature on firms' networks, *topological works* study how specific network structure influence the intensity of knowledge flows among a network's firms. Our perspective is dual to the topological one: by not assuming that links among firms are pre-existent our objective is to generate the network topology with the help of an agent-based computational laboratory.

Our contribution would be on different aspects: 1) we would explore how knowledge exchange processes can generate the emergence of network structures; 2) we analyse this topic in the context of small firms' clusters, taking into account the crucial role that social

characteristics of these systems play in shaping the phenomenon of network emergence; 3) the paper aims at contributing to the literature stream of dynamic emergence and evolution of supply networks, with a specific focus on the impact of collaborative strategies of agents on the emergent structures of networks.

Practical implications - Main results of simulation experiments show that for every experimental set a stable network of links emerges among firms of the simulated ID. In addition, through the generative experiments we are able to identify certain conditions under which the emerged networks exhibit a hub&spoke structure. The model here proposed is not a case-based model, but an ideal-typical computational model, aimed at exploring and identifying a micro-macro relationship that could be applied to a class of empirical cases. As a consequence, the present research does not request, at this stage, a strict relation between the model and the empirical reality. The simulation is devoted to produce research hypotheses to be tested further using traditional methodologies. As this empirical validation process will be completed, the computational laboratory that has been presented in this paper could be used as a tool to support policy analysis e policy making decision processes.

Keywords – knowledge exchange, supply networks, industrial cluster, agent-based modelling.

Paper type – Academic Research Paper

1 Introduction: supply networks in flexible specialized industrial districts

In the last fifteen years a new stream of research (Choi et al., 2001; Li et al., 2010; Pathak et al., 2007; Surana et al., 2005) in supply chain management literature has emerged that frame supply chains and networks as Complex Adaptive Systems (CAS).

A CAS is a system characterized by a large number of autonomous and heterogeneous agents, that interact locally and simultaneously according to some simple behavioural rules (Holland, 1992). Agents learn and adapt to both the environment and to the other entities populating the system. Non-linearity, emergence and self-organization are the most relevant properties of a CAS and all are related to the huge amount of parallel interactions among the agents of the system. CASs are systems in which new patterns, structures, and aggregate behaviours or properties *emerge* from the bottom-up (Epstein and Axtell, 1996) as “nonlinear and dynamic function of the large number of activities made in parallel by interacting entities” (Pathak et al., 2007). The non-linearity implies that the collective behaviour of the system cannot be reduced to the sum of the local behaviours of its components. Emergence and self-organization refer to the emergence

from the bottom-up of an order that is not imposed by a central controller (Holland, 1992). Examples of CASs can be identified in several fields of natural, human and social life: the ant colony system, the human immune system, trade markets, industrial clusters and supply networks represent only a limited group of systems recognized as Complex Adaptive Systems.

In their seminal paper, Choi et al. (2001) define the supply network as “a network of firms that exist upstream to any one firm in the whole value system” and suggest that the networks refer not only to the materials flow but also to the knowledge flow.

Furthermore, they argue the claim that supply networks cannot be simply recognized as “systems”: supply networks are Complex Adaptive Systems.

Recognizing supply networks as CAS implies a new approach to the topic of supply chain management: from a deterministic approach focused on deliberative and control aspects to a new perspective based on the concepts of emergence and self-organization.

Starting from this seminal work, additional papers (Surana, 2005; Pathak et al., 2007; Nair et al., 2009; Li et al., 2010) have further developed the conceptualization proposed by Choi et al. (2001). All these studies are mainly devoted to suggest the need of changing the perspective in supply chain management, by considering the self-organization, the non linear dynamics and the emergence as fundamental properties to be taken into account by decision makers and to be better explored and understood at the research level.

The contribution of this paper would be in this direction, by adding new elements or steps in the process of understanding of supply networks as emergent patterns. In particular, we focus on how local interactions among small firms of a value chain exchanging knowledge assets (Esposito and Raffa, 1994) can let the emergence of a supply network structure.

The spontaneous emergence of structures and the self-organization of supply networks are particularly evident in the context of flexible specialized Industrial Districts (IDs). IDs are geographically localized production systems characterized by a large number of small and medium sized firms that are involved in various phases of the production of a homogeneous product family (Becattini, 1989)

These firms are highly specialized in a few phases of the production process and join up in supply chains in a flexible and dynamic way depending on market opportunities. Thus, within IDs a spatial labour division is accomplished (Piore and Sabel, 1984).

In particular, two forms of labour division characterize the IDs production model: vertical and horizontal division of labour. Vertical division of labour takes place among ID firms involved in different phases of the production process. Each phase represents a stage of the supply chain. Horizontal division of labour occurs among ID firms involved in the same phase of the production process. These firms may act with different degrees of specialization in the same production phase. For example, if a firm is specialized in a single product it establishes inter-firm relationships with other companies operating in the same production phase to acquire additional labour capacity. Both types of labour division favor the formation of a dense network of inter-firm relationships in which cooperation and competition coexist. In particular, inter-firm cooperation within neo-marshallian IDs has been traditionally developed to a greater extent vertically rather than horizontally (Albino et al., 2007).

By adopting a theoretical perspective influenced by social network theory and complexity science, a stream of literature, mostly developed in the '80s and '90s, attributed IDs' effectiveness to the richness of IDs' underlying relational systems (Aydalot, 1986; Becattini, 1989; Brusco, 1982; Camagni, 1989; Rullani, 1992).

The network perspective (Granovetter, 1985; Powell, 1991), though acknowledging the relevance of transaction cost economics, emphasizes the social and cultural determinants of inter-firm relationships, like the role of informal transactions (Uzzi, 1997), the sharing of norms and culture, reciprocity and trust (Jones et al., 1997). A key characteristic of social networks is that they allow efficient access to knowledge resources for members of the network (Podolny and Page, 1998) as well as the creation of idiosyncratic and valuable knowledge resources thanks to the sharing and integration of individual knowledge. Furthermore, thanks to geographic proximity and the availability of social capital, IDs are privileged loci for tacit knowledge diffusion (Inkpen and Tsang, 2005).

Whilst the network approach has greatly contributed to the understanding of the complexity of knowledge exchange in IDs and its influence on IDs performances, research on small firms' supply networks has mostly assumed the network as a given.

The aim of this paper is to fill this gap in the literature by implementing an agent-based model that simulates the mechanisms of interaction and exchange of complementary knowledge between the firms of an ID in order to predict the structural

properties of the supply networks that emerge from these interactions and to identify those that can guarantee the best innovative performance at the system level.

In particular, we are interested in exploring: i) if the firms' need to exchange complementary knowledge is a sufficient condition for the emergence of stable supply network structures; ii) if so, what are the structural properties of the networks that emerge as a result of the mechanisms of interaction and exchange of knowledge; iii) whether and how different behaviours undertaken by the district firms, in order to maximize their knowledge endowment, can affect the characteristics of the networks emerging from the interaction of actors at the local level.

2 Background: network structures and knowledge flows

The literature on firms' networks (Dyer and Singh, 1998; Dyer and Nobeoka, 2000; Human and Provan, 1997; Levinson and Asahi, 1996) has widely recognized networks of firms as loci for innovation, knowledge creation and inter-organizational learning (Podolny and Page, 2000).

A firms' network consists of a collection of (often small) autonomous actors that pursue repeated and enduring reciprocal exchanges aimed at creating products or services for final markets. Examples of firms' networks are R&D consortia, trade associations, strategic alliances and also Industrial Districts (Inkpen and Tsang, 2005).

Repeated, enduring and structured relationships are the main rationale behind the capability of networks to spread and diffuse knowledge among their members (Inkpen and Tsang, 2005). The literature on firms' networks proposes different approaches to the analysis of knowledge exchange/transfer phenomenon.

Topological works study how specific network architectures and related structural properties influence the intensity of knowledge flows among a network's firms and the knowledge accumulation performances at the firm and at the network level. The research in this stream refers, from the theoretical point of view, to social network theory and, from the methodological point of view, to social network analysis. Furthermore, the focus is on different kinds of networks, such as strategic alliances, intra-corporate networks, lead firm-networks or supply networks. Structural properties of networks that have been proven to influence network performance (e.g. knowledge diffusion, learning, innovation, etc.) are density, centrality and the existence of cliques (Provan et al., 2007). The stream

of research on the *management of innovation* is aimed at identifying key characteristics of successful learning and diffusion of innovation in networks. Papers in this stream are mainly focused on strategic alliances or productive networks, such as supply networks (Dyer and Nobeoka, 2000; Lorenzoni and Lipparini, 1999), and adopt qualitative research methodologies such as single or multiple case studies (Esposito et al., 1997) . These studies provide interesting narratives to analyze specific knowledge sharing routines in order to gather insights and lessons learned for the development of governance and management guidelines to support efficient learning dynamics in networks.

Both the *topological* and the *management of innovation* approaches assume network architecture as given and neglect the problem of how specific structural arrangements can emerge and dynamically evolve from bottom-up interactions among agents exchanging and sharing knowledge.

There are important researches on networks' formation and on their dynamic evolution (Gulati, 1999; Gulati and Gargiulo, 1999). These studies are almost exclusively focused on the firm or on the dyads level and mostly analyse the specific context of strategic alliances. Finally, in this field there is yet a lack of works that approach the problem of network structures formation from the bottom-up using a simulation approach, with few exceptions.

Ozman (2007), for example, uses a simulation model to explore whether knowledge tacitness and environmental turbulence affect the emergent structure of firms networks built up to exploit-explore external knowledge sources. The proposed simulation model is an agent-based model in which firms construct external linkages for the purpose of learning via exploitation or exploration. Ozman's model shows that stable environments and codified knowledge result in the emergence of local star firms. When knowledge tacitness and environment turbulence increase, local stars become global stars.

Cowan, Jonard and Zimmermann's paper (2007) on networks as emergent structures from bilateral links is another important exception to the most common approach to the problem of knowledge exchange in firms' networks. This work explores which kind of networks emerge from bilateral collaborations between firms aimed at exchanging knowledge. Two elements influence alliances and network formation: the way in which agents pool their knowledge resources and the way in which they select and choose partners. Repeated bilateral partnerships result in the emergence of innovation networks

and in certain parts of the parameter space these networks have properties of small worlds.

This last paper provides a number of points of reference which we build upon: our theoretical perspective and methodological approach are very similar to those of Cowan et al. research (2007). Our perspective can be considered dual to the topological one: by not assuming that links among firms are pre-existent our objective is to generate the network topology with the help of a computer model by making minimal assumptions about the rules governing the exchange mechanism. In particular, we are interested in exploring structural properties of supply networks emerging from links among small firms in an Industrial District, assuming that these links are created out of need to exchange complementary knowledge assets and that the choice of partners is influenced by relational embeddedness.

The contribution of this paper would be on different aspects: first of all, we would explore in general the topic of how knowledge exchange processes among heterogeneous agents can generate the emergence of network structures; secondly, we are interested in exploring the interplay between knowledge exchanges and network architecture in the context of small firms' clusters, taking into account the crucial role that particular social characteristics of these systems play in shaping the phenomenon of network emergence; thirdly, the paper aims at contributing to the literature stream of dynamic emergence and evolution of supply networks, with a specific focus on the impact of collaborative strategies of agents on the emergent structures of networks.

3 Methodological approach

The methodology adopted in this research is the Agent-Based Modelling (ABM). ABM is recognized as one of the most proper tools of complexity science (OECD Global Science Forum, 2009), in particular for policy advice and decision making concerns.

ABM is a computational method to model and simulate complex systems made by several agents that interact to each other and with the environment (Gilbert, 2007). Modeling and simulating complex agent-based systems could have different, not alternative, functions: exploring in a virtual laboratory the dynamic behavior of a system or a phenomenon that could be difficult to investigate through the observation in the real world; performing generative experiments (Epstein and Axtell, 1996) in order to establish

if a set of micro-specifications is able to determine the emergence of observed, plausible or eventually unexpected macroscopic regularities and growing new theories from the bottom-up; solving formal problems that are not analytically tractable (Gilbert and Terna, 2000). Furthermore, agent-based models can be classified with respect to their target according to a taxonomy proposed by Boero and Squazzoni (2005) for models used in social science. They classify agent-based models in: 1) case-based models; 2) ideal-typical models; 3) abstract models. Case-based models are those strictly related to the empirical world, aimed at finding a micro-macro relationship to better understand a circumscribed empirical case. Ideal-typical models are “theoretical constructs” (Boero and Squazzoni, 2005) used to explore mechanisms that apply to a specific class of empirical phenomena. In this case, the full correspondence between the model and the empirical reality is not a requisite of this class of models. Finally, abstract models aim at representing in a simple way general social phenomena (Carley, 2002). The above categories differ for their diverse targets and, as consequence, for their relationship with empirical reality.

In this research, the ABM is used to identify a possible micro-macro (knowledge exchange mechanisms – network structures) relationship that could apply in a specific class of phenomena (flows of complementary-specialist knowledge assets among small subcontracting firms in flexible specialized industrial districts). The proposed model is, thus, a “typification” that does not refer to a well defined empirical case (a specific industrial district), but relate to some stylized facts concerning the empirical reality of traditional industrial districts.

In the following section the proposed model is described.

3.1 The model

The model represents a canonical Industrial District (ID) (Becattini, 1989; Markusen, 1996). According to Becattini (1990), the canonical neo-marshallian district is “a socio-territorial entity which is characterized by the active presence of both a community of people and a population of firms in one naturally and historically bounded area.”

The main characteristics of the canonical neo-marshallian ID are (Becattini, 1990, Markusen, 1996; Paniccchia, 1998): a business structure dominated by small firms, substantial intra-district trade among buyers and suppliers, low-level cooperation with firms external to the district, vertical cooperation prevailing over horizontal cooperation,

strong labor division according to the flexible specialization model (Piore and Sabel, 1984), geographical proximity among firms facilitating the emergence of a common culture and of reciprocity and trust.

As said before, the construction of the model is based on some stylized facts reported in theoretical and empirical literature on IDs. In particular, the model: i) reproduces the business structure of traditional IDs characterized by small firms (limited relational capability, specialization of each firm in one phase of the productive process); ii) assumes the geographic proximity among firms. The physical proximity among agents of the model is taken for granted in the sense that the typology of social relations among district's firms and the typology of their transactions are typical of co-location (Albino et al., 2000; Albino et al., 2007; Brusco, 1990). Only links internal to the district are considered and, as a consequence, the specific measure of distance among agents does not matter in the model; iii) represents the high level of labor division typical in canonical districts; iv) allows for vertical cooperation; v) reproduces some socially-determined mechanisms regarding partners choice.

A major simplification in the model is that the cluster is a closed system into which external firms cannot enter. Although this restriction certainly represents a limitation of the model, in stable phases of their existence, neo-marshallian IDs can be assumed to be very similar to closed systems because they tend to exhibit low entrance rate and high level of embeddedness of existing links (Markusen, 1996).

In the followings, the building blocks of the model are illustrated in depth.

3.1.1 The agents

The agents of the model represent the firms of an ID. According to the flexible specialization model, firms are specialized in different phases of the production process and the corresponding agents are divided into three different classes.

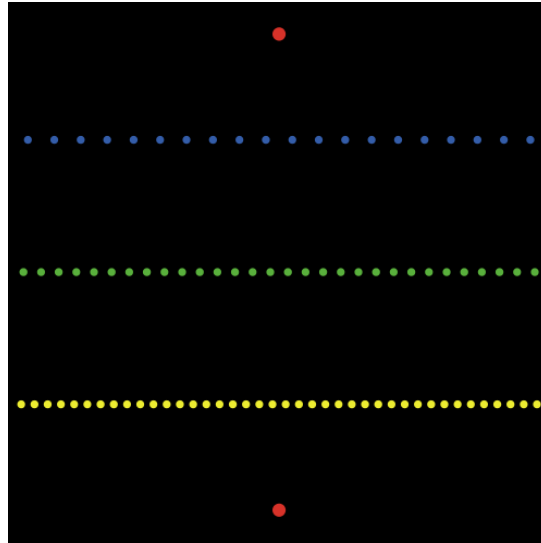


Figure 1 - Graphical representation of the firms in the ID through NetLogo interface

As shown in Figure 1, blue nodes represent the “contractors”, green nodes represent the “first-tier sub-contractors” and the yellow nodes represent the “second-tier sub-contractors”. The contractors directly interact with the enterprise customer, represented by a red node on the top in the grid-space; the first-tier sub-contractors can exchange goods and information with the contractors and with the second-tier sub-contractors; the second-tier sub-contractors receive raw materials and resources from the raw materials suppliers, represented by the red node on the bottom in the grid-space.

The firms are arranged in the grid-space of the simulation environment on five different levels, in relation to the different stages that comprise the supply chain.

The formation of the supply chain has been assumed to proceed from the top down. In fact, when a contractor receives an order from an enterprise customer, to be able to cope with the request it must necessarily rely on the cooperation of the firms at the level immediately below. In other words, in the model is not simulated the market demand or the awarding of an order to the contractors. What is simulated is a part of the response mechanism.

To each agent of the model a knowledge assets vector is associated:

$$K_j = [c_{j1}, c_{j2}, \dots, c_{jn}] \quad (1)$$

Each dimension c_{ij} represents the knowledge level achieved by the firm j -th in the i -th asset. In the proposed model n is settled equal to 3. Consequently, to each agent a three-dimensional knowledge vector is associated:

$$K = [c_1, c_2, c_3] \quad (2)$$

whose elements represent the knowledge level achieved by the agent in three different categories of knowledge and that evolve over time through a knowledge exchange. Knowledge levels are measured through real positive numbers in the interval $[0, \text{knowledge_limit}]$, where the “knowledge_limit” is a parameter introduced in the model and set equal to 100. In the simulation model there are 90 firms of which 20 are the contractors specialized in c_1 , 30 are first-tier subcontractors specialized in c_2 and 40 are second-tier subcontractors specialized in c_3 .

At the beginning of simulation each agent is supplied with a certain knowledge level depending on its specialization. In particular, in order to parameterize the knowledge level possessed by the firms in each category, the variable $k = (\text{knowledge_limit} / 10) / 2$ is created. In this way, to each firm is assigned a random value in $[k, k + \text{random } k]$ for the knowledge category in which is specialized and the value k in the other two categories. For example, if knowledge_limit is set equal to 100, the value of knowledge level in which each type of firm is specialized is randomly chosen in $[5, 10]$, while in the other two knowledge categories is equal to 5.

Consequently knowledge vectors are defined as follows:

$$\begin{aligned} K_{\text{contractors}} &= [c_1, c_2, c_3] = [5 + \text{random } 5, 5, 5] \\ K_{\text{first-tiers subcontractors}} &= [c_1, c_2, c_3] = [5, 5 + \text{random } 5, 5] \\ K_{\text{second-tiers subcontractors}} &= [c_1, c_2, c_3] = [5, 5, 5 + \text{random } 5] \end{aligned} \quad (3)$$

The knowledge level of the enterprise customers and raw materials suppliers is set equal to:

$$K = c_r = 5 \quad (4)$$

In addition, every agent has its own Absorptive Capacity (AC). The AC is a construct used to measure a firm’s ability to value, assimilate, and apply new knowledge (Cohen and Levinthal, 1989). The principal element to determine a firm’s AC is represented by its available knowledge. To each firm is associated a three-dimensional vector:

$$A_C = [a_{c_1}, a_{c_2}, a_{c_3}] \quad (5)$$

whose components indicate the AC level in each knowledge category.

The AC is a function of the knowledge level that a firm already has. A simple way to model the dependency of (a_{ci}) on existing knowledge is to assume a direct proportionality as follows:

$$\begin{aligned} a_{c_1} &= c_1/100 \\ a_{c_2} &= c_2/100 \\ a_{c_3} &= c_3/100 \end{aligned} \tag{6}$$

In the course of simulation, the set of competencies, and therefore the AC, is subject to continuous changes, due to two conflicting processes: learning and obsolescence.

3.1.2 Interactions

During the simulation, firms interact with each other, creating a network of relationships that evolve dynamically due to the continuous creation of new links, removing others and exit from the market of all inefficient firms. The interactions mechanisms modelled in the proposed agent-based system are learning mechanisms and the construction of networks.

In particular, two types of learning mechanisms are considered: the internal learning and the external learning (or relational).

Internal learning considers that the firm produces the knowledge by itself through the skills of individuals who work in it and, therefore, without any interaction with other firms. In the proposed model, the internal learning process has been implemented through the introduction of the “sigmoid function”.

Formally, let $c_i(t)$ and $(a_{ci})(t)$ respectively the knowledge level in which a firm is specialized and the AC in that specific knowledge, at the time $(t + 1)$ each firm will increase that knowledge level by an amount equal to:

$$C_i(t + 1) = c_i(t) + \frac{1}{1 + \exp^{[-(a_{ci})(t) \cdot c_i(t)]}} \tag{7}$$

while the knowledge levels in which a firm is not specialized remain unchanged.

External learning is a process of learning by interacting. This process involves the continuous exchange of knowledge between two firms A and B. The external learning occurs only if the condition of complementariness is satisfied, namely if there is at least one category of knowledge in which A dominates B and, at the same time, there is at least one other type of knowledge where B dominates A. As long as there is one category in

which agent A dominates agent B and one in which B dominates A, both agents perceive trade as mutually advantageous and a connection between them is activated.

As reported by Cowan and Jonard (2004), thanks to the external learning process, at every cycle each agent increases the knowledge level in which it is not specialized by an amount proportional to the AC in that knowledge.

Formally, assuming that at time t the firm B dominates the firm A in the category of knowledge c_i , the knowledge level that the firm A may reach at time $(t + 1)$ in the category c_i , after interacting with the firm B, is expressed by the following relation (symmetric for firm B):

$$c_{A,i}(t + 1) = c_{A,i}(t) + (a_{c_{A,i}}) \cdot [c_{B,i}(t) - c_{A,i}(t)] \quad (8)$$

Instead, as regards the agents representing the contractors and the raw materials suppliers, the increase of knowledge is done through the following relation:

$$c_r(t) = [(t/100)^2] \cdot 100 + 5 \quad (9)$$

Another force affecting firms' knowledge endowment is represented by the obsolescence. In fact, if on one hand every firm keeps on learning during the simulation, on the other hand knowledge levels decrease progressively at each cycle by an amount equal to the obsolescence rate. This latter, modelled through the parameter "obs", is equal for all firms and is variable in $[0, 1]$.

This phenomenon affects the firms' survival, causing their death and the exit from the market if they cannot counterbalance this effect through internal or external learning processes.

In order to avoid the exit from the market, each firm searches one or more partners with which create a link and exchange knowledge, in order to maximize its knowledge endowment. Another parameter introduced in the model is the maximum number of interactions that any agent can activate at each cycle. This latter, modeled through the parameter "L", represents the maximum allowed number of outgoing links. This modelling choice is a reasonable assumption since interaction involves transaction costs; in particular, small firms can manage only a limited number of partners at the same time, though they can build relations with many partners during their life. By limiting the number of simultaneous partners we also force firms to choose among possible partnership alternatives. It is not imposed, however, any constraint on the number of input

links. In the model, the parameter L has been settled equal to 3, as in previous steps of this research (Iandoli et al., 2012) it has been verified that the variation of this parameter in a predefined set of values does not significantly affect the results of simulations.

Figure 2 shows a simplified flow chart describing how firms make decisions about building or breaking links.

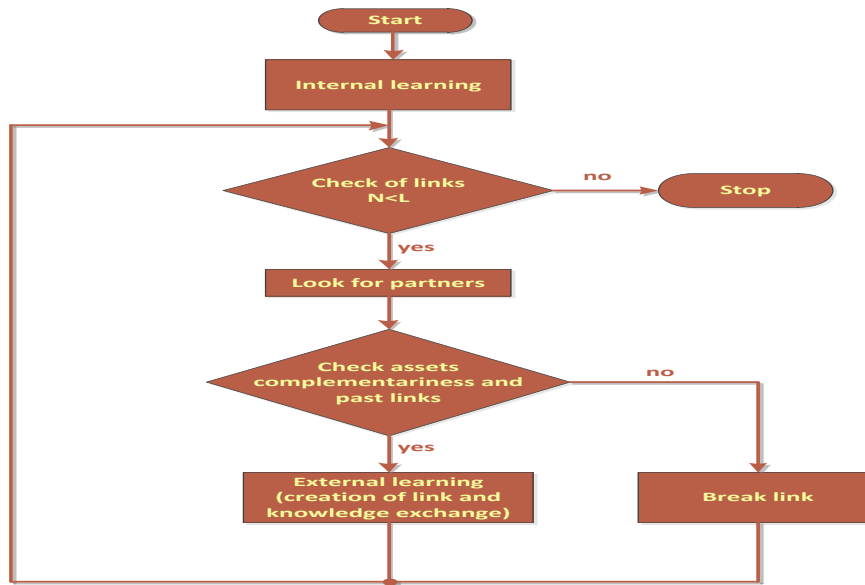


Figure 2 – Network building flow-chart

The probability of creating a link is dependent on two elements. The first element is the level of reciprocal complementariness between agents’ knowledge endowment, measured by the following relation:

$$p = 1 - \left| \frac{c_i - c_j}{\max(c_i, c_j)} \right| \quad (10)$$

where $(c_i - c_j)$ represents the “cognitive distance” between different specialist skills, while $\max(c_i, c_j)$ is the normalization factor. The second element influencing the probability of link establishment between two firms is the (normalized) number of links that they have already established in the past. In fact, one of our objective has been to introduce a mechanism of selection that takes into account whether and how the “embeddedness” of the firms in the social system can influence their behavior and, ultimately, as the latter may reflect on the network characteristics. In this regard, when a firm chooses to develop cooperative relationships with other entities, it selects its partners

based on reputations, recommendations or relying on previous experiences were successful.

Firms that prefer previous partners are driven by a sort of “inertial rationality”. However, the embeddedness in the social system does not prevent the actors in the system to make decisions based solely on an “utilitarian rationality”, mainly in order to complement their knowledge endowment and thus enable collaboration, even sporadic, with entities other than the partner usually involved in exchange relationships.

More in depth, we have modelled the probability for a firm to establish a link with a potential partner (when the complementariness condition is satisfied) in the following way:

$$f = T \cdot x + (1 - T) \cdot y \quad (11)$$

where x represents the number of links established in the past between the two firms, y represents the knowledge gap between different specialist skills, while the T parameter measures the relative weight of these two variables and can assume values in the range $[0,1]$. From this relation we deduce that for high values of T , the probability that two firms establish a link depends more on the number of relationships that they have already established in the past, while for low values of T such probability depends to greater extent from their cognitive gap.

4 Experimental sets and simulation analysis

In order to develop the interpretive hypotheses about the phenomena under investigation, the behaviour of the model has been analyzed through simulations under different parameters configurations.

More in detail, set $L = 3$ and $\text{knowledge_limit} = 100$, three different experimental sets have been analyzed each of which corresponding to a different value of the parameter T : $T = 0.10$, $T = 0.50$ and $T = 0.90$. Fixed T , it has been analyzed the behaviour of the system for three different values of the parameter obs ,: $\text{obs} = 0.50$, $\text{obs} = 0.60$, $\text{obs} = 0.65$.

As shown in table 1, 9 different scenarios have been considered, for each of which 100 simulation runs have been performed.

Table 1 – Experimental sets

Set	T	Obsolescence		
I experimental set	0.10	0.50	0.60	0.65
II experimental set	0.50	0.50	0.60	0.65
III experimental set	0.90	0.50	0.60	0.65

In the first setting the parameter T is equal to 0.10. This means that the probability that two agents establish a link to exchange knowledge is almost totally dependent on the level of knowledge gaps between them. The probability will decrease as this gap increases. In the second experiment the value of T is equal to 0.50. This implies that the number of past links and the level of knowledge complementariness have the same weight in defining the probability of establishing a link. In the third experiment, T is equal to 0.90. This means that the probability of a link being created between two agents depends much more on the number of past links between them than on their level of knowledge complementariness. The probability of establishing a link increases according to the level of relational embeddedness of the two firms.

For each experimental set, different variables have been analyzed in order to describe with sufficient precision any emerging scenario. Specifically, the number of surviving nodes at the end of the simulation (a sort of stable equilibrium is reached) and the number of links for each type of firms.

The choice to investigate these variables is mainly due to the fact that is not meaningful in this case to use other classical metrics of Network Analysis, such as the centrality or the characteristic path length, since they always return the same values. The model simulates the vertical relationships between firms in an industrial district, then the measure that allows to obtain unequivocally information about the output of the simulations is the degree of connectivity of the network and of its nodes. This information can be easily obtained right through the above-mentioned parameters.

Furthermore, social simulation models are usually not deterministic and our model is not an exception. In our case this implies that if one runs a simulation with identical parameters setting twice, different nodes will survive, different relationships among them will be established and therefore different link distributions will be produced in each run. Since one of our aims has been to look for statistical regularities of the network generated by the model in different iterations within a same experimental set, it has been necessary

to adopt a method to objectively classify the network structures produced by the simulation in each run. Specifically, The statistical distribution of the links has been identified as a way to describe and classify the output of the simulations. Therefore, we chose an appropriate method to cumulate the set of distributions obtained in each run and to establish whether there was a recurring network structure for a given experimental set.

In order to achieve those aims we have used the Kolmogorov-Smirnov (K-S) test (Chakravati et al, 1967). Without being exhaustive, the K-S test can be thought of as goodness of fit test. It computes an estimation of the distance between two samples and tells us whether those two samples can come from the same distribution. So, we compared our simulation outputs with a Gamma distribution with a significance level equal to 0.05. The Gamma distribution is useful for this purpose because it can describe a wide range of distributions with just two parameters: shape and scale. For each simulation output we performed the K-S test with a shape between 1 and 9 with step 1, and a scale ranging between 1 and 4 with step 0.5, then we chose the pair with the lowest p-value. All the chosen p-values are smaller than the 0.05 significance level.

4.1 Results

Experimental results are reported in bar plots for the K-S test, where each bar represents the relative frequency with which a Gamma distribution with a given shape and scale has been produced in the total sample of iterations generated in each experimental set.

In order to read the bar plots presented, a clarification of the meaning of the shape-scale couple is needed. The first value gives an idea of the extent to which a link distribution is positive skewed; the smaller is the shape, the more positively skewed the distribution is. So, for instance, a link distribution where the shape equals 1 represents a scale-free network. The second value provides information about the mean of the link distribution: the greater the scale, the greater the mean of the link distribution. One way to read these bar plots, with respect to network structures, is to identify shape-scale couples on the left hand side as scale-free networks, and the ones on the right hand side as random networks. Those couples located between the left and the right hand side of the bar plot represent link distributions characterized by a rounded pick and a moderate right tail.

A first interesting conclusion that has been reached by performing the simulations, is that after a certain number of cycles the system reaches an equilibrium state that presents constant values of the output variables of the. In particular, whatever the value of the

parameter T , when the obsolescence is equal to 0.50, the number of cycles in which the network reaches stability is about 260, when the obsolescence is equal to 0.60 and 0.65 the number of cycles in which the network reaches stability is about 340. After this interval of time, the variables that measure the structural characteristics of networks are characterized by a constant value. Thus, the value of the number of cycles depends on the value of the parameter *obs*.

Also the trend of the population seems to be influenced by this parameter. In fact, it has been observed that, whatever the value of the parameter T , the number of firms that survive decreases as the value of obsolescence increases. This result seems to confirm the fact that in the traditional districts the survival of firms is due to the presence of a poorly innovative environment, unlike the high-tech districts that are characterized by environments more dynamic and therefore more selective.

With respect to the distribution of the number links, in all the experimental sets each firm has on average a number of links equal to 4. In particular, there is greater similarity between the sets where $T = 0.10$, and $T = 0.50$, while for the set in which $T = 0.90$ the values are significantly different. So, it is possible to say that the number of links of the firms and how they are distributed strongly depends on the way in which firms choose their partners, but also on the obsolescence, since it affects directly the population of surviving firms.

It may still be noted that, whatever the value of the obsolescence, the system reaches an equilibrium state characterized by high values of the average knowledge level. In fact, when the cognitive pauperisation takes place with a high speed, and therefore for high values of obsolescence, the competition between the firms significantly increases, the market becomes more selective and only those firms with high knowledge and absorptive capacity are able to survive. In this context, there is an heterogeneous distribution of knowledge which will tend to comply with the exit from the market of those firms with a low level of knowledge endowment. Instead, low values of obsolescence create an uncompetitive environment, where even the firms with limited knowledge endowment are able to survive by improving their knowledge assets and by determining, also in this case, an homogeneous distribution of knowledge.

This behaviour can be interpreted, generally, as a tendency of the system to reorganize and rebalance itself in a completely autonomous way, by eliminating the firms less efficient in terms of learning as a result of the changes induced by the external

environment. The ability to react to changes by reconfiguring the network of internal relations is one of the main features of industrial districts.

At the equilibrium is also possible to observe the presence of one or more hub, namely firms characterized by a number of connections slightly higher than the average value in the system and which play the role of leading enterprises..

In particular, the analysis of the simulations shows that the evolution of the network toward characteristics of a scale-free network is mainly influenced by the parameter T .

Figure 3 shows the bar diagrams of the K-S test performed relatively to the experimental set in which $T = 0.10$.

In this scenario, firms select potential partners mainly according to an “utilitarian” criterion. In particular, the networks emerging from the interaction between firms have structural features typical of a scale-free network. This property is emphasized as the obsolescence parameters increases.

This scenario is characterized by the presence of hubs, that are mainly represented by first-tiers-subcontractors.

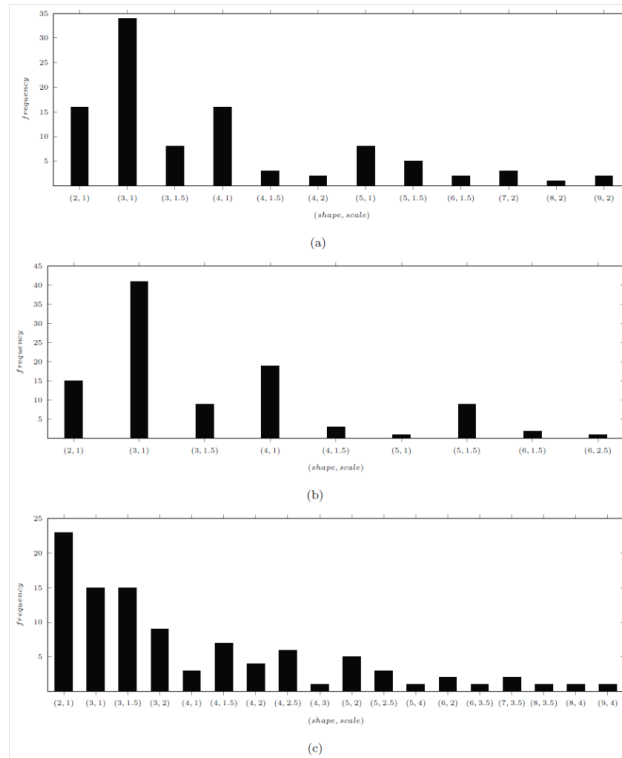


Figure 3 - Experimental results obtained for $T=0.10$ and for different values of the obsolescence: (a) $obs=0.50$; (b) $obs=0.60$; (c) $obs=0.65$.

Figure 4 shows the bar diagrams of the K-S test performed relatively to the experimental set where $T = 0.50$.

In this second scenario, the situation is substantially similar to the first scenario, but with a less pronounced tendency toward scale-free networks.

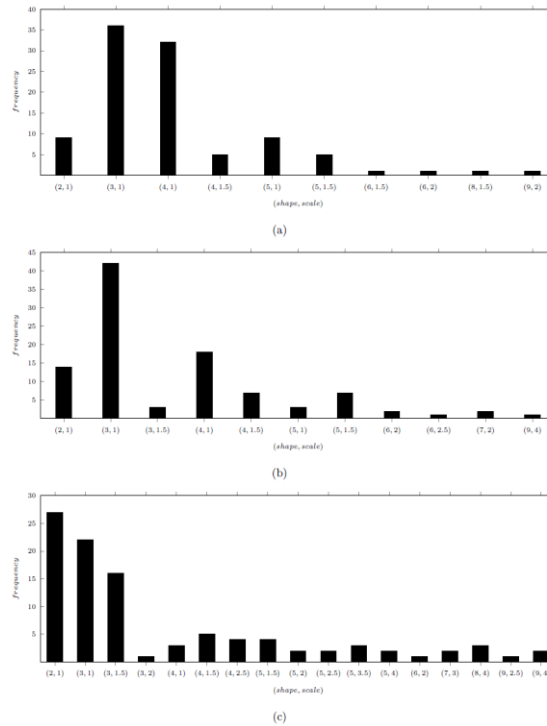


Figure 4 - Experimental results obtained for $T=0.50$ and for different values of the obsolescence: (a) $obs=0.50$; (b) $obs=0.60$; (c) $obs=0.65$.

Figure 5 shows the bar diagrams of the K-S test performed relatively to the experimental set where $T = 0.90$.

The third scenario corresponds to the situation in which the behaviour of firms is “inertial”, with a tendency to give greater weight to past relationships. In particular, by increasing obsolescence, the networks that emerge from the interaction between firms have on average structural features typical of a random networks. In this scenario, the first-tier-subcontractors present a number of links moderately higher than the other firms.

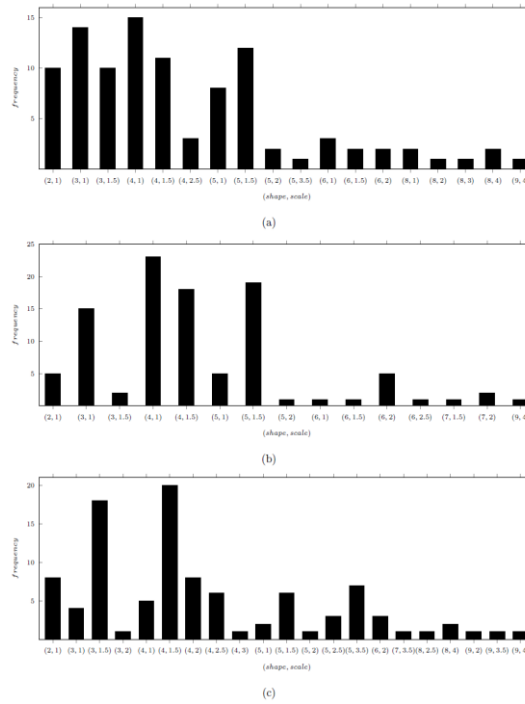


Figure 5 - Experimental results obtained for $T=0.90$ and for different values of the obsolescence: (a) $obs=0.50$; (b) $obs=0.60$; (c) $obs=0.65$.

In summary, the analysis carried out through generative experiments shows that: 1) the complementariness of specialized knowledge among small firms in a ID is a sufficient condition for the emergence of stable transaction networks; 2) the level of knowledge obsolescence (parameter obs) affects the survival of the population of firms at the equilibrium, but not significantly the average level of knowledge acquired by agents; 3) the logic (utilitarian vs. inertial, parameter T) driving the selection of potential partners and the establishment of cooperative relationships affects the structure of above networks. In particular, the emergence of hub&spoke networks is driven by the prevalence of an utilitarian criterion used by firms in choosing partners. In this scenario, the frequency of occurrence of hub&spoke structures increases according to the level of obsolescence.

Starting from these results it can be concluded that most selective environments (in particular with respect to the internal district environment) are more conducive of hub&spoke structures, that, in turns, are recognized by literature as best performing in innovation, diversification and knowledge diffusion (Guerrieri and Pietrobelli, 2004; Phelps et al., 2012)

5 Conclusions

The main objective of this paper was to investigate the topological properties of the supply networks emerging as a result of selective choices made by small firms of a flexible-specialized Industrial District in exchanging complementary knowledge assets.

Contrary to the many works that have used social network analysis to investigate the properties of clusters of small firms, we did not assume the network as given. Our aim was to improve our understanding of the transactional mechanisms that favor the emergence of network structures from stable and recurring patterns of interactions among autonomous firms provided with bounded rationality. In particular, we focused on knowledge exchange happening among firms in a closed cluster, and we modelled the partnership mechanism based on competencies' complementariness that is typical in the formation of supply chains in IDs with flexible specialization through a simple barter of non-rival assets among agents. Furthermore, we modelled the impact of relational embeddedness on the choice of possible partners and, by doing that, we were able to investigate the role played by various social mechanisms characterizing canonical IDs in shaping the general behavior of the system. Our simulation results show that, our assumption on knowledge complementariness is sufficient to generate stable networks and that the logic driving the choice of partners is able to affect the structure of these networks. In fact, when the logic inspiring firms in choosing potential partners is mostly "utilitarian" the distribution of links among surviving agents is power law like, determining the emergence of hub&spoke structures that are recognized as more conducive to growth and evolution of the system. A similar result is obtained in a scenario in which the "utilitarian" logic is perfectly balanced by an "inertial" logic, represented by a choice criterion driven by the history of past links between the firms involved in the relationship. This result can be interpreted as the presence of a relational embeddedness threshold affecting the structure of nodes connections in emerging supply networks. This hypothesis is, at this stage of the research, the first output of the simulation analysis and has to be further verified by means of empirical validation.

Given the current state of development in agent-based technology, we do not consider it mature enough to identify straightforward applications for practitioners. So we see it primarily as a tool through which social scientists can improve their understanding of the phenomena object of their investigation, especially when these involve heterogeneous

agents, lack of centralization and complex co-evolutionary or path-dependent development trajectories.

However, some lessons learned, confirmed by subsequent empirical testing, could lead to novel insights for policy makers or trigger new directions for policies experimentation and design.

Agent-based modeling's promise is not in the development of tools to map reality and make predictions, but in the potential to help policy-makers to simulate possible consequences of certain choices. To allow them to examine potentially unexpected impacts as well as to support sense-making and creative thinking thanks to a deeper analytical understanding of problems.

In addition to the general remarks and criticisms advanced to the agent-based modeling approach as a whole, our study suffers from other more specific limitations that we intend to address in future work.

First, we have not yet validated our model using evidence from empirical studies on real IDs, so the next step will be to complement our present work with field work to gather the necessary data. Unfortunately this kind of empirical work is usually hard and time-consuming, because companies are often unwilling to disclose information on their partnerships or because they do not have a reliable longitudinal information database to build the map of their interactions. Consequently, the relational system and its evolution through time has to be reconstructed from scratch and then subjected to cross-validation because of the multiplicity of different sources from which information has to be obtained and verified.

Second, we have not included horizontal relationships in our model. Whilst, at least in vertical IDs, they are of secondary importance compared to the vertical, supply chain-driven partnerships, we have no clues on how much they can contribute to shape the structure of the network and explain its performances in terms of knowledge creation/sharing and diffusion. A first step will be to compare our model with similar ones developed to explain innovation performances in other kinds of firms clusters characterized by a higher importance of horizontal collaboration (Cowan, 2005) and a flatter organizational structure, as in certain kind of hi-tech clusters. The comparison of different ways of organizing collaboration and their impact on innovation in different models of industrial organization could be a fruitful angle for the identification of

suggestions for policy makers on how to increase the innovation potential of small firms networks.

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Learning to grow – a methodology to sustain growth capabilities of SMEs

Klaus North*

Wiesbaden Business School
Hochschule RheinMain.
Bleichstr, 44, D-65183 Wiesbaden.

Manfred Bergstermann, Thomas Hardwig,

KOM.In - Institut für Wachstumsmanagement und Projektlernen,
Wilhelm-Raabe Straße 17a
D-37083 Göttingen

Structured Abstract

Purpose – To sustain growth in turbulent environments SMEs face major challenges due to their limited human, organizational and financial resources and capabilities. How to reconcile learning and growth to sustain competitive advantage of SMEs in turbulent environments is a vital but widely unsolved question in theory and practice .

Design/methodology/approach – Based on a three year action research project with 124 SMEs in Germany drivers and obstacles of growth have been identified and the methodology “Learning to grow” has been developed and successfully applied in further learning networks of SMEs in Germany, Spain , Argentina, Brazil and Peru.

Originality/value – This methodology puts in evidence the effectiveness of project based learning to sustain and develop growth capabilities of SMEs. Aligning learning of teams with business challenges creates measurable short or mid-term results as well enhances organizational capabilities to sustain growth.

Practical implications – Evaluations carried-out demonstrate that the learning projects let to significant business results (for example conquering new markets, adding new services to products, improving processes, productivity and quality) as well as enhancing organisational capabilities amongst which are improved team work, better problem solving, enhanced communication , freeing of owners or managers from daily routine tasks, development of leadership capabilities of middle managers, entrepreneurial thinking of employees.

Keywords – SMEs, growth, turbulent environment, project learning, dynamic capabilities

Paper type – Practical Paper & Academic Research Paper (both aspects are developed)

1 Introduction

To sustain growth in turbulent environments SMEs face major challenges due to their limited human, organizational and financial resources and capabilities. Owner/managers are overloaded by daily business and are pressed to delegate and integrate new employees (Van Bruystegem et al 2008). While striving to cope with current business SMEs tend to lose grip on future development and thus deplete resources while growing in an often uncoordinated manner. On the other hand periods of growth can be quickly followed by periods of decline. Hence the need to adapt to turbulent environments (Detarsio, North, Ormaetxea 2013, see also www.dynamic-sme.org)

How to reconcile learning and growth (Holt and Mcpherson 2006) in order to sustain competitive advantage (Barney 1991) of SMEs in turbulent environments is a vital but widely unsolved question in theory and practice. Wiklund et al (2009 p.351) argue that “despite substantial increase in research volume, recent reviews of the literature on small firm growth suggest that little is still known about the phenomenon, and conceptual development has been limited.” Macpherson and Holt’s (2007) literature review on knowledge, learning and small firm growth also reveals deficits in research on the concrete mechanisms of learning and their relation to growth of SMEs.

To deepen our understanding of learning and growth of SMEs and subsequently develop and test learning formats to support growth of SMES a three year action research project was carried between 2009 and 2011 in three German regions (Baden-Württemberg, Sachsen and Berlin-Brandenburg) with 124 SME which had above average growth rates. Out of these 26 SMES were selected to develop the “*Learning to grow*” methodology ” (Hardwig, Bergstermann, North 2011). In the action research Wiesbaden Business School cooperated with “RKW” the German government supported consulting service for SMEs.

Following a review of our empirical results on learning and growth of SMEs the main focus of this paper is to present the “*Learning to grow*” methodology which draws on deliberate learning as a means of developing dynamic capabilities (Zollo and Winter 2002) and applies project-based learning (Scarbrough et al. 2004) closely linked to business challenges.

2 Obstacles and drivers for growth of innovative SMEs

2.1 Survey of growing SMEs

To learn more about the real obstacles and what drives company growth, above average growing and innovative SME's were examined. In three German regions companies known to the RKW advisors were selected that had a) a growth rate above average of their sector and b) had a high innovation capacity as demonstrated by product and process innovations in the previous three years as well as maintained regular research and development activities. Two thirds of the selected firms realized a growth in sales of more than 10 % per annum in the years 2005 to 2007.

In the 124 SMEs a survey (Bergstermann et al. 2009) was carried out during a two hours consultation– mostly with the owner or a top manager of the enterprise. A three-part instrument was used. It contained a standardized questionnaire about the conditions of growth, an interview about the situation of growth and perspectives of development of the company as well as a self-assessment of the management quality.

During the sifting of the empirical data it became obvious, that enterprises in growing markets, achieve higher growth-rates than enterprises in stagnating or shrinking markets. 17% of surveyed SMEs, however, were able to achieve an increase in turnover of more than 20% annually, although they acted in stagnating markets. This supports our assumption that rather than unfavorable environmental conditions the quality of the management impacts the success of an enterprise, which is consistent with Macpherson and Holt's (2007) literature review.

Manager/owners of the surveyed companies were further asked to give explanations for several factors contributing to growth as well as gauge their relative importance. The three factors "competence of the employees", "sound business strategy" and a "strong leadership" marked in Figure 1 were not only relevant in the subjective assessment of the company decision-makers, but also had a statistically high impact on the strength of an enterprises' growth.

What Contributes Most to the Growth of Your Firm?

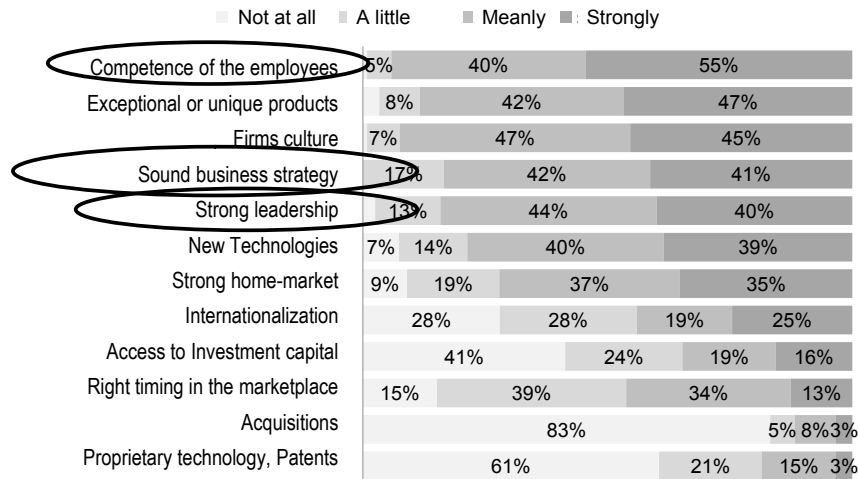


Fig. 1: Contributions to growth from the owner/manager's point of view (base: 124 SME owner/managers interviewed in 2008)

Those three factors are closely linked. Owner/managers who cited leadership as a relevant contribution to growth also mentioned strategy and competence of the employees as highly related to growth. We will call this connection of a strong leadership and a sound business strategy valuing the contribution of competence of the employees "competence-based management".

To test the hypothesis, if competence-based management is a decisive factor to explain growth of SMEs we realized a factor analysis (Oneway ANOVA). The independent variable was growth of turnover in the years 2005 to 2007 (compound annual growth rate)¹. As dependent variables we took variables relating to the structure of the enterprise², its situation of competition³, its growth strategy⁴ as well as its innovativeness⁵ - all these factors are possible sources of growth.

¹ Growth of turnover is highly correlated with the growth of the number of employees.

² Industry, size (employees), age of the enterprise, grade of independency, the relations of property, and the structure of the staff's qualification.

³ Porter's five forces: Supplier power, threat of substitutes, buyer power, barriers to entry, degree of rivalry.

⁴ The product / market orientation and the regions of market activity.

⁵ Intensity of product and process innovations, expenditure of research and development.

The analysis shows that apart from “competence-based management” only 2 of the 16 variables checked were in statistically significant correlation with the strength of growth in turnover of these enterprises. The two other factors are “threat of substitutes” (highly significant) and intensity of “process innovation” (weakly significant). Both factors have like competence-based management, an impact on the strength of growth, whereas all the other factors could not be cleared up.

This supports the hypothesis that the quality of the management to a large extent explains the strength of growth in our sample. This result is consistent with newer research on determinants and dimensions of firm growth (cf. Zhou / deWit, 2009) where mostly internal factors are held accountable for growth.

2.2 Higher performance by activating the employees.

The results of the survey also show that those SMEs, whose representatives named competence-based management as a strong contribution to growth (Fig. 1) showed higher growth than the other SMEs or our sample. At the same time, there are further indicators showing a better economic performance of those enterprises:

- They have a better profitability (improvement in the last three years and in self estimated comparison to competitors),
- They articulated less problems with the staff (motivation and willingness for accomplishment of the staff; conflicts within the staff and conflicts within the company management) and
- They have stronger innovation activities (more process innovations in the last three years; more social innovations within the company; fewer problems within the organization while realizing innovations).

Higher performance could be a result of a stronger activation of the employees. Owner/managers following a competence-based management agreed more often to the statements displayed in Fig. 2 describing a stronger engagement of the employees for company goals than leaders of SMEs not explicitly practicing a competence-based management (see Fig.2).

Activating Employees through Competence-based Management

Independent Variable: „Competence-based Management“ - (Factor analysis, Oneway ANOVA)

Statement	Significance	
„Our employees show in their daily activities, that they support firm's aims of growth and innovation.“	0,000	Highly
„Our firm is characterized by the ambition to continuous improvement and looking for new solutions“	0,001	Highly
„The relations between the members of our firm are characterized by mutual respect and trust.“	0,001	Highly
"Our employees share the firm's visions."	0,009	Highly
„Our employees engage strongly for the needs of our customers“	0,018	
„Employees in our firm are strongly success- and achievement-orientated.“	0,028	
„We realize improvement based on ideas of our employees all the time.“	0,039	Weakly
"Transfer and sharing of knowledge goes well even between departments and different professions."	0,054	Weakly
„Our firm is characterized by entrepreneurial thinking and action of employees.“	0,078	Weakly

Fig. 2: Owner/managers who practice a competence-based management confirm statements describing the activation of employees to a greater extent than those not explicitly practicing this management approach.

The results of our investigations point to the fact that a competence-based management leads to a higher performance by activating the competences of the employees. Essential features of SMEs practicing a competence-based management approach are more encouraged and empowered employees acting with responsibility, the ability to exchange knowledge and to learn as well as realizing changes within the organization. Thus responsiveness to external changes and dynamics in society, including technology or markets is increased. In this respect a competence-based management approach contributes the development of “dynamic capabilities” (Teece 2007). Several empirical studies showed that dynamic capabilities contribute to performance and growth of SMEs (He/Wong 2004; Lubatkin et al. 2006; Protogerou et al. 2008). They have an indirect impact on performance by adjusting the company’s core competences: “Dynamic capabilities seem to support and enhance the reconfiguration and development of new

marketing and technological competences which in turn lead to higher competitive performance in terms of market share and profitability.” (Protogerou et al. 2008, p.27).

What are the implications of the survey results for the development of a learning format to enhance growth of SMEs? The approach to be developed has to closely link business challenges and learning, it should activate potentials of employees and enable them to take up responsibilities within a framework of strong leadership. In operational terms the empowerment of employees should free the manager/owner from day-today business in order to devote more time to strategic issues. In addition only a minimum of external assistance (consultancy/coaching) should be needed by the companies to implement the learning format.

3 The “Learning to grow” methodology

3.1 Key features

Following the survey phase a first group of 13 SMEs distributed over the three regions representing different sizes and sectors (particularly manufacturing and services) and willing to join an action research “experiment” to develop a learning format to enhance growth capabilities were selected. This first group served over around 9 months to develop the methodology. In a subsequent second consortium of 13 firms the methodology was further matured. In the mean time “*Learning to grow*” has been applied in learning networks of SMEs in Germany, Spain (UGGASA 2013); Brazil (North et al. 2013), projects in Peru and Argentina are under way (cf. Dynamic SME project). Up to now approximately 70 SMEs have made their learning journey to enhance growth capabilities using the methodology

In a nutshell “*Learning to grow*” consists of the following steps: Based on a structured analysis of growth capabilities and deficits by means of a “wheel of growth” the owner/manager supported by a “growth coach” defines a strategic growth project that has a short to medium term impact on business performance and in parallel serves to develop/sustain growth capabilities. To this effect the project is delegated by the owner/manager to a team of employees who define their learning objectives to be accomplished and carry-out the project conceived as a learning journey over a period of 6 to 9 months. The whole process is supported by a coach (approx. 12 half days of intervention) who has been trained in the methodology. Normally the “*Learning to grow*” methodology is used in a network of about 10 SMEs whose teams meet to exchange

experiences and run joint learning sessions. In the following the methodology will be explained in more detail.

3.2 The wheel of growth: diagnosing growth challenges and capabilities

To develop the “*Learning to grow*” methodology we classified interview results and thus identified four typical challenges of SME growth. Nearly all the 127 SME’s involved could be assigned to one of the four challenges (98%):

- Many firms were in a situation demanding them to sense new growth potentials, (19% of the SME’s).
- For others the challenge was defining a growth strategy to orientate the enterprise towards capturing market potentials (22%).
- Further enterprises discussed seizing growth potentials by motivating and empowering their employees to exploit available possibilities for growth by consequent action (20%).
- The strongest group of the survey (36%) included enterprises which had grown successfully over a period of time and were now challenged to cope with the effects of growth: such organizations had to be adjusted to the situation or there were problems with the supply with the most important resources (e.g. the lack of qualified employees, and the bottleneck of financing).

Linking these survey results to theory it became evident that the challenges named by owner/managers matched quite well with Teece’s (2007) “Sensing”, “seizing” and “transforming” trilogy of dynamic capability development: "For analytical purposes, dynamic capabilities can be disaggregated into the capacity (1) to sense and shape opportunities and threats, (2) to seize opportunities, and (3) to maintain competitiveness through enhancing, combining, protecting and, when necessary, reconfiguring the business enterprise’s intangible and tangible assets. Dynamic capabilities include difficult-to-replicate enterprise capabilities required to adapt to changing customer and technological opportunities." (Teece 2007, 1319).

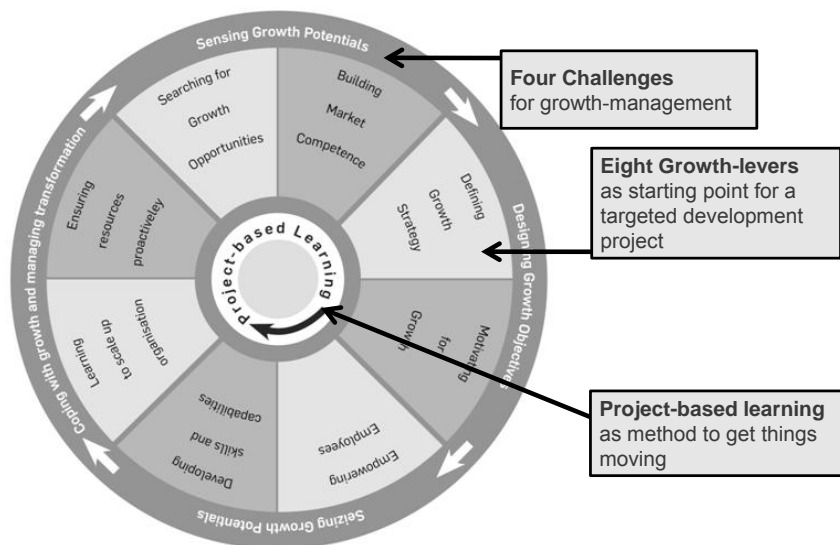


Fig. 3: The Wheel of growth

Merging theory and practice we constructed a *Wheel of Growth* to analyse growth capabilities. It comprises the four central challenges and two “growth levers” for each challenge:

1. Sensing growth potentials (Searching for growth opportunities, Building market competence);
2. Designing growth objectives (Defining growth strategy, Motivating employees for growth);
3. Seizing growth potentials (Empowering employees, Developing skills and capabilities);
4. Coping with growth and managing transformation (up-scaling the organization, Ensuring resources proactively).

The two “growth levers” defined for each challenge constitute fields of action to leverage growth capabilities of the firm. The growth levers were derived from our analysis of 124 SMEs based on the interviews with owner/managers.

To use the wheel of growth as self-analysis tool for each lever two key statements have been formulated. They are rated according to the capability level reached (using a three-point traffic light scaling) and in a second rating the relative importance for sustaining competitiveness is assessed in order to derive priority areas of action.

Statements for the lever “searching for growth opportunities” for example are “Our company observes and recognizes systematically new possibilities and trends in relevant markets and learns from competitors, clients, suppliers, partners” and “Our company encourages and effectively uses the ideas of the employees” .¹

The self-analysis is usually carried-out in a dialogue between owners and managers of an SME and the external coach and takes about two hours. The 4 challenges, 8 levers, and 16 key questions are the starting point of targeted innovation and learning projects.

3.3 A learning Project impacting on business performance.

Based on the wheel of growth the external coach assists the owner/manager to define a learning project which on the one hand will have a measurable short to medium term business impact and on the other hand is well suited to improve growth capabilities.

Past projects have focussed for example on such topics such as improving competitor analysis, implementing an idea competition for new products and services, expanding to new markets, improving internal organisation, creating a continuous improvement process, developing a participative strategy process, establishing a second management level etc.

The development of growth capabilities starts with the identification of the actual relevant challenges faced by an enterprise during the process of growth. In practical terms, the coach assists the manager/owner to define a learning project. The manager/owner selects members of a project team considering in particular competence development potentials and needs (e.g. preparing staff for middle management position, learning cooperation across units, preparing technical staff for sales support). In a briefing session the project is handed over to the team. Subsequently the owner/manager acts as client of the team. This requires the owner/manager to trust in the team and not to interfere (which is also a learning process for the owner/manager).

The team supported by the coach develops a project plan containing not only the business objectives but also detailed learning objectives for the team as a whole and for individual members. Often a competence matrix (cf. North and Kumta 2014) is used to visualise current and desired competence distribution of the team. After approval by the manager owner the project is carried-out step by step which is supported by the coach.

¹ *The wheel of growth with the 16 questions can be downloaded from www.dynamic-sme.org*

There are regular meetings scheduled with the “client”, the team organises its self-learning and, if necessary, task related training is provided by the coach.

The “growth coach” acts as process consultant following Schein’s (1999) concept of building a helping relationship. By understanding that the consultant/coach can only help the clients to solve their problems consultation becomes a matter of establishing a supportive relationship in which the client is guided to understand the need and opportunities for change. The growth coach is to facilitate the project and the learning process, ensure communication between project team and manager/owner and periodically reflect with team and manager/owner on the process.

Many owners/managers of SMEs have mixed feelings of employing external consultants and normally would expect an expert consultant to solve their “technical” problems. Therefore the growth coach has often to overcome resistance to process coaching in SMEs and cautiously support a cultural change. In order to train “growth coaches” a 20 hour training course is offered for participants with consultancy and coaching experience. In order to qualify for a certificate as growth coach candidates have to successfully accompany a “*Learning to grow*” project and submit a report to the originators of the methodology. Coaches are invited to participate in a supervision process.

Experience exchange and peer pressure in a SME network is integral part of the Learning to Grow methodology. Usually a “*Learning to grow*” network consists of 7-10 SMEs in a region who are not competitors. One rationale of the network is to act as a pacemaker to ensure that projects at firm level keep track. Furthermore the network agrees on training needs and runs joint training sessions (p.e. on topics such as project management, internal organisation, effective team work, active sales management). During the usually 6 months project duration three “Learning to grow” workshops are carried-out, where SMEs share their project advances and difficulties and in each session focus on a relevant topic from the wheel of growth (p.e. delegation and empowerment of employees). There is always time for networking between project teams which in some cases leads to intensive bilateral interaction.

4 Triple value: Results of *Learning to grow* projects

This methodology puts in evidence the effectiveness of project based learning to sustain and develop growth capabilities of SMEs. Aligning learning of teams with

business challenges creates measurable short or mid-term results as well enhances organizational capabilities to sustain growth.

During the development process of the methodology periodic interviews and reflection sessions were carried-out by the researchers with manger/owners, project teams and consultants acting as growth coaches. A number of case studies were written to document the project process at firm level (RKW Deutschland 2012). In the Basque (Spanish) SME *Learning to grow* network storytelling was used to create evidence on results achieved UGGASA (2013). In the mean time a standard questionnaire is in place, one for manager/owners and another for project teams to evaluate results of the project, which has been applied in two *Learning to grow* networks so far.

These evaluations demonstrate that there is a triple benefit of the learning projects.

Firstly, projects let to significant business results (e.g. conquering new markets, adding new services to products, improving processes, productivity and quality). This is relatively easy to measure related to the “business objectives” of the project.

Secondly, learning projects have contributed to enhance organisational capabilities amongst which are improved team work, better problem solving, enhanced communication, freeing of owner-manager from daily routine tasks, development of leadership capabilities of middle managers as well as entrepreneurial thinking of employees. The learning projects have also raised the awareness about the unused potentials of employees. While at the beginning of the project some manager/owners stated “*I doubt that my people are able and qualified to carry-out such a project*”, in the reflection session at the end of the project the same managers/owners stated: “*I was not aware what my people are able to do*” or “*I have learned to trust in the capabilities of my people*”. The demonstration what teams are able to achieve let also to a different communication and delegation behaviour. Asked about the effects of the project team performance at the end of a 6months learning journey the 9 owner/managers of the Basque *Learning to grow* consortium (UGGASA 2013) particularly valued the increased capacity to reflect, self-organise and orientation towards firm objectives. The perception of project results by 46 members of 7 projects teams of SMEs in lower Saxonia (Hardwig 2012) is shown in figure 4. More than fifty percent of the respondents agreed that there had been a substantial improvement of internal communication and that new processes, procedures, structures had been introduced ensuring a better use of employee potentials thus rendering the organization more flexible and adaptable to change.

A third benefit of the *Learning to grow* methodology is derived by creating a network of participating firms allowing exchange of experiences with the methodology, for discussing solutions to similar problems (for example internal communication, delegation of responsibilities, improving sales) and pooling resources for training on topics of mutual interest. The joint workshops were seen as an important pacemaker and exerted peer pressure to advance in the in-company projects.

As the workshops usually are hosted by one of the participating enterprises this gives also a chance to get to know the host and establish business links. While in Germany there is a long tradition of SME cooperation, in Spain or Latin America SMEs tend not to cooperate. Therefore in these countries the barrier to open itself and share insights with other SMEs still needs to be overcome.

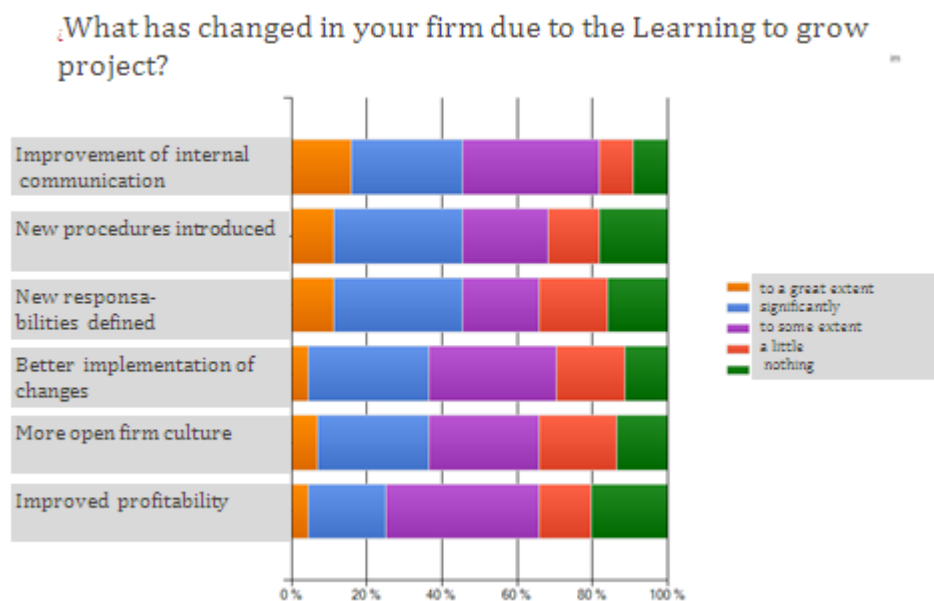


Figure 4: Perceived changes by project team members (basis: 46 members of 7 projects teams of SMEs in lower Saxonia, 100% = 46 answers, Hardwig 2012)

5 Conclusions

There is an abundance of programmes worldwide aiming at an improvement of SME performance by providing external advice. Programmes vary widely in their approaches and effectiveness. The experience with currently about 70 projects demonstrates that the

Learning to grow methodology is an effective way of developing capabilities relevant to sustain growth in SMEs. Combining business objectives with a learning journey addresses the desire of owner/managers for measurable short or midterm business results and introducing changes of attitudes and behaviours towards a more participative management. Employees gain confidence in their capabilities and learn how to evaluate and develop their competencies.

The mayor challenge resides in ensuring continuity after the end of the first *Learning to grow project* in the firm. Usually the cost of the external coach is funded by a regional development agency or other SME assistance programme. Once the first project is over SMEs would need to continue either by themselves or pay for the coach and organize between themselves to continue the *Learning to grow* network. While a significant number of SMEs continued work with their coach to support implementation of the first project or start a second one, the majority of firms who participated in a funded *Learning to grow* initiative have not continued with an external coach even though they expressed their satisfaction with project results. This is a common phenomenon of SME assistance programmes.

Therefore, in recent *Learning to grow initiatives* emphasis is put on the training of internal coaches who will execute a first project with an external coach and then should be able to run a second project without or only a minimum of external assistance.

Furthermore, an evaluation is planned to assess if changes initiated in a *Learning to grow* project have taken root in the participating SMEs. Based on occasional contacts we know that instruments like the project charter or the competence matrix are used on a regular basis in a number of firms.

Our vision is that *Learning to grow* projects become a routine exercise to sustain change in turbulent environments.

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Small Business Issues: Impact of Canada's Global Competitiveness and Recommendations for Sustainable Growth

Mark Kam-Loon Loo

Mihalcheon School of Business, Faculty of Management
Concordia University College of Alberta
7128 Ada Boulevard, Edmonton, Alberta,
Canada T5B 4E4

Structured Abstract

Purpose – Identify barriers to small business in Canada and propose policies to sustain growth due to three key reasons: (a) small businesses are the driver of economic growth, forming 87% of Canada's total businesses and 25% of total value of export goods worth \$68 billion, (b) they sustain the Canadian economy with the highest growth in export value by 20% in the last decade when big firms declined by 20%, and (c) their growth is impeded by Canada's slipping rank in global competitiveness from top 10 to 14th in the last two years.

Design/methodology/approach – As the performance of small firms is influenced by the nation's global competitiveness, the author proposes an approach to identifying the barriers by replicating and validating the World Economic Forum's (WEF) annual survey of 16 business barriers in over 140 nations, reported in the WEF's global competitiveness reports. The WEF's sample comprises an average of 98 firms per nation of unspecified firm size. This research samples 316 small firms to identify the rankings and relevance of the 16 barriers and match them against Canada's 12 pillars of global competitiveness to develop policies that promote small business growth and sustainability.

Originality/value – This methodology puts in evidence for the first time the validation of the WEF's 16 barriers to business, not tested anywhere previously but critically important among small firms, the economic spine of a nation. The top five barriers were found uniquely different from WEF's rankings: tax rates, tax regulations, access to financing, Poor Work Ethic and restrictive labour regulations. Chi-square and independent sample tests found respective significant associations and differences between barriers and business categories, provinces and data collection methods, which further help highlight the respective barriers specific to each demographic variable.

Practical implications – The outcomes of the research provide implications for focusing resources in dismantling barriers by type of business, employee size and province, and strengthening weak pillars in global competitiveness to sustain long-term growth for small firms. Abiding by the United Nation's Principles for Responsible Management, this research helps build a model of knowledge management for decision makers to monitor and analyse relevant data sources, design and implement policies to promote

small business sustainability. This research will provide the stimulus among academic scholars, industry captains and government leaders to collaborate for a better economic future and a more globally competitive nation.

Keywords – small business, barriers, sustainability, knowledge management, policies.

Paper type – Academic Research Paper with Practical Implications

1 Introduction

A small firm, commonly known as small business, is a business with less than 100 employees (Longenecker, Donlevy, Champion, Petty, Palich & Moore, 2013) or has 1 to 99 paid employees (Industry Canada, 2014). As of December 2012, there were 1,107,540 employer businesses in Canada, of which 1,087,803 were small. Small businesses make up 98.2% of employer businesses, medium-sized businesses make up 1.6% and large businesses at 0.1 % (Industry Canada, 2014). This demonstrates the critical role small businesses play in providing employment.

Small firms are the driver of economic growth, forming 87% of Canada's total businesses and 25% of total value of export goods worth \$68 billion in 2009 (Canadian Small Business Exporters, June 2011). In terms of export value, they have helped sustain Canada's economy over the last decade growing by 20% in export value when big firms declined by 20% (Canadian Small Business Exporters, 2011).

However, the growth of small business is impeded by various factors. Financiers are reluctant to fund small firms with innovative products due to the difficulty with evaluating the risk of such ventures (Craig, Jackson and Thomson, 2006 p. 346). Small firms are one of the largest customers of commercial banks but the loans are often limited to very short periods, ruling out financing any considerable investments and export activities (Lloyd, 2009).

There is little factual knowledge of the state of small business apart from the reports from the Canadian government. An online review of the Small Business Association of Canada (2014) found networking activities but lacked statistical information on small business issues. National and international bodies such as the Canadian Chamber of Commerce and the World Economic Forum present annual reports that cover the business scenario of the nation but they do not devote a section to study in-depth small business issues.

Canada's slipping rank in global competitiveness from top 10 to a weaker 14th position in the last two years has become a growing concern. This signals rising threats from other nations who are strengthening their pillars of competitiveness to help small firms succeed and new entrepreneurs flourish. Even Qatar, once a distant 27th has surged past Canada to 13th position.

The barriers faced by small business deserve attention and assistance to enhance their growth and sustainability which in turn strengthen Canada's global competitiveness. The attention is increasingly critical considering more and more organisations accredit their competitiveness to knowledge assets and value knowledge as the differentiating competitive lever (Nonaka and Takeuchi, 1995; Robbins, Coultier, Leach and Kilfoil, 2012).

1.1 Objective

This central objective of this research is to investigate the key research problem:

What are the significant barriers to small business in Canada?

There are five research issues and related objectives to investigate this key research problem as described in Table 1 below.

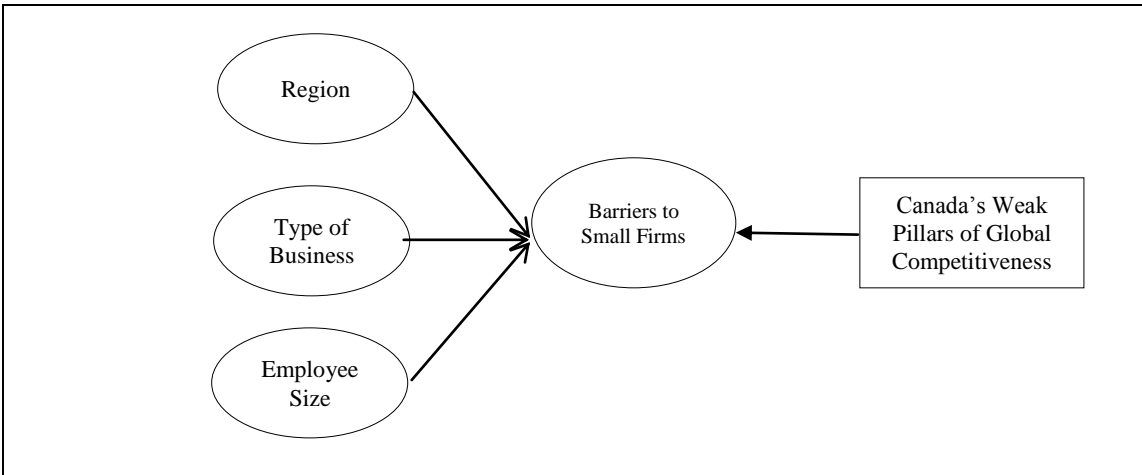
Table 1: Five Research Issues and Objectives

<p>Research Issue 1 What are the barriers faced by small firms in Canada and are they different from bigger firms?</p>	<p>Research Objective 1 Identify the significant barriers to small firms in Canada and investigate any differences with bigger firms.</p>
<p>Research Issue 2 Is there a difference in the barriers faced by small firms between Western and Eastern Canada?</p>	<p>Research Objective 2 Investigate the significant differences in barriers to small firms between Western and Eastern Canada.</p>
<p>Research Issue 3 Is there a difference in the barriers faced by small firms among different types of business in Canada?</p>	<p>Research Objective 3 Investigate the significant differences in barriers to small firms between types of business in Canada?</p>
<p>Research Issue 4 Is there a difference in the barriers faced by small firms of differing employee size in Canada?</p>	<p>Research Objective 4 Investigate the significant differences in barriers to small firms by employee size in Canada.</p>

<p>Research Issue 5 What are the areas of Canada’s global competitiveness affecting the sustainability of small firms?</p>	<p>Research Objective 5 Investigate the performance of Canada’s global competitiveness to determine the weak pillars that affect the sustainability of small firms.</p>
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Source: Developed by the author for this research.

Figure 1 shows the theoretical framework to facilitate the discussion of the five research objectives.



Source: Developed by author for this research.

Figure 1: Theoretical Framework

Referring to Figure 1, the key primary objective related to the theoretical framework and as stated in Research Objective 1 is to identify significant barriers to small firms.

The three related objectives are to investigate the differences in barriers to small firms among regions, types of business and employee sizes as stated in Research Objectives 2 to 4. Together they contribute to the significant barriers to small firms.

The final objective as stated in Research Objective 5 is to identify the weak pillars of Canada’s global competitiveness that affect the sustainability of small firms.

Following the investigations, this paper will present implications for policies to improve the sustainability of small firms and stimulate entrepreneurship, which in turn enhance Canada’s global competitiveness.

The relevance of knowledge assets as fundamental strategic factors of business success has been widely recognised in today’s competitive scenario (Barney, 1991;

Drucker, 1993). In this regard, this research will also propose a framework that captures and utilizes relevant knowledge to plan and implement policies that sustain the growth of small firms and enhance the nation's global competitiveness.

Knowledge management is cultivating a learning culture in which an organization's members systematically gather knowledge and share it with others in the organization to achieve better performance (Robbins et al., 2012). In the context of this paper, the organization is the nation and the need for knowledge management pertains to the barriers faced by small business.

1.2 Contributions of this Study

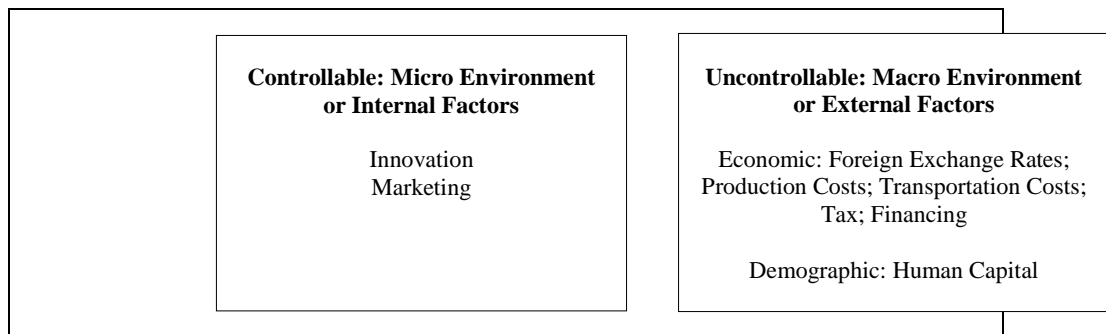
Canada's small businesses are engines for job creation that boost economic growth. In 2012, over 7.7 million employees, or 69.7 % of the total private labour force, worked for small businesses (Industry Canada, 2014). Despite recognition as the biggest employer, there is a lack of literature that identifies a comprehensive range of barriers to small firms, or studies the relationship between the barriers and the nation's global competitiveness, to provide a holistic approach to sustaining small business growth.

Canada is richly endowed with natural resources and its physical and cultural proximity with the biggest market in the world, the United States (US), has enabled the development of manufacturing and export industries. Canada's policy of cultural diversity has encouraged international trade and high educational attainments provided the intellectual capital to fuel economic progress. Despite all these favourable indicators, Canada still slips from 10th to 14th position in the global competitiveness rankings among 140 plus nations by the World Economic Forum. This study is timely to identify the weak pillars of competitiveness that hinder the growth of small business.

2. Literature Review

What are the barriers to small business? Are the barriers to small business the same or different from bigger businesses?

The first question can be answered by literature that studied specific issues to small business. These issues can be attributed to controllable and uncontrollable factors as shown in Figure 2.



Source: Developed by the author for this study.

Figure 2: Controllable and Uncontrollable Factors faced by Small Firms

The controllable issues are related to the micro environment or internal factors. Small firms can determine the kind of innovative products and/or services they can offer to local and international markets (Aschalek, 2011; Hunter, 2002; Withers, Drnevich and Marion, 2011). Canadian television shows such as Dragons Den feature entrepreneurs seeking funding to market their innovations. Small firm entrepreneurs work for themselves and thus, have the flexibility to create products and services that they deem marketable, unlike corporate employees who are subject to investment priorities (Burgess, 2002; McMillan, 2009; Sharma, Greg and Sharma, 2011; Spence, 2003). They generally have funds in the initial stage of research and development but they would eventually need help to market their innovations (Duan, Yangins, Mullins & Hamblin, 2002; Elsen, 2011; Hannel, 2003).

Small firms can control the variables in their marketing strategy – target market, product, price, distribution channels, promotion and customer service. They can decide which markets to target, evaluate emerging markets and adapt responsively to customer needs (Chadwick, Moore and Polushin, 2008; Ghafoo, Fukaikha, Khan and Hassan, 2011; Craig et al., 2006; Reuber and Fisher, 2012; Rowden, 2001). Geographical proximity such as domestic markets and export destinations closer to Canada will help lower transportation costs (Kohli, 1994; Lawless, 2010; Lee and Swagel, 1997; Partridge and Futan, 2008) while cultural and language proximities will ease trade with international markets (Easton and Kortum, 2002; Hutchinson, 2005; Lawless, 2010; Lloyd, 2008).

However, there are uncontrollable variables that affect small firms negatively, known as the macro environmental or external factors. The economic environment is largely influenced by local and global political developments. Firms are subject to increase in cost in transportation and raw materials for production (Lai and Chun, 2004; Carrere and Schiff, 2004; Clausing, 2001) as well as fluctuations in foreign exchange rates (Carrere and Schiff, 2004; Kohli, 1994).

While some entrepreneurs are able to initiate innovations with their own funds, others need financing to get started. However, small firms will ultimately need financing to commercialize innovations to reach a wider market and achieve economies of scale (Craig et al., 2006; Duan et al., 2002; Kalantaridis and Vassilev, 2011; Miocevik and Crjnak Karanovic, 2011). The issue is access to financing. Investments in start-ups have declined from \$5.9 billion with 1,007 ventures in 2000 to \$1.5 billion with 444 ventures in 2011 (Canadian Chamber of Commerce, 2013), which means the dollar investment and number of new ventures financed had shrunk respectively to 25% and 44% of the start-ups a decade ago.

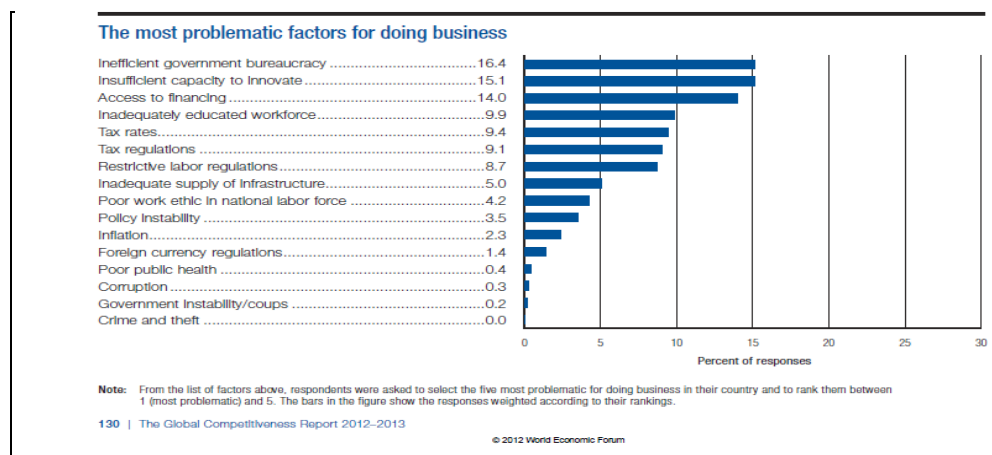
Tax is a perennial headache of the small business (Carrere and Schiff, 2005; Herander and Saavedra, 2005, Lain and Chun, 2004). A study in 2008 revealed that the annual cost for business compliance with tax obligations was \$12.6 billion, with 90.5% of that cost largely shouldered by small firms and partly by medium size firms (CGA, 2012). Many low and middle income sole proprietors face punishingly high marginal effective personal income tax rates that discourage them from working, saving and taking further education and training.

Demographics are a study of human population trends with variables such as age, gender and education (Schiffman and Wisenblit, 2014). Small firms face a shortage of skilled labour for two main reasons. Canada has a big boomer generation who are retiring and there are not enough people to replace them. Secondly, small firms have to battle with large firms to attract and retain talent. While employees in large firms have specialized job functions that attract new graduates, the employees in small firms need a range of multi-tasking skills from administration to finance to marketing to customer service which are generally available among more experienced personnel (Aschick, 2011; Brichard, 2010; McMillan, 2009; Craig et al., 2006).

The most consistent and comprehensive study on the barriers to small business has been undertaken by the World Economic Forum (WEF) since 2004. The results are

reported in the WEF's annual Global Competitiveness Report which ranks countries based on the Global Competitiveness Index, developed by Sala-i-Martin and Artadi (Global Competitiveness Report, 2014). Before that, the macroeconomic ranks were based on Sach's Growth Development Index and the microeconomic ranks were based on Porter's Business Competitiveness Index. The Global Competitiveness Index integrates the macroeconomic and the micro/business aspects of competitiveness into a single index.

The launch of the Global Competitiveness Index introduced an Executive Opinion Survey that comprised 14 most problematic factors to doing business, expanded to 16 factors from 2012 as shown in Figure 3.



Source: Global Competitiveness Report 2012-2013 p. 130.

Figure 3: The 16 Most Problematic Factors for Doing Business in Canada in 2012-13

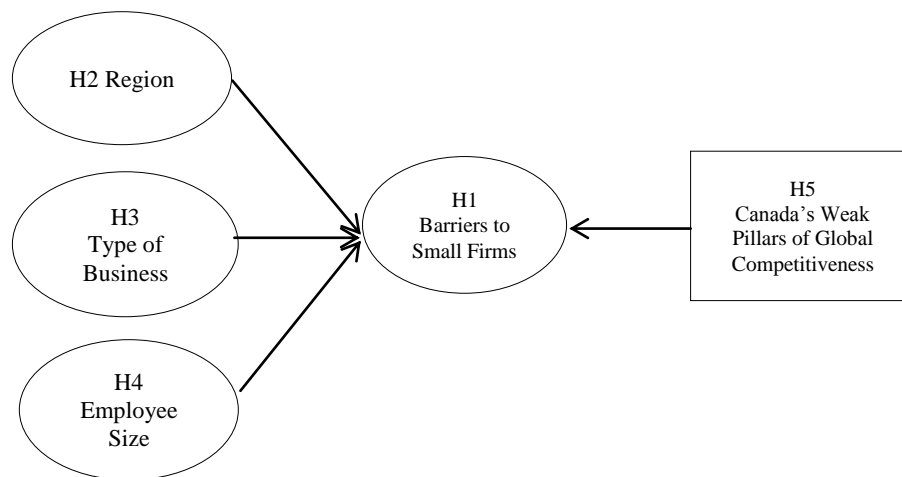
As can be seen from Figure 3, the survey covers a comprehensive range of factors including tax, financing, labour, infrastructure and government policies and stability – factors that comprise the external and internal environments as shown in Appendix 1. The survey covers 15,000 business respondents averaging 98 per nation from over 140 countries. The findings identify the most problematic factors for doing business, providing indicators where governments could collaborate with businesses to improve economic health. The data is studied by various institutions in each country for policy formulation which include government agencies, institutes of strategic studies, consulting firms and not-for-profit research organizations (Conference Board of Canada, 2014).

While the findings provide advice and competitive data that stimulate and direct the activities for collaboration between the government and its business constituents, the Executive Opinion Survey (EOS) does not focus on small firms but is likely to interview captains of industry as well as medium and small firms, and in this research the EOS sample is referred as “bigger firms.” The information on the barriers faced by small firms are all the more critical considering that small firms are the biggest employer and rescuer of the Canadian economy in the last decade with its export revenue. This lack of information leads back to the two questions at the start of literature review: *What are the barriers to small business? Are the barriers to small firms the same with or different from bigger firms?*

The best way to answer the two questions is to replicate the “16 most problematic factors to doing business” survey among small firms. This will be the first test to validate if the factors also apply to small firms and if they do, will the top five factors be the same with the bigger firms?

2.1 Hypotheses

In the earlier section, five research objectives were specified. In this section, a theoretical framework is established to guide research. Figure 4 shows the key variables representing the five research objectives under study. The key objective is to identify the most problematic factors to small firms (H1). Different provinces/regions (H2), types of business (H3) and employee sizes (H4) may experience different problematic factors and these three demographic variables contribute collectively to the barriers to small firms. Finally, the research extends to investigating the pillars of Canada’s global competitiveness that impact small firms negatively (H5).



Source: Developed by author for this research.

Figure 4: Theoretical Framework

2.1.1 Identify the significant barriers to small firms in Canada and investigate any differences with bigger firms.

Replicating the WEF’s survey of the 16 most problematic factors will help determine the significant barriers to small firms and the extent of similarity or difference between small firms and bigger firms. Although the Global Competitiveness Report by the WEF does not state the size of the respondents’ firm, a major emphasis will be to interview corporate figures who are regarded as captains in their respective industries and their views of the evolving barriers are important to governments to improve business and global trade.

Appendix 2 shows the weighted responses according to the rankings of each problematic factor in the surveys from 2009/10 to 2013/14. As ratings by respondents may fluctuate by the year, consistency is sought and thus, averages are used to indicate the consistency of respondents’ views. The results in the average column show the five most problematic factors are Access to Financing, Inefficient Government Bureaucracy, Insufficient Capacity to Innovate, Tax Rates and Tax Regulations.

Small firms are expected to share four problematic factors. Tax Rates and Tax Regulations are expected to be among the top five most problematic factors as small

firms bear the most of the burden of the heavy cost of tax compliance as evidenced by the study by the CGA in 2008.

The next most problematic factor would be Access to Financing. New ventures that received financing have dropped to 25% of the number a decade ago. As small firms are the most affected by rising prices which include a recent postage hike by 35 % (Flavelle, 2014) and escalating fuel costs which drive up freight transportation costs (Buonoguore, 2014), small firms need financing to sustain and grow their business.

The last two most problematic factors would be Restrictive Labour Regulations and Poor Work Ethic. The current warning from Restaurants Canada that many restaurants are forced to close if the foreign temporary workers (FTW) program is discontinued (Tencer, 2014) attests to perceived Restrictive Labour Regulations. While supporters for the program's closure cite low wages as disincentive for Canadians among 6.9% population who are unemployed, small firm owners explain that FTWs bring specialized skills and work ethic. Poor Work Ethic may be in part attributed to the difficulty to stay loyal to small firms due to more attractive benefits from bigger firms. These two factors are expected to be unique to small firms as bigger firms are more concerned with government bureaucracy for large contracts and capacity to innovate to grow in multinational giants and conglomerates.

Related to the labour issues would be Inadequately Educated Workforce and Insufficient Capacity to Innovate. However, they are not expected to be among the top five most problematic factors as most small firms are family-operated retail or service business, largely personal services or support services to bigger firms. They tend to be more concerned with sustaining the business against rising cost and competition, and many lack the finance to hire more staff to help grow the business.

Inefficient government bureaucracy is not expected to be a major problem to small firms as Canada has been rated the "second most business friendly" after Hong Kong, beating the U.S., Germany and Japan in a Bloomberg ranking of the best countries for doing business (Argistis, 2014). Thus, the hypothesis is:

H1 The significant barriers to small firms are Tax Rates, Tax Regulations, Access to Financing, Restrictive Labour Regulations and Poor Work Ethic.

2.1.2 *Investigate the significant differences in barriers to small firms between Western and Eastern Canada.*

The dominant industries in Western and Eastern Canada would suggest significant differences in barriers to small firms. Eastern Canada comprises the Atlantic Provinces and Central Canada. The Atlantic Provinces are made up of Newfoundland and Labrador, Prince Edward Island, Nova Scotia and New Brunswick, and their industries are focused in fishing, farming, forestry and mining. Quebec and Ontario make up Central Canada, the manufacturing and industrial heartland that produces over three-quarters of all Canadian manufactured goods (Citizenship and Immigration Canada, 2011).

Western Canada comprises the Prairie Provinces of Manitoba, Saskatchewan and Alberta, and the Western Coast which is British Columbia. The Prairie Provinces are rich in energy resources and some of the most fertile farmland in the world. Vancouver in British Columbia is Canada's largest and busiest port, handling billions of dollars in goods traded around the world (Citizenship and Immigration Canada, 2011).

Further, studies have suggested that there are legitimate, localized labour shortages, particularly in Alberta and Saskatchewan. For example, Restaurants Canada lamented that the changes the federal government made to the temporary foreign workers (TFW) program in 2013 has resulted in the decline of TFWs in the restaurant industry, falling 28% between 2012 and 2013, and dropping another 38% in the first quarter of 2014. The industry group cited numbers from Economic and Social Development Canada and informed that the decline had led to more unfilled restaurant jobs, particularly in Western Canada (Tencer, 2014). Thus, the hypothesis:

H2 There is a significant difference in barriers to small firms between Eastern Canada and Western Canada.

2.1.3 *Investigate the significant differences in barriers to small firms between types of business in Canada?*

Table 2 shows the number of employer businesses by sector and firm size. By definition, the goods-producing sector in Table 2 consists of manufacturing; construction; and forestry, fishing, mining, quarrying, and oil and gas. The service-producing sector consists of wholesale and retail trade; accommodation and food services; professional, scientific and technical services; finance, insurance, real estate and leasing; health care

and social assistance; business, building and other support services; information, culture and recreation; transportation and warehousing; and other services (Statistics Canada, 2014). As shown in Table 2, about 21% of small business employees work in the goods-producing sector and 79% in the service-producing sector.

Table 2: Number of Employer Businesses by Sector and Firm Size (Number of Employees), December 2012

Number of Employees	% of Employer Businesses	Cumulative % of Employer Businesses	Number of Employer Businesses				
			Total	Goods-Producing Sector		Service-Producing Sector	
				Number	%	Number	%
1-4	55.1	55.1	610,178	138,526	22.70	471,652	77.30
5-9	19.8	74.9	219,771	45,958	20.91	173,813	79.09
10-19	12.5	87.4	138,031	26,905	19.49	111,126	80.51
20-49	8.2	95.6	91,026	18,491	20.31	72,535	79.69
50-99	2.6	98.2	28,797	6,686	23.22	22,111	76.78
				Average	21.33	Average	78.67

Source: Adapted from Statistics Canada, Business Register, December 2012.

Statistics Canada (2014) further reports that over half of the 1.08 million small businesses are concentrated in four industries: wholesale trade and retail (18.8 %), construction (11.7 %), professional, scientific and technical services (11.6 %) and other services (10.6 %). The range of industries suggests that a significant difference can be expected between different types of businesses. Thus, the hypothesis:

H3 There is a significant difference in barriers to small firms between different types of businesses.

2.1.4 Investigate the significant differences in barriers to small firms by employee size in Canada.

Table 2 also shows small firms with less than 10 employees are the biggest employer at 74.9 % followed by 10 to 19 employees at 12.5%, and 20 to 49 employees at 8.2 % and 50 to 99 employees at 2.6%. Firms with less than 10 staff would indicate they are in the introduction stage of business or stagnant growth phase, while those with 50 to 99 employees show evidence of expansion and have the potential to grow into medium-sized firms.

In terms of the total number of employees, industries that had the largest number of employees working for small firms were, in order of magnitude, wholesale and retail trade (1.84 million), accommodation and food services (0.91 million), manufacturing

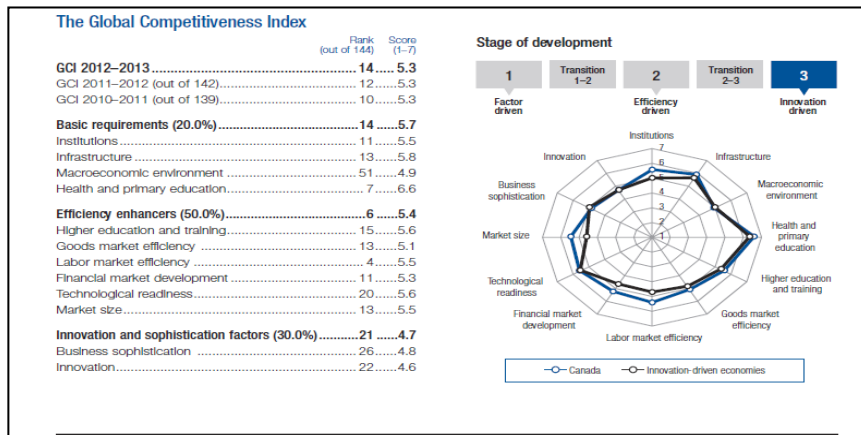
(0.86 million) and construction (0.72 million). These industries alone accounted for 56% of all jobs in small businesses in Canada. Overall, industries in the goods-producing sector accounted for 27.3 % of total employment and 24.0 % of employment in small businesses (Statistics Canada, 2014).

All these suggest that a significant difference can be expected between firms with different number of employees, termed employee size. Based on the statistics in Figure 2, there is a need to collapse the various employee sizes into categories to allow statistical analysis, resulting in the hypothesis below.

H4 There is a significant difference in barriers to small firms between employee sizes of 1 to 10 and 11 to 20, and 1 to 10 and 21 to 99.

2.1.5 Investigate the performance of Canada’s global competitiveness to determine the weak pillars that affect the sustainability of small firms.

Canada’s fluctuating performance in global competitiveness in recent years can be seen in Figure 5. The Global Competitiveness Index (GCI) shows Canada was ranked 10th of 139 countries in 2010-2011 but slipped to 12th of 142 countries in 2011-2012, and declined to 14th of 144 countries in 2012-2013. Canada holds on to 14th place of 148 countries in the Global Competitiveness Report 2013-2014.



Source:

Global Competitiveness Report 2012-2013

Figure 5: Canada’s Global Competitiveness Rankings 2012-2013

The GCI shows the rankings of the 12 pillars of competitiveness in three stages of economic development: *factor-driven* which demands Basic Requirements (20%), *efficiency-driven* where the nation has Efficiency Enhancers (50%), and finally *innovation-driven* where the nation has strong Innovation and Sophistication Factors (30%). Canada is in the innovation-driven stage and Canada's performance equals the average performance of innovation-driven economies in eight pillars and exceeds in four pillars – Institution, Market Size, Financial Market Development and Labour Market Efficiency. However, Canada's current performance in 2013-2014 continues to see six pillars ranked below its 14th rank: Pillar 3 Macroeconomic Environment ranked 50th, Pillar 11 Business Sophistication ranked 25th, Pillar 12 Innovation ranked 21st. Pillar 9 Technological Readiness ranked 21st, Pillar 6 Goods Market Efficiency ranked 17th, and Pillar 5 Higher Education and Training ranked 16th.

Among the 12 pillars, Pillar 3 Macroeconomic Environment and Pillar 5 Higher Education and Training are expected to impact small business as the key barriers to small firms are related to tax, financing and work ethic.

H5 Pillar 3 Macroeconomic Environment and Pillar 5 Higher Education and Training are the two pillars of competitiveness that impact the most problematic factors to doing business for small businesses.

3. Methodology

3.1 Research Instrument

The WEF's survey of the 16 most problematic factors was replicated. Following an exploratory research among 50 small firms, demographic variables covering location/province, number of employees and type of business were included. Appendix 3 shows the final questionnaire. The respondent was requested to rate each factor from 1 as most problematic to 5 as least problematic. The Likert scale was maintained without modifying the description such as 3 for neutral as each factor is a problem varying in degree from country to country.

3.2 Research Sampling

The sampling process followed five key steps (Luck and Rubin, 1987; Malhotra, 2013).

1. Define the population: Firms with 1 to 99 employees. There are 1,087,803 small firms in Canada and 151,866 small firms in Alberta as at August 2013 (Statistics Canada, 2014).
2. Establish sampling frame: All respondents must be based in Canada. As the author and research assistants are based in Edmonton, Alberta is the main sampling frame. However, online surveys are targeted to yield responses beyond Alberta to provide a comparative analysis between Western and Eastern Canada.

Alberta is the most populous Prairie Province, and the largest producer of oil and gas. Alberta is also renowned for agriculture, especially for the vast cattle ranches that make Canada one of the world's major beef producers (Citizenship and Immigration, 2011). In a 2012 survey report that reviewed 103 cities by the Canadian Federation of Independent Business (CFIB), nine of the Top 10 cities best suited for entrepreneurs is situated in Western Canada, with five in Alberta: Grand Prairie, Lloydminster, Red Deer, Edmonton and Lethbridge (Somerset, 2013). In 2014, the CFIB found 72% of Albertans would recommend starting a business in their province behind only Saskatchewan at 88%. Small businesses represent 96% of total businesses and contribute nearly a third of Alberta's GDP (Tonneguzzi, 2014). Thus, Alberta has a heavy concentration of small firms to facilitate sampling.

3. Specify sampling method: There were three key sampling methods – interviews, fax and social media.. With interviews, systematic random (probability) sampling was used to generalize the results as much as possible. Research assistants were instructed to systematically sample every third office or retail outlet within a commercial complex. Research assistants also participated in small business events at the Leduc Chamber of Commerce to interview participants. The interview methods comprised personal interviews and self-administered questionnaires in the presence of a research assistant to help when needed. The questionnaire was made available online via email, Facebook and Reddit to reach small firms beyond Alberta. The questionnaire was also faxed to 50 small firms.

4. Determine sample size. A sample size of at least 200 was recommended to provide a sound basis for estimation (Hair, Black, Babin, Anderson and Tatham, 2006). This research aimed for at least 300 respondents.
5. Execute sampling process: The procedures specified to research assistants were firstly, survey only firms with less than 100 employees and secondly, select every third office or retail outlet within the survey areas.

Six students representing a diverse mix of Caucasian, Asian and African ethnicity were recruited based on their projection of professionalism, enthusiasm and confidence to establish rapport with respondents. Each assistant could speak at least one other language apart from English as retailers such as those in food business were expected to be largely visible minorities. They were trained to motivate respondents to accept the survey and answer all questions. During weekends and mid-semester breaks, these students visited their hometowns and collected data via online and interviews.

3.3 Methods of Statistical Analysis

For research objective 1, analysis by Mean will help determine the rank order of the 16 most problematic factors and One-Sample Test will determine the significance of each factor. Analysis by Mean will also be used in research objective 5 to determine the weak pillars of global competitiveness that affect small business.

For research objectives 2 to 4, the Chi-square test for independence and Independent Samples Test will help determine significant associations between variables and significant differences between samples. The Chi-square test is suited to explore the relationships between two categorical variables for research objectives 2 to 4. Interpreting chi-square results, the minimum expected cell frequency should be 5 or greater, or at least 80% of cells should have frequencies of 5 or more (Pallant, 2010). In other words, no more than 20% of the expected counts are less than 5 and all individual expected counts are 1 or greater (Yates, Moore and McCabe, 1999 p. 734). The most important value would be the Pearson chi-square value and the Sig. value needs to be 0.05 or smaller for significance (Pallant, 2010).

Independent samples test were used to test for significant differences. The test shows results under two main labels: Levene's test for Equality of Variances and t-test for Equality of Means. The procedures for testing (Pallant, 2010) are explained below.

Levene's test for Equality of Variances

- If Significant (Sig.) value is larger than 0.05, *Equal variances assumed* (EVA) would be used.
- If the significance level of Levene's test is $p = 0.05$ or less, the variances for the two groups are not the same. This means the data violates the assumption of equal variance and *Equal variances not assumed* (EVNA) would be used.

t-test for Equality of Means

The Sig. (2-tailed) values under t-test for Equality of Means will show whether there is a significant difference. The Sig. (2-tailed) value will be chosen according to the Sig. value selected in the Levene's test:

- If the value in the Sig. (2-tailed) column is equal or less than 0.05, there is significant difference in the mean scores of the dependent variable for each of the two groups.
- If the value is above 0.05, there is no significant difference between the two groups. (Pallant. 2010)

4. Results

This section will discuss the results by demographics followed by the research objectives.

4.1 Demographics: Respondents' Characteristics

A total of 316 fully completed questionnaires collected were usable and the respondents' characteristics were analyzed by frequency tables according to province, type of business, employee size and data collection method.

4.1.1 City and Province

The respondents represented 57 cities from 10 provinces. Edmonton yielded the highest number of respondents at 170 as expected being the residence of the author and research assistants. Alberta has the highest number of respondents at 251 or 79.5%, followed by Ontario at 33 or 10.4%. The other provinces have less than 3% of respondents. The information by city and province is presented in Table 3 and Table 4.

Table 3: Respondents by City and Province

City, Province	N	City, Province	N	City, Province	N
1. Bonnyville, AB	1	2. Rathwell, MB	1	3. Richmond Hill, ON	1
4. Calgary, AB	2	5. Sanford, MB	1	6. Scarborough, ON	1
7. Drayton Valley, AB	1	8. Selkirk, MB	1	9. St. Catharines, ON	1
10. Edmonton, AB	170	11. Saint-Leolin, NB	1	12. Stoney Creek, ON	1
13. Elk Point, AB	5	14. St. Josephs, NL	1	15. Stratford, ON	1
16. Frog Lake, AB	2	17. Sydney, NS	1	18. Toronto, ON	11
19. Leduc, AB	24	20. Athens, ON	1	21. Windsor, ON	1
22. Nisku, AB	2	23. Blackstock, ON	1	24. Woodbridge, ON	1
25. Spruce Grove, AB	2	26. Carleton Place, ON	1	27. Cardigan, PEI	1
28. St. Paul, AB	41	29. Dunnville, ON	1	30. Gatineau, QC	1
31. Vegreville, AB	1	32. Elmira, ON	1	33. Kingston, QC	1
34. Dawson Creek, BC	1	35. Innisfil, ON	2	36. Kirkland, QC	1
37. Fort St. John, BC	1	38. Lions Head, ON	1	39. Montreal, QC	3
40. Pritchard, BC	1	41. London, ON	1	42. Saint-Hyacinthe, QC	1
43. Richmond, BC	1	44. Markham, ON	1	45. Biggar, SK	1
46. Surrey, BC	1	47. Mississauga, ON	1	48. Chitek Lake, SK	1
49. Vancouver, BC	3	50. Orleans, ON	1	51. Herbert, SK	1
52. Winnipeg, MB	3	53. Ottawa, ON	2	54. Outlook, SK	1
55. Lorette, MB	1	56. Peterborough, ON	1	57. Saskatoon, SK	2

Key: N = Number of respondents; AB = Alberta, BC = British Columbia, MB = Manitoba, NB = New Brunswick, NS = Nova Scotia, NL = Newfoundland, ON = Ontario, PEI = Prince Edward Island, QC = Quebec, SK = Saskatchewan

Table 4: Frequency by Province

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid AB	251	79.4	79.4	79.4
ON	33	10.4	10.4	89.9
BC	8	2.5	2.5	92.4
QC	7	2.2	2.2	94.6
SK	6	1.9	1.9	96.5
MB	7	2.2	2.2	98.7
PE	1	.3	.3	99.1
NS	1	.3	.3	99.4
NB	1	.3	.3	99.7
NL	1	.3	.3	100.0
Total	316	100.0	100.0	

AB and ON are the only two provinces with a sample big enough for statistical analysis. As the rest of the provinces were too small in sample size to allow meaningful statistical analysis, they were collapsed into two major categories:

- Western Canada (BC, AB, SK and MB) represented 273 respondents, and
- Eastern Canada (ON, QC, NB, PE, NS and NL) represented 43 respondents, totalling 316 respondents.

4.1.2 Employee Size

Employee size range from one to 98 employees. Employee size 1 to 10 represented 72.8% of respondents. Three employee sizes had more than 10% of respondents: 2 employees at 12.3%, 4 employees at 11.7% and 3 employees at 10.4% as shown in Table 5.

Table 5: Frequency by Employee Size from 1 to 98

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1.00	22	7.0	7.0	7.0
2.00	39	12.3	12.3	19.3
3.00	33	10.4	10.4	29.7
4.00	37	11.7	11.7	41.5
5.00	31	9.8	9.8	51.3
6.00	15	4.7	4.7	56.0
7.00	12	3.8	3.8	59.8
8.00	16	5.1	5.1	64.9
9.00	12	3.8	3.8	68.7
10.00	13	4.1	4.1	72.8
11.00	5	1.6	1.6	74.4
12.00	7	2.2	2.2	76.6
13.00	6	1.9	1.9	78.5
14.00	6	1.9	1.9	80.4
15.00	7	2.2	2.2	82.6
16.00	4	1.3	1.3	83.9
17.00	1	.3	.3	84.2
18.00	3	.9	.9	85.1
20.00	2	.6	.6	85.8
22.00	2	.6	.6	86.4
23.00	3	.9	.9	87.3
24.00	1	.3	.3	87.7
25.00	4	1.3	1.3	88.9
26.00	1	.3	.3	89.2
29.00	1	.3	.3	89.6
30.00	2	.6	.6	90.2
34.00	2	.6	.6	90.8
38.00	2	.6	.6	91.5
43.00	1	.3	.3	91.8
44.00	1	.3	.3	92.1
45.00	3	.9	.9	93.0
47.00	1	.3	.3	93.4
50.00	4	1.3	1.3	94.6
51.00	1	.3	.3	94.9
55.00	1	.3	.3	95.3
60.00	1	.3	.3	95.6
61.00	1	.3	.3	95.9
75.00	2	.6	.6	96.5

76.00	1	.3	.3	96.8
77.00	1	.3	.3	97.2
79.00	1	.3	.3	97.5
85.00	1	.3	.3	97.8
87.00	1	.3	.3	98.1
88.00	1	.3	.3	98.4
90.00	1	.3	.3	98.7
95.00	1	.3	.3	99.1
96.00	1	.3	.3	99.4
98.00	2	.6	.6	100.0
Total	316	100.0	100.0	

As the majority of the respondents have one or two employees, they were collapsed into three main categories to facilitate statistical analysis:

- 1 to 10 employees represented 222 respondents
- 11 to 20 employees represented 51 respondents and
- 21 to 99 represented 43 respondents.

4.1.3 *Type of Business*

Table 6 shows Retail and Service are the two most dominant types of business at 47.5% and 34.2% respectively. Restaurants, food catering, auto repair and construction services are the more frequent small businesses. Some of the service and retail/service small firms play an auxiliary role to the oil, agriculture and manufacturing industries, while others provide personal services such as tailoring and fashion, jewellery and accessories, hair grooming, dental and medical services.

Table 6: Frequency by Type of Business

	Frequency	Percent	Valid Percent	Cumulative Percent
Retail	150	47.5	47.5	47.5
Service	108	34.2	34.2	81.7
Oil	22	7	7	88.7
Valid Agriculture	18	5.7	5.7	94.4
Retail/Service	16	5.1	5.1	99.5
Manufacturing	2	0.6	0.6	100
Total	316	100	100	

As some types of business were too small in sample size for statistical analysis, they were collapsed into three main categories:

- Retail representing 158 respondents

- Service representing 116 respondents, and
- Others (Oil, Agriculture and Manufacturing) representing 42 respondents.

4.1.4 Data Collection Method

Table 7 shows the most frequent data collection method was Interview at 32%. Social media surveys via Reddit and Facebook yielded 21.5% and 15.5%, totalling 37%. Email and Self-Administered surveys were least frequent with less than 5%.

Table 7: Data Collection Method

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Interview: Personal	101	32.0	32.0	32.0
Online: Reddit	68	21.5	21.5	53.5
Fax	50	15.8	15.8	69.3
Online Facebook	49	15.5	15.5	84.8
Interview: Conference Participants	25	7.9	7.9	92.7
Online: email	14	4.4	4.4	97.2
Interview: Self-Administered	9	2.8	2.8	100.0
Total	316	100.0	100.0	

4.2. Research Objectives

4.2.1 *Identify the significant barriers to small firms in Canada and investigate any differences with bigger firms.*

The results of the ranking of the 16 most problematic factors are presented in Table 8. The hypothesis for research objective 1 expected the top five significant barriers to be Tax Rates, Tax Regulations, Access to Financing, Restrictive Labour Regulations and Poor Work Ethic. The first three factors were in the right order but Poor Work Ethic was viewed as more problematic than Restrictive Labour Regulations. The mean values of Tax Rates, Tax Regulations, Access to Financing and Poor Work Ethic fall between 2 and 3 indicating the degree of the factor being problematic. The mean of Restrictive Labour Relations at 3.04 is in the zone of somewhat problematic although it leans close to problematic.

Table 8: One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
1. Tax Rates	316	2.57	1.223	.069
2. Tax Regulations	316	2.63	1.187	.067
3. Access to Financing	316	2.78	1.248	.070
4. Poor Work Ethic in National Labour Force	316	2.84	1.256	.071
5. Restrictive Labour Regulations	316	3.04	1.158	.065
6. Insufficient Capacity to Innovate	316	3.19	1.117	.063
7. Inadequately Educated Workforce	316	3.25	1.207	.068
8. Inflation	316	3.27	1.173	.066
9. Crime and Theft	316	3.27	1.298	.073
10. Inefficient Government Bureaucracy	316	3.42	1.100	.062
11. Inadequate Supply of Infrastructure	316	3.48	1.085	.061
12. Policy Instability	316	3.75	1.025	.058
13. Poor Public Health	316	3.92	-1.069	.060
14. Foreign currency regulations	316	4.05	1.008	.057
15. Corruption	316	4.05	1.027	.058
16. Government Instability	316	4.17	.955	.054

Are all 16 factors significant? A One-Sample Test would help provide the answer but first the test value has to be determined. As the Likert scale 1 represents most problematic and 5 least problematic, the mean between:

- 1 and 2 would indicate the degree of being most problematic as it moves closer to 1,
- 2 and 3 would indicate the degree of being problematic as it moves closer to 2,
- 3 and 4 would indicate the degree of being somewhat problematic as it moves closer to 3 and finally,
- 4 and 5 would indicate the degree of being least problematic as it moves closer to 5.

Thus, the mean 4 would be the point that a factor has become less problematic, graduating to least problematic as the mean becomes 5. Taking 4 as the test value between 3 and 4 indicating the degree of a factor being somewhat problematic, a One-Sample Test was run with the following results in Table 9.

Table 9: One-Sample Test

	Test Value = 4					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Inefficient Government Bureaucracy	-9.307	315	.000	-.576	-.70	-.45
Insufficient Capacity to Innovate	-12.839	315	.000	-.807	-.93	-.68
Access to Financing	-17.401	315	.000	-1.222	-1.36	-1.08
Inadequately Educated Workforce	-11.094	315	.000	-.753	-.89	-.62
Tax Rates	-20.784	315	.000	-1.430	-1.57	-1.29
Tax Regulations	-20.566	315	.000	-1.373	-1.50	-1.24
Restrictive Labour Regulations	-14.718	315	.000	-.959	-1.09	-.83
Inadequate Supply of Infrastructure	-8.502	315	.000	-.519	-.64	-.40
Poor Work Ethic in National Labour Force	-16.440	315	.000	-1.161	-1.30	-1.02
Policy Instability	-4.334	315	.000	-.250	-.36	-.14
Inflation	-11.123	315	.000	-.734	-.86	-.60
Foreign currency regulations	.837	315	.403	.047	-.06	.16
Poor Public Health	-1.263	315	.208	-.076	-.19	.04
Corruption	.931	315	.352	.054	-.06	.17
Government Instability	3.239	315	.001	.174	.07	.28
Crime and Theft	-9.969	315	.000	-.728	-.87	-.58

From the above table, all the factors are found significant as barriers to small business except Foreign currency regulations, Poor Public Health and Corruption at $p < 0.005$.

How do the results compare with the WEF's findings of bigger firms? Appendix 4 shows the detailed results of the comparison. Table 10 shows the comparison between the findings from the 316 respondents and the WEF's findings for 2013/14 and average of 5-year period from 2009/10 to 2013/14.

Table 10: Comparison of the findings between WEF's surveys and this research

Rank	WEF 2009/10 to 2013/14	WEF 2013/14	This Research: 316
1.	Access to financing	Access to financing	Tax rates
2.	Inefficient government bureaucracy	Insufficient Capacity to Innovate	Tax regulations
3.	Insufficient Capacity to	Inefficient government	Access to financing
4.	Tax rates	Tax regulations	Poor Work Ethic in national
5.	Tax regulations	Tax rates	Restrictive labor

Note: WEF = World Economic Forum

Table 10 also shows that small firms share three barriers with bigger firms: Tax Rates, Tax Regulations and Access to Financing. However, these three factors are ranked 1st, 2nd and 3rd by small firms compared to the WEF's 2013/14 and 5-Year Average where Access to Financing was ranked 1st, and Tax Rates and Tax Regulations ranked 4th and 5th in the 5-Year Average, and reversed as 5th and 4th in 2013/14.

Poor Work Ethic and Restrictive Labour Regulations ranked 4th and 5th are unique barriers to small firms versus Inefficient Government Bureaucracy and Insufficient Capacity to Innovate which are second and third in the 5-year average and reversed in 2013/14.

Hence, the top five barriers to small firms are different from bigger firms being Tax Rates, Tax Regulations and Access to Financing as the top three in rank order. Poor Work Ethic and Restrictive Labour Regulations are the remaining two factors, unique to small firms.

4.2.2 Investigate the significant differences in barriers to small firms between Western and Eastern Canada.

Table 11 shows Chi-square tests established a significant association between Regions and five Barriers: Tax Rates, Tax Regulations, Inadequate Supply of Infrastructure, Access to Financing and Restrictive Labour Relations as the Pearson Chi-Square Asymp. Sig. (2-sided) value is below 0.05.

Table 11: Chi-Square Tests for Association between Barriers and Regions (Western and Eastern Canada)

Barriers	Pearson Chi-Square		
	Value	df	Asymp. Sig. (2-sided)
1. Tax Rates	20.102 ^a	4	.000
2. Tax Regulations	15.879 ^a	4	.003
3. Inadequate Supply of Infrastructure	14.078 ^a	4	.007
4. Access to Financing	13.291 ^a	4	.010
5. Restrictive Labour Relations	10.042 ^a	4	.040

a. 1 cells (10.0%) have expected count less than 5. The minimum expected counts are greater than 1.

The next test is to verify significant differences between Western and Eastern Canada. Table 12 shows the results of independent samples test between Western and Eastern Canada, and between Alberta (AB) and Ontario (ON).

Table 12: Independent Samples Test for Significance Difference between Regions/Provinces

Provinces/Regions	Barrier	Levene's Test for Equality of Variance		t-test for Equality of Means	
		F	Sig	Sig. (2-tailed)	
Western and Eastern Canada	Insufficient Capacity to Innovate	EVA	3.902	0.049	0.016
		EVNA			0.007
Western and Eastern Canada	Access to Financing	EVA	0.119	0.73	0.001
		EVNA			0.001
Western and Eastern Canada	Tax Rates	EVA	16.426	0.000	0.000
		EVNA			0.000
Western and Eastern Canada	Tax Regulations	EVA	6.272	0.013	0.000
		EVNA			0.000
Western and Eastern Canada	Restrictive Labour Relations	EVA	2.529	0.113	0.005
		EVNA			0.001
Eastern and Western Canada	Inadequate Supply of Infrastructure	EVA	5.183	0.023	0.001
		EVNA			0.01
Western and Eastern Canada	Foreign currency regulations	EVA	0.45	0.503	0.005
		EVNA			0.008
AB and ON	Insufficient Capacity to Innovate	EVA	4.368	0.38	0.024
		EVNA			.008
AB and ON	Access to Financing	EVA	6	0.937	0.004
		EVNA			0.006
AB and ON	Tax Rates	EVA	15.146	0.000	0.000
		EVNA			0.000
AB and ON	Tax Regulations	EVA	3.103	0.079	0.000
		EVNA			0.000
AB and ON	Restrictive labour Regulations	EVA	1.311	0.253	0.018
		EVNA			0.010
AB and ON	Inadequate Supply of Infrastructure	EVA	8.444	0.004	0.002
		EVNA			0.001
AB and ON	Foreign currency regulations	EVA	0.916	0.339	0.022
		EVNA			0.037

Note: Levene's test for Equality of Variances – Sig. > 0.05 *Equal variances assumed* (EVA) would be used, **Sig. < 0.05 *Equal variances not assumed* (EVNA) would be used.** t-test for Equality of Means - Sig. (2-tailed) value will be chosen according to the Sig. value selected in the Levene's test; Sig. (2-tailed) = or < 0.05, there is significant difference.

Based on Table 12, there is a significant difference between Western and Eastern Canada, and between AB and ON. The two regions and two provinces have significant differences in seven identical barriers: Insufficient Capacity to Innovate, Access to Financing, Tax Rates, Tax Regulations, Restrictive Labour Regulations, Inadequate Supply of Infrastructure and Foreign currency regulations.

4.2.3 *Investigate the significant differences in barriers to small firms between types of business in Canada?*

Table 13 shows Chi-square tests established a significant association between Type of Business and eight Barriers: Inadequately Educated Workforce, Inflation, Crime and Theft, Restrictive Labour Relations, Inadequate Supply of Infrastructure, Insufficient Capacity to Innovate, Poor Work Ethics and Access to Financing, as the Pearson Chi-Square Asymp. Sig. (2-sided) value is below 0.05.

Table 13: Chi-Square Tests for Association between Type of Business and Barriers

Barriers	Pearson Chi-Square		
	Value	df	Asymp. Sig. (2-sided)
1. Inadequately Educated Workforce	29.794 ^a	8	.000
2. Inflation	37.919 ^a	8	.000
3. Crime and Theft	37.852 ^a	8	.000
4. Restrictive Labour Relations	23.533 ^a	8	.003
5. Inadequate Supply of Infrastructure	19.750 ^a	8	.011
6. Insufficient Capacity to Innovate	17.185 ^a	8	.028
7. Poor Work Ethic in national labour force	16.494 ^a	8	.036
8. Access to Financing	21.704 ^a	8	.05

a. 1 cells (6.7%) have expected count less than 5. The minimum expected counts are greater than 1.

The next test is to verify significant differences between the Types of Business. Table 14 shows the results of independent samples test between Types of Business.

Table 14: Independent Samples Test for Significance Difference between Types of Business

Types of Business	Barrier		Levene's Test for Equality of Variance		t-test for Equality of Means
			F	Sig	Sig. (2-tailed)
Retail and Service	Access to Financing	EVA	.028	.868	.000
		EVNA			.000
Retail and Service	Restrictive Labour Relations	EVA	5.436	.020	.002
		EVNA			.002
Retail and Service	Inadequate Supply of Infrastructure	EVA	1.359	.245	.046
		EVNA			.049
Retail and Service	Crime and Theft	EVA	.089	.765	.000
		EVNA			.000
Retail and Others*	Insufficient Capacity to Innovate	EVA	1.256	.264	.007
		EVNA			.014
Retail and Others*	Access to Financing	EVA	0.77	.782	.019
		EVNA			.033
Retail and Others*	Inadequately Educated Workforce	EVA	1.075	.301	.000
		EVNA			.000
Retail and Others*	Tax Rates	EVA	2.524	.114	.036
		EVNA			.030
Retail and Others*	Tax Regulations	EVA	1.806	.181	.012
		EVNA			.010
Retail and Others*	Inflation	EVA	11.260	.001	.000
		EVNA			.000
Retail and Others*	Government Instability	EVA	4.309	.039	.000
		EVNA			.000
Retail and Others*	Crime and Theft	EVA	.284	.595	.001
		EVNA			.001
Service and Others*	Insufficient Capacity to Innovate	EVA	.001	.977	.009
		EVNA			
Service and Others*	Inadequately Educated Workforce	EVA	4.922	.028	.000
		EVNA			
Service and Others*	Tax Rates	EVA	.806	.371	.020
		EVNA			
Service and Others*	Tax Regulations	EVA	2.062	.153	.018
		EVNA			
Service and Others*	Restrictive Labour Relations	EVA	.451	.503	.001
		EVNA			
Service and Others*	Inadequate Supply of Infrastructure	EVA	.027	.871	.004
		EVNA			
Service and Others*	Inflation	EVA	9.203	.003	.000
		EVNA			
Service and Others*	Government Instability	EVA	6.911	.009	.014
		EVNA			

Note: *Others - Oil, Agriculture and Manufacturing; Levene's test for Equality of Variances – Sig. > 0.05 *Equal variances assumed* (EVA) would be used, **Sig. < 0.05 *Equal variances not assumed* (EVNA) would be used.** t-test for Equality of Means - Sig. (2-tailed) value will be chosen according to the Sig. value selected in the Levene's test; Sig. (2-tailed) = or < 0.05, there is significant difference.

The similarities and differences in the significant differences of the three types of business are summarized in Table 15.

Table 15: Summary of Significant Differences among Types of Business: Retail, Service and Others

Barrier	Retail and Service	Retail and Others	Service and Others
Access to Financing	Yes	Yes	No
Crime and Theft	Yes	Yes	No
Inadequate Supply of Infrastructure	Yes	No	Yes
Restrictive Labour Relations	Yes	No	Yes
Government Instability	No	Yes	Yes
Inadequately Educated Workforce	No	Yes	Yes
Inflation	No	Yes	Yes
Insufficient Capacity to Innovate	No	Yes	Yes
Tax Rates	No	Yes	Yes
Tax Regulations	No	Yes	Yes

Note: Others - Oil, Agriculture and Manufacturing; Yes = Significant Difference and No = No Significant Difference

As can be seen from Table 15, there is a significant difference in four barriers between Retail and Service and a significant difference in eight barriers between Retail and Others, and between Service and Others. No barrier was found with significant difference among them.

4.2.4 Investigate the significant differences in barriers to small firms by employee size in Canada.

Chi –square tests did not establish any significant association between employee size and barriers, but there were significant differences between Employee Sizes. Table 16 shows the results of independent samples test between Employee Sizes.

Table 16: Independent Samples Test for Significance Difference between Employee Sizes

Employee Sizes	Barrier		Levene's Test for Equality of Variance		t-test for Equality of Means
			F	Sig	Sig. (2-tailed)
1 to 10 and 11 to 20	Tax Regulations	EVA	6.457	.012	.034
		EVNA			.024
1 to 10 and	Corruption	EVA	1.654	.200	.009

11 to 20		EVNA			.019
11 to 20 and 21-99	Access to Financing	EVA	1.987	.162	.021
		EVNA			.023

Note: *Others - Oil, Agriculture and Manufacturing; Levene's test for Equality of Variances - Sig. > 0.05 *Equal variances assumed* (EVA) would be used, **Sig. < 0.05 *Equal variances not assumed* (EVNA) would be used.** t-test for Equality of Means - Sig. (2-tailed) value will be chosen according to the Sig. value selected in the Levene's test; Sig. (2-tailed) = or < 0.05, there is significant difference.

Referring to Table 16, there is a significant difference between Employee Sizes 1 to 10 and 11 to 20 in two barriers: Tax Regulations and Corruption. There is also a significant difference between Employee Sizes 11 to 20 and 21 to 99 in one barrier: Access to Financing.

4.2.5 Investigate the performance of Canada's global competitiveness to determine the weak pillars that affect the sustainability of small firms.

Table 17 shows Canada among the Top 15 nations in global competitiveness and their average ranks over three 5-Year periods from 1999 to 2013/14. Appendix 5 shows the detailed performance for each nation each year. Canada was strongest in global competitiveness between 1999 and 2003 averaging 8th rank and achieved 3rd in 2001. However, between 2004 and 2008/09 Canada's average performance dropped by four ranks to an average 13th but improved by one rank at 12th between 2009/10 and 2013/14.

Table 17: Canada's average performance among Top 15 in Global Competitiveness from 1999 to 2013/14

Country	1999-2003 Average	2004-2008/09 Average	2009/10-2013/14 Average
Switzerland	8.4	4.8	1.0
Singapore	5.6	6.6	2.4
Sweden	6.6	4.6	3.8
Finland	2.2	4.0	4.6
United States	5.4	1.4	4.6
Germany	12.8	9.4	5.6
Netherlands	8.2	10.4	7.6
Japan	15.8	8.6	8.4
Denmark	9.6	3.6	9.8
Hong Kong SAR	16.4	16.4	9.8
United Kingdom	11.2	9.4	10.6
Canada	8.2	12.8	11.8
Taiwan, China	8.8	10.6	12.6
Norway	11.4	12.6	14.0
Qatar	NA	27.0	15.4

Source: Global Competitive Reports from 1999 to 2013/14

Table 18 shows Canada's global competitiveness rankings from 2009/10 to 2013/14 among the Top 15. Canada has been slipping in rank each year from 9th in 2009/10 to 14th in 2012/13, and maintained the same position in 2013/14. Even Qatar, from a distant average of 27th between 2004 and 2008/09, has surged past Canada at 13th place. What caused Canada's decline in global competitiveness?

Table 18: Canada's Global Competitiveness rankings from 2009/10 to 2013/14 among Top 15

Country	2009/10	2010/11	2011/12	2012/13	2013/14
Switzerland	1	1	1	1	1
Singapore	3	3	2	2	2
Sweden	4	2	3	4	6
Finland	6	7	4	3	3
United States	2	4	5	7	5
Germany	7	5	6	6	4
Netherlands	10	8	7	5	8
Japan	8	6	9	10	9
Denmark	5	9	8	12	15
Hong Kong SAR	11	11	11	9	7
United Kingdom	13	12	10	8	10
Canada	9	10	12	14	14
Taiwan, China	12	13	13	13	12
Norway	14	14	16	15	11
Qatar	22	17	14	11	13

Table 19 shows Canada's performance in global competitiveness over six years, measured by 12 pillars in three stages of economic development, from 2008/09 to 2013/14. The first stage, *Factor Driven Economies*, is driven by four basic pillars weighted at a total of 20%: (1) Institutions, (2) Infrastructure, (3) Macroeconomic Environment and (4) Health and Primary Education. The second stage, *Efficiency Driven Economies*, is built by five pillars weighted at a total of 50%: (5) Higher Education and Training, (6) Goods Market Efficiency, (7) Labour Market Efficiency, (8) Financial Market Development, (9) Technological Readiness and (10) Market Size. The third stage, *Innovation Driven Economies*, is powered by two pillars weighted at a total of 30%: (11) Business Sophistication and (12) Innovation.

As the rankings fluctuate from year to year, the rankings of the 12 pillars are averaged over a 3-year period from 2008/09 to 2010/11 and from 2011/12 to 2013/1 as shown in Table 19. The last column in Table 19 shows positive or negative Change in Average Rank (Average Rank 1 minus Average Rank 2). Three pillars show positive

change: Institution 2.3, Labour Market Efficiency 2.3 and Market Size 1.3. However, the remaining nine pillars declined in performance.

The pillars that suffer a critical decline of nearly 5 or more ranks need priority attention. Under Basic Requirements, Macroeconomic Stability declined by an average 13.3 ranks and Infrastructure, 4.7 ranks. Under Efficiency Enhancers, Higher Education and Training declined by 5.7 and Technological Readiness, 5.3. Under Innovation and Sophistication Factors, Innovation declined by 6 ranks.

Table 19: Canada's Performance in Global Competitiveness from 2008/09 to 2013/14

Pillar	2008/09	2009/10	2010/11	Average Rank 1	2011/12	2012/13	2012/14	Average Rank 2	Average Rank
Basic Requirements (20%)	8	10	11	9.7	13	14	15	14.0	- 4.3
Institution	15	17	11	14.3	11	11	14	12.0	2.3
Infrastructure	6	7	9	7.3	11	13	12	12.0	- 4.7
Macroeconomic stability	43	31	36	36.7	49	51	50	50.0	- 13.3
Health and primary education	6	7	6	6.3	6	7	7	6.7	- 0.3
Efficiency Enhancers (50%)	5	4	6	5.0	6	6	6	6.0	- 1.0
Higher education and training	9	9	8	8.7	12	15	16	14.3	- 5.7
Goods market efficiency	7	16	11	11.3	12	13	17	14.0	- 2.7
Labour market efficiency	10	7	6	7.7	5	4	7	5.3	2.3
Financial market sophistication	9	11	12	10.7	13	11	12	12.0	- 1.3
Technological readiness	14	11	16	13.7	16	20	21	19.0	- 5.3
Market size	16	14	14	14.7	14	13	13	13.3	1.3
Innovation and sophistication factors (30%)	16	12	14	14.0	15	21	25	20.3	- 6.3
Business sophistication	18	17	16	17.0	2	26	25	17.7	- 0.7
Innovation	13	12	11	12.0	11	22	21	18.0	- 6.0

Source: Global Competitiveness Reports from 2008/09 to 2013/14

4.3 Summary of Findings on Research Issues 1 to 5

As a summary, the findings of research issues 1 to 5 are tabulated in Table 20.

Table 20: Summary of Findings of Research Issues 1 to 5

Research Issue	Hypothesis	Findings
1. What are the barriers faced by small firms in Canada and are they different from bigger firms?	The significant barriers to small firms are Tax Rates, Tax Regulations, Access to Financing, Restrictive Labour Relations and Poor Work Ethic.	<p>The hypothesis is partly supported. Tax Rates, Tax Regulations, Access to Financing and Poor Work Ethic fall below the mean value 3 qualifying as problematic factors, while Restrictive Labour Relations has a mean value of 3.04, measured as somewhat problematic although close to problematic.</p> <p>The barriers to small firms are different from bigger firms. The top three of five barriers to small firms in rank order are Tax Rates, Tax Regulations and Access to Financing versus Financing, Inefficient Government Bureaucracy and Insufficient Capacity to Innovate for bigger firms.</p> <p>The remaining two of the top five barriers are unique to small firms: Poor Work Ethic and Restrictive Labour Regulations.</p> <p>Except Foreign Currency Exchange, Poor Public Health and Corruption, the remainder 13 are significant barriers.</p>
2. Is there a difference in the barriers faced by small firms between Eastern and Western Canada?	There is a significant difference in barriers to small firms between Eastern and Western Canada.	The hypothesis is supported. There is a significant difference between Eastern and Western Canada in seven barriers: (1) Insufficient Capacity to Innovate, (2) Access to Financing, (3) Tax Rates, (4) Tax Regulations, (5) Restrictive Labour Relations, (6) Inadequate Supply of Infrastructure and (7) Foreign Currency Regulations. The same significant differences are found between AB and ON.
3. Is there a difference in the barriers faced by small firms among different types of business in Canada?	There is a significant difference in barriers to small firms between different types of business in Canada.	The hypothesis is supported. There is a significant difference in four barriers between Retail and Service, six barriers respectively between Retail and Others and between Service and Others.

4. Is there a difference in the barriers faced by small firms of differing employee size in Canada?	There is a significant difference in barriers to small firms between employee sizes of 1 to 10 and 11 to 20, and between 1 to 10 and 21 to 99.	The hypothesis is supported. There is a significant difference between employee sizes 1 to 10 and 11 to 20 in Tax Regulations and Corruption. There is a significant difference between employee sizes 11 to 20 and 21 to 99 in Access to Financing.
5. What are the areas of Canada's global competitiveness affecting the sustainability of small firms?	Pillar 3 Macroeconomic Environment and Pillar 5 Higher Education and Training are the two pillars of competitiveness that impact the most problematic factors to doing business for small firms.	The hypothesis is partly supported. Pillar 3 Macroeconomic Environment impacts financial issues such Tax Rates and Tax Regulations but the tax indicators are in Pillar 6 Goods Market Efficiency and the Access to Financing indicator in Pillar 8 Financial Market Development. Pillar 5 Higher Education and Training impacts Poor Work Ethic in national labour force. Pillar 7 Labour Market Efficiency, not in the hypothesis, impacts Restrictive Labour Regulations. Pillar 7 has seen improvement and has been consistently ranked among the Top 10 nations.

Source: Developed by the author for this research.

5. Discussion

There are at least three managerial implications from the research findings. The first implication is that the allocation of resources to resolve the barriers should be prioritized according to the degree or magnitude of the problem and by province, type of business and employee size. The second implication is the need for policies to strengthen the weak pillars of competitiveness that impact small business. The third managerial implication is to develop a holistic knowledge management model that continuously monitor, study and analyse the variables that impact small business for a proactive approach to sustaining small business growth.

5.1 Allocation of Resources to Overcome Problematic Factors

5.1.1 Priority based on Measurement of Problematic Factor

In relation to research objective 1, although 13 of 16 most problematic factors are found significant, priority for resources to overcome the barriers should be based on the magnitude of the problem. The barriers should have a mean value below 3.5 indicating is between most problematic to somewhat problematic, and there are 11 factors that qualify.

While none of the 16 barriers were found most problematic, there are four problematic

factors that deserve immediate attention: Tax Rates (2.57), Tax Regulations (2.63), Access to Financing (2.63) and Poor Work Ethic in national labour force (2.84).

The remaining seven factors lie within the clearly somewhat problematic zone: Restrictive Labour Regulations (3.04), Insufficient Capacity to Innovate (3.19), Inadequately Educated Workforce (3.25), Inflation and Crime and Theft (3.27); Inefficient Government Bureaucracy (3.42) and Inadequate Supply of Infrastructure (3.48).

5.1.2 Priority based on Province, Type of Business and Employee Size

In relation to research objectives 2, 3 and 4, the results show a significant difference in the barriers to small business by region/province, type of business and employee size. Appendix 6 shows the differences in mean value between provinces, types of business and employee sizes. As presented in the findings, Ontario small firms view six factors significantly more problematic than Alberta: Tax Rates (1.73 vs. 2.74), Tax Regulations (2 vs. 2.78), Access to Financing (2.27 vs. 2.94), Restrictive Labour Regulations (2.67 vs. 3.17), Insufficient Capacity to Innovate (2.82 vs. 3.29) and Inadequate Supply of Infrastructure (2.97 vs. 3.57).

Retail businesses view four factors significantly more problematic than Service businesses: Access to Financing (2.5 vs. 3.06), Restrictive Labour Regulations (2.91 vs. 3.36), Poor Work Ethic (2.62 vs. 3.08), and Crime and Theft (2.82 vs. 3.65).

While firms with 11 to 20 employees view Tax Regulations significantly less problematic than firms with 1 to 10 employees (2.96 vs. 2.57), they view Access to Financing significantly more problematic than firms with 21 to 99 employees (2.51 vs. 3.09).

5.2 Strengthening Pillars of Competitiveness that Impact Small Firms

As discussed, there are four problematic factors: Tax Rates (2.57), Tax Regulations (2.63), Access to Financing (2.78) and Poor Work Ethic (2.84). Tax and Financing issues are impacted by Pillar 3 Macroeconomic Stability and Poor Work Ethic is impacted by Pillar 5 Higher Education and Training.

5.2.1 Recommendations for Overcoming Tax Barriers

Table 21 shows the five indicators in Pillar 3 Macroeconomic Stability and their rankings over the last six years from 2008/09 to 2013/14. Canada has been excellent in managing Inflation achieving 1st rank in the last three years as well as Country Credit Rating at an average 4th rank. However in the last three years, the average rank in Gross National Savings is 73rd, Government Budget Balance 97th and worst, General Government Debt, 130th – these ranks place Canada in the second half of the 140 plus countries surveyed.

Table 21: Canada's Indicator Rankings in Pillar 3 Macroeconomic Stability from 2008/09 to 2013/14

	2008/09	2009/10	2010/11	Average Rank 1	2011/12	2012/13	2012/14	Average Rank 2	Change in Average Rank
3.01 Government budget balance, % GDP	44	39	34	39.0	10 2	10 4	86	97.3	- 58.3
3.02 Gross national savings, % GDP	61	58	80	66.3	80	73	67	73.3	-7.0
3.03 Inflation, annual % change	26	3	24	17.7	1	1	1	1.0	16.7
3.04 General government debt, % GDP	10 7	10 8	12 0	111. 7	12 9	12 9	13 3	130. 3	- 18.7
3.05 Country credit rating, 0-100 (best)	N A	N A	4	4.0	4	3	5	4.0	0.0

Source: Global Competitiveness Reports from 2008/09 to 2013/14

Running fiscal deficits tend to limit the government's ability to react to business cycles and enhance competitiveness. Governments tend to lower the debt by raising taxes and reducing services which in turn hurt business and productivity. The indicator for Total Tax Rate and Effect of Taxation on Incentives to Invest are found in Pillar 6 Goods Market Efficiency as shown in Table 22. The Canadian government has improved the rank of Total Tax Rate to 30th rank in the last three years from a prior 75th rank, as well as the Effect of Taxation on Incentives to Invest to 34th rank from a prior 67th.

Table 22: Canada's Indicator Rankings Related to Tax Rate from 2008/09 to 2013/14

	2008/09	2009/10	2010/11	Average Rank 1	2011/12	2012/13	2012/14	Average Rank 2	Change in Average Rank
6.05 Total tax rate, % profit	72	75	79	75.3	29	32	25	30.5	44.8
6.04 Effect of taxation on incentives to invest	88	65	48	67	40	28	26	34	33

Source: Global Competitiveness Reports from 2008/09 to 2013/14

Although improvements have been achieved, the two indicators are far from Canada's overall 14th rank. The Certified Accountants Association of Canada (CGA, 2012) argues that the annual cost for business compliance with tax obligations at \$12.6 billion is too high for small and medium firms to shoulder \$11.4 billion or 90.5% of the cost. The CGA made two proposals:

- Simplify the tax forms by removing unnecessary information so that the intent and benefit of tax measures are better understood and easier for businesses to comply.
- Conduct a comprehensive review of Canada's tax system to reduce complexity and reform its structure. For example, the marginal tax on labour needs a review as many low and middle income sole proprietors face punishingly high marginal effective personal income tax rates that discourage them from working, saving and taking further education and training.

In 2013, representing 109,000 small business owners, the Canadian Federation of Independent Business wants the federal government to lower the small business tax rate to 11%. The general corporate tax rate has been reduced from 22% to 15% over the last six years but the small business tax rate has only dropped by one percentage point during the same time (Financial Post, March 13, 2013). The federal government granted the request for small business tax rate at 11% that unfortunately meant an increase by 1% in British Columbia. Ontario has its own system of taxation with small firms paying 13% comprising 5% federal and 8% provincial tax rates. Thus, the CGA's appeal to overhaul the country's entire and differing tax system by province is lauded.

Canada over relies on income and profit taxes which has been cautioned as the most damaging forms of taxation. Switching the tax mix toward consumption based taxes like the GST or HST would encourage work and capital formation, stimulate productivity and economic growth. Nations such as Singapore and New Zealand have successfully

switched to a more consumption-based tax system (Poh, 2003) and this has proven a wise decision. World Bank has consistently ranked Singapore as 1st and New Zealand as 3rd among 185 countries to start a business in the last five years.

Finally, closing the issue related to tax, there are no indicators for Tax Regulations and it would be best for WEF to incorporate an indicator in Pillar 6 Goods Market Efficiency to supplement the 6.05 Total Tax Rate % profit and 6.04 Effect of Taxation.

5.2.2 Recommendations for Overcoming Access to Financing

Table 23 shows the indicators for Access to Financing in Pillar 8 Financial Market Development.

Table 23: Canada's Indicator Rankings Related to Access to Financing from 2008/09 to 2013/14

	2008/09	2009/10	2010/11	Average Rank 1	2011/12	2012/13	2012/14	Average Rank 2	Change in Average Rank
8.04 Ease of access to loans	25	25	24	24.7	22	18	26	20.0	4.7
8.05 Venture capital availability	19	18	19	18.7	19	20	23	19.5	-0.8

Source: Global Competitiveness Reports from 2008/09 to 2013/14

Although the Ease of Access to Loans has improved to an average 20th rank in the last three years from a prior 25th rank, Venture Capital Availability is at its lowest rank at 26th in 2013-2014.

As mentioned earlier, despite being one of the largest customers of commercial banks, loans to small firms are often limited to short periods, ruling out financing any considerable investments (Lloyd, 2009). Money lenders are reluctant to fund small firms because of the difficulty to evaluate the risk of the new, innovative products (Craig et al., 2006). Access to seed capital remains restricted (Canadian Chamber of Commerce, 2013).

There are various government support programs available for small businesses to access funding:

1. International Business Funding
 - a. The Export Guarantee Program increases the chances of small businesses of securing bank financing from with a government guarantee on their export-related activities (About Exporting, n.d.).
 - b. The Global Opportunities for Associations provide funding to support national associations undertaking new or international business development activities (Global Opportunities for Associations, n.d.).
2. Small Business Financing and Assistance
 - a. The Small Business Financing Program helps small businesses to secure up to \$250,000 from a financial institution (Canada Small Business Financing Program. n.d.).
 - b. The Business Development Bank (BDC) provides services for entrepreneurs including financing, venture capital, and consulting services to entrepreneurs (BDC is the only bank exclusively dedicated to entrepreneurs, n.d.).
3. Research Incentive and Assistance
 - a. The SR&ED offers tax incentive for scientific research and experimental development.
 - b. The Industrial Research Assistance Program (IRAP) provides more than 200 industry technical advisers to assist companies in plan layout, productivity, cost control, production process improvement, and assessment of new manufacturing technology (Industrial Research Assistance Program, n.d.).

However, not all small firm owners or entrepreneurs are aware and if they do, they view the process of succeeding in their application is long and difficult. There are two recommendations to help increase access to financing for small firms:

1. Active promotion campaign of government assistance programs. For example, financial institutions could schedule regular seminars for clients, public and undergraduates to disseminate information of assistance programs (Riding, Orser, Spence & Belanger, 2012).
2. An angel investment tax credit to support the early stages of innovation (Canadian Chamber of Commerce, 2013).

5.2.3 Recommendations for Overcoming Poor Work Ethic

Table 24 shows seven indicators that have a bearing on Poor Work Ethic.

Table 24: Canada's Indicator Rankings Related to Higher Education and Training from 2008/09 to 2013/14

	2008/09	2009/10	2010/11	Average Rank 1	2011/12	2012/13	2012/14	Average Rank 2	Change in Average Rank
4.10 Primary education enrolment, net %	6	7	8	7	6	3	3	4.5	2.5
5.01 Secondary education enrolment, gross %	6	21	19	15.3	21	25	32	23	-7.7
5.02 Tertiary education enrolment, gross %	24	25	27	25.3	29	35	38	32	-6.7
5.03 Quality of educational system	8	5	5	6	7	6	10	6.5	-0.5
5.05 Quality of management schools	4	2	3	3	4	5	7	4.5	-1.5
5.07 Availability of research and training services	10	11	11	10.7	13	13	18	13	-2.3
5.08 Extent of staff training	19	12	12	14.2	18	23	34	20.5	-6.2

Source: Global Competitiveness Reports from 2008/09 to 2013/14

Except for Primary Education Enrolment which has improved to 3rd rank in the last two years, the rest of the six indicators have declined. Nevertheless, despite slipping in rank, Quality of Educational System, Quality of Management School and Availability of Research and Training Services have managed to stay higher than Canada's GCI at 14th. However, there are two alarming trends:

1. While Primary Education Enrolment is ranked 3rd in 2013/14, Secondary Education Enrolment is nearly 30 ranks behind at 32nd and Tertiary Education Enrolment a further six ranks behind at 38th. This means a drastic drop out rate at secondary schools which will influence a lower tertiary rate that depends on high school graduates. The high drop out at secondary schools indicate a disinterest or negative attitude towards studies, the formative tool for self-discipline, that will result not only in lack of skill but also poor attitude at work.
2. Extent of Staff Training has deteriorated to 34th rank in 2013/14 and overall dropped by an average six ranks in the last three years. A lower level of training would mean a stagnation of skill may lead to the old adage "familiarity breeds contempt" festering a lackadaisical attitude at work.

While schools (and homes) are a critical place to teach responsible work ethic, there

may be several reasons contributing to the perception of Poor Work Ethic among small firms:

- There is a shortage of skilled workers as much as 550,000 by 2016 and possibly over a million by 2021 according to the Chamber of Commerce (2013). This means bigger firms are willing to pay more attractive perks and salaries to induce job hoppers.
- While there is a shortage of skilled labour, 48% of adults in Canada are below Level 3 literacy skills which mean they are unable to use new technologies and absorb training effectively to recover cost of investment (Murray, McCracken, Willms, Jones, Shillington and Stucker, 2009).
- Value differences among generational categories could result in an older employer labelling a younger colleague as lazy or rebellious. While baby boomers value recognition and interpersonal communication, Gen Y value freedom and digital communication.
- Over coddling of children has resulted in a new generation of workers who are now known as the entitled generation, over protected until they lack basic skills in communication and self-help (Hyper Parents, Coddled Kids, n.d.).
- With all the above reasons, employers are discouraged from investing in talent development to avoid the train-to-drain syndrome.

The strategies to overcome Poor Work Ethic is not just about teaching work ethic. They are also about creating a bigger pool of talent to minimize job hopping, stimulate innovation and motivate employee loyalty. There are two key recommendations:

1. Collaboration between educators and employers to balance supply with demand for skilled trades and occupations, for example, the Alberta government's allocation of \$282 million for three years to the Northern Alberta Institute of Technology (NAIT), Norquest College, University of Calgary, Lethbridge College and Mount Royal University (Alberta rolls out austerity budget: CAUT Bulletin, March 2013) to train and fill the skilled vacancies.
2. Up-skilling underutilized segments, primarily the youth, older, immigrant and Aboriginal workers.
 - a. Job shadowing and work ethic training for the youth should be strengthened from senior high to post-secondary institutions.

- b. Older workers could be retained as they are a valuable source of skills and knowledge to younger colleagues. For example, faced with labour shortage and an aging population, employers in Singapore are re-offering employment to retiring employees (Retirement and Re-employment Act, n.d.).
- c. Immigrants to Canada under the skilled category are found to earn 60 to 70% of the wages of Canadian-born workers, a decline from the 85 to 90% in the late 1970s (Garnett & Sweetman, 2012). If it is a question of skill-fit, then up-skilling or re-skilling should begin pre-entry to Canada. The government could advise applicants to take online programs with Canadian universities while waiting for their landing permits. Canadian educational institutions should consider starting campuses abroad, where there is a proliferation of American, Australian, British and French universities, to compete for the best immigrant talents.
- d. The Aboriginal population is much younger, providing a source for longer-term employment: 28% of Aboriginal are aged 14 and under compared to 16.5% for non-Aboriginal, and only 5.9% of Aboriginal are aged 65 and above, less than half the rate of 14.2% of non-Aboriginal. With the median age of the Inuit at 23, First Nations at 26 and Métis at 31, the average median age is 26.6 years, 13.3 years younger than the median age in Canada at 39.9 years (National Aboriginal Day... by the numbers 2013, n.d.).

5.3 *Developing a Model for Knowledge Management for Small Business Issues*

Figure 6 shows a proposed model for knowledge management for small business issues to capture, monitor, analyse data and develop strategies to sustain small business growth.

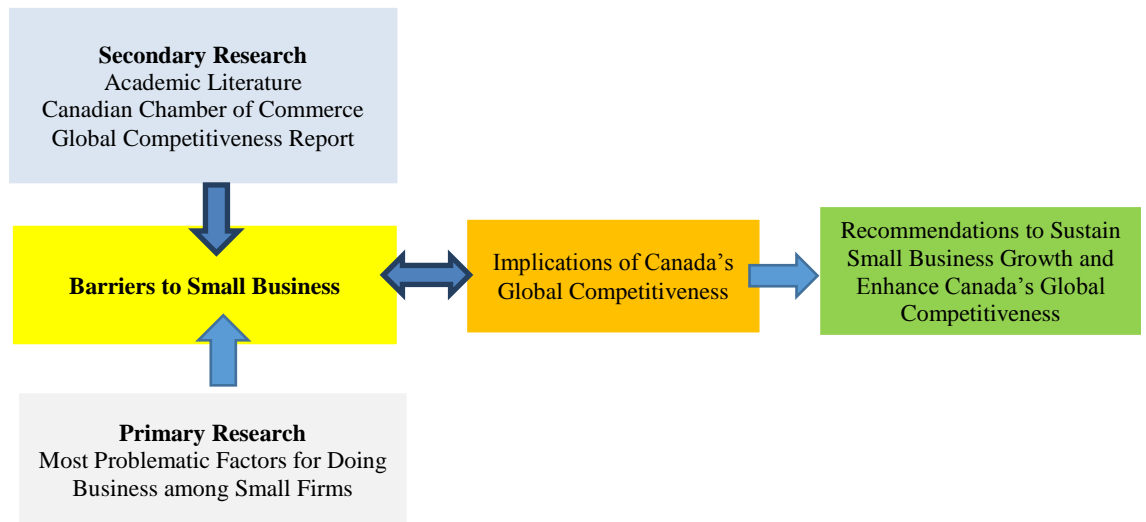


Figure 6: A Knowledge Management Model for Small Business Issues

There are two research components critical to accurately identifying barriers to small business. First, there should be consistent secondary research to understand the factors that influence small business issues and the areas for future research to gain deeper insights for policy development. In this regard, relevant sources must be made available for analysis. Apart from academic literature, reports from the Canadian Chamber of Commerce, Conference Board of Canada and Global Competitiveness Reports from the World Economic Forum, World Bank and other trusted global not-for-profit research organizations. An analysis of trends would help identify the recurring issues to small firms.

Second, there must be continuous primary research in at least three forms: (a) scanning the macro and micro environments to identify strengths, weaknesses, opportunities and threats to small business, (b) conducting annual surveys to understand the challenges faced by small firms in sustaining and growing their business, and (c) inviting participation of small firms at various small business forums and seminars where focus groups can be conducted on a more regular basis to collect valuable data. Information can be collected from respondents regarding the policies at federal and provincial levels that hamper their growth.

Valuable information has been provided by global economic bodies of research. Thus, a systematic and measurable approach to identifying the deeper issues that impact

small business is a diligent study of the indicators of global competitiveness from global not-for-profit organizations such as the World Economic Forum and World Bank. Much of the information, if not all, is available free online.

Finally, strategies and action programs that are implementable should be recommended to help the government and business sectors collaborate to sustain small business growth and thereby, enhance Canada's global competitiveness.

6. Conclusion

This research represents the first attempt to replicate and test the universal model of the World Economic Forum's 16 most problematic factors to doing business. This research also represents another first in examining the impact of a nation's global competitiveness on small business growth. Of greater significance is that this research provides an insight to Canadian small business challenges compared to the overwhelming studies from other western nations, especially the United States.

As a summary, this research has made six major contributions:

1. identified the significant barriers faced by small firms
2. Identified the significant barriers faced by small firms by province/region, type of business and employee size.
3. Recommended prioritization of resources to overcome the barriers according to the magnitude of the problem, from most problematic to somewhat problematic.
4. Reviewed and identified trends from Canada's global competitiveness performance over a six-year period.
5. Identified the weak pillars and respective indicators that need attention.
6. Proposed recommendations to overcome small business barriers related to tax, access to financing and poor work ethic.

This research has its limitations which form the two key recommendations for future research:

1. Enlarge demographic categories for significance testing. The researcher has to determine the province, type of business, employee size or even new variables such as gender and ethnicity for an in-depth study or comparative studies. .
2. Test model across business sectors. As further research is needed to generalize the model to broader settings, future studies may examine, for example, the needs of small firms in the oil and gas industry.

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Appendix 1: External and Internal Factors Influencing the 16 Most Problematic Factors

Most Problematic Factor (Issue)	Issue Category	Environment	
		Macro/External	Micro/Internal
Tax rates	Tax	External: Economic	
Tax regulations	Tax	External: Economic	
Access to financing	Limited loans & interest rate	External: Economic	
Insufficient capacity to innovate	Lack funds Lack technology	External: Technology	Internal: Finance, Talent, Technology
Restrictive labor regulations	Labour	External: Economic	
Inadequately educated workforce	Labour	External: Economic	
Poor work ethic in national labour force	Labour	External: Social Cultural	
Inadequate supply of infrastructure	Infrastructure	External: Economic	
Inefficient government bureaucracy	Government	External: Political	
Policy instability	Government	External: Political	
Government instability/coups	Government	External: Political	
Poor public health	Government	External: Political, Technology	
Corruption	Government	External: Political	
Crime and theft	Government	External: Economic, Political	
Inflation	Economy (Government)	External: Economic	
Foreign currency regulations	Economy (Government)	External: Economic	

Appendix 2: The 16 Most Problematic Factors to Doing Business in Canada from 2009/10 to 2013/14

Most Problematic Factor	2013/14	2012/13	2011/12	2010/11	2009/10	Average
1. Access to financing	16.50	14.00	14.10	15.40	22.60	16.52
2. Inefficient government bureaucracy	12.90	16.40	17.70	13.20	12.80	14.60
3. Insufficient capacity to innovate	13.00	15.10	NA	NA	NA	14.05
4. Tax rates	9.90	9.40	12.90	18.00	16.70	13.38
5. Tax regulations	10.20	9.10	10.00	13.10	12.30	10.94
6. Restrictive labor regulations	9.50	8.70	7.20	12.10	13.30	10.16
7. Inadequate supply of infrastructure	7.80	5.00	11.40	7.30	6.00	7.50
8. Inadequately educated workforce	7.50	9.90	8.50	6.00	4.10	7.20
9. Policy instability	3.40	3.50	8.50	5.70	4.70	5.16
10. Poor work ethic in national labour force	4.70	4.20	1.90	4.40	3.60	3.76
11. Inflation	0.50	2.30	3.30	2.10	1.20	1.88
12. Foreign currency regulations	1.60	1.40	2.10	1.30	1.60	1.60
13. Government instability/coups	0.2	0.2	1.8	0.4	0.1	0.54
14. Poor public health	0.40	0.40	0.70	0.30	0.60	0.48
15. Corruption	1.3	0.3	0	0.2	0	0.36
16. Crime and theft	0.6	0	0	0.5	0.5	0.32

Note: The numbers to each factor for each year represents the responses weighted according to their rankings. The factor “insufficient capital to innovate” was introduced from year 2012/13.

Appendix 3: The Final Research Questionnaire replicated from the World Economic Forum's survey of 16 most problematic factors and modified to include demographic variables.

This research seeks to identify the challenges faced by small businesses in Canada. We appreciate your kind cooperation.

Name of Respondent (optional but appreciated):

Name of Company/Type of Business:

Province:

Number of employees:

City/Town:

Contact number (optional but appreciated):

Email address (optional but appreciated):

Please rate each factor with the scale of **1 as most problematic and 5 as least problematic**. Please **circle only one choice** from 1 to 5 for each factor.

Factor	Most problematic				Least problematic
1. Inefficient government bureaucracy	1	2	3	4	5
2. Insufficient capacity to innovate	1	2	3	4	5
3. Access to financing	1	2	3	4	5
4. Inadequately educated workforce	1	2	3	4	5
5. Tax rates	1	2	3	4	5
6. Tax regulations	1	2	3	4	5
7. Restrictive labor regulations	1	2	3	4	5
8. Inadequate supply of infrastructure	1	2	3	4	5
9. Poor work ethic in national labour force	1	2	3	4	5
10. Policy instability	1	2	3	4	5
11. Inflation	1	2	3	4	5
12. Foreign currency regulations	1	2	3	4	5
13. Poor public health	1	2	3	4	5

14. Corruption	1	2	3	4	5
15. Government instability/coups	1	2	3	4	5
16. Crime and theft	1	2	3	4	5

Please list other challenges that were not included above.

Thank you for your kind participation.

Appendix 4: Comparing Ratings of 16 Most Problematic Factors between This Research and WEF's 2013/14 and 5-Year Average from 2009/10 to 2013/14

Rank	WEF Average Responses over 5 Years from 2009/10 to 2013/14		WEF 2013/14		This Research: 316 Respondents	
	Factor	Average	Factor	Rank	Factor	Average
1.	Access to financing	16.52	Access to financing	16.5	Tax rates	2.57
2.	Inefficient government	14.6	Insufficient capacity to	13	Tax regulations	2.63
3.	Insufficient capacity to	14.05	Inefficient government	12.9	Access to financing	2.78
4.	Tax rates	13.38	Tax regulations	10.2	Poor work ethic in national labour	2.84
5.	Tax regulations	10.94	Tax rates	9.9	Restrictive labor regulations	3.04
6.	Restrictive labor regulations	10.16	Restrictive labor regulations	9.5	Insufficient capacity to	3.19
7.	Inadequate supply of infrastructure	7.5	Inadequate supply of	7.8	Inadequately educated	3.25
8.	Inadequately educated	7.2	Inadequately educated	7.5	Inflation	3.27
9.	Policy instability	5.16	Poor work ethic in national labour	4.7	Crime and theft	3.27
10.	Poor work ethic in national labour	3.76	Policy instability	3.4	Inefficient government	3.42
11.	Inflation	1.88	Foreign currency regulations	1.6	Inadequate supply of	3.48
12.	Foreign currency regulations	1.6	Corruption	1.3	Policy instability	3.75

13.	Government instability/coups	0.54	Crime and theft	0.6	Poor public health	3.93
14.	Poor public health	0.48	Inflation	0.5	Foreign currency regulations	4.05
15.	Corruption	0.36	Poor public health	0.4	Corruption	4.05
16.	Crime and theft	0.32	Government instability/coups	0.2	Government instability/coups	4.18

Appendix 5: Canada's Global Competitiveness from 1999 to 2013/14

Country	1999	2000	2001	2002	2003	Average
Finland	2	5	1	2	1	2.2
United States	21	1	2	1	2	5.4
Singapore	12	2	4	4	6	5.6
Sweden	4	12	9	5	3	6.6
Canada	8	6	3	8	16	8.2
Netherlands	3	3	8	15	12	8.2
Switzerland	5	9	15	6	7	8.4
Taiwan, China	19	10	7	3	5	8.8
Denmark	7	13	14	10	4	9.6
United Kingdom	10	8	12	11	15	11.2
Norway	18	15	6	9	9	11.4
Germany	6	14	17	14	13	12.8
Japan	14	20	21	13	11	15.8
Hong Kong SAR	21	7	13	17	24	16.4
Qatar		N/A	N/A	N/A	N/A	NA

Country	2004	2005	2006/07	2007/08	2008/09	Average
United States	2	2	1	1	1	1.4
Denmark	5	4	3	3	3	3.6
Finland	1	1	6	6	6	4.0
Sweden	3	3	9	4	4	4.6
Switzerland	8	8	4	2	2	4.8
Singapore	7	6	8	7	5	6.6
Japan	9	12	5	8	9	8.6
Germany	13	15	7	5	7	9.4
United Kingdom	11	13	2	9	12	9.4
Netherlands	12	11	11	10	8	10.4
Taiwan, China	4	5	13	14	17	10.6
Norway	6	9	17	16	15	12.6
Canada	15	14	12	13	10	12.8
Hong Kong SAR	21	28	10	12	11	16.4
Qatar	N/A	19	32	31	26	27.0

Country	2009/10	2010/11	2011/12	2012/13	2013/14	Average
Switzerland	1	1	1	1	1	1.0
Singapore	3	3	2	2	2	2.4
Sweden	4	2	3	4	6	3.8
Finland	6	7	4	3	3	4.6
United States	2	4	5	7	5	4.6
Germany	7	5	6	6	4	5.6
Netherlands	10	8	7	5	8	7.6
Japan	8	6	9	10	9	8.4
Denmark	5	9	8	12	15	9.8
Hong Kong SAR	11	11	11	9	7	9.8
United Kingdom	13	12	10	8	10	10.6
Canada	9	10	12	14	14	11.8
Taiwan, China	12	13	13	13	12	12.6
Norway	14	14	16	15	11	14.0
Qatar	22	17	14	11	13	15.4

Appendix 6: Differences in Mean between Provinces, Types of Business and Employee Sizes

Differences in Mean between Provinces

Province		Inefficient Government Bureaucracy	Insufficient Capital to Innovate	Access to Financing Inadequately Educated Workforce	Tax Rates	Tax Regulations	Restrictive Labour Regulations	Inadequate Supply of Infrastructure	Poor Work Ethic in National Labour Force	Policy Instability	Inflation	Foreign Currency Regulations	Poor Public Health	Corruption	Government Instability	Crime and Theft	
AB (N=251)	Mean	3.41	3.29	2.94	3.28	2.74	2.78	3.17	3.57	2.84	3.72	3.25	4.12	3.99	4.01	4.14	3.34
ON (N=33)	Mean	3.24	2.82	2.27	3.03	1.73	2.00	2.67	2.97	2.94	3.88	3.15	3.70	3.85	4.09	4.45	3.18

Differences in Mean between Types of Business

Type of Business		Inefficient Government Bureaucracy	Insufficient capacity to Innovate	Access to Financing Inadequately Educated Workforce	Tax Rates	Tax Regulations	Restrictive Labour Regulations	Inadequate Supply of Infrastructure	Poor Work Ethic in National Labour Force	Policy Instability	Inflation	Foreign Currency Regulations	Poor Public Health	Corruption	Government Instability	Crime and Theft	
Retail (N=150)	Mean	3.44	3.13	2.50	3.11	2.56	2.67	2.91	3.45	2.62	3.71	3.02	3.91	3.85	4.04	4.04	2.82
Service (N=108)	Mean	3.50	3.31	3.06	3.16	2.66	2.68	3.36	3.69	3.08	3.81	3.31	4.19	3.99	4.02	4.17	3.65

Differences in Mean between Employee Sizes

Employee Size		Inefficient Government Bureaucracy	Insufficient Capital to Innovate	Access to Financing	Inadequately Educated Workforce	Tax Rates	Tax Regulations	Restrictive Labour Regulations	Inadequate Supply of Infrastructure	Poor Work Ethic in National Labour Force	Policy Instability	Inflation	Foreign Currency Regulations	Poor Public Health	Corruption	Government Instability	Crime and Theft
1-10 (N=22)	Mean	3.41	3.20	2.78	3.21	2.54	2.57	3.01	3.47	2.82	3.78	3.24	4.06	3.92	4.14	4.18	3.32
11-20 (N=51)	Mean	3.49	3.22	2.51	3.31	2.65	2.96	3.22	3.51	2.88	3.80	3.24	3.94	3.82	3.73	4.10	3.08
21-99 (N=43)	Mean	3.40	3.14	3.09	3.35	2.63	2.51	2.98	3.51	2.86	3.51	3.44	4.12	4.07	4.26	3.26	4.58

Effects of Knowledge Transfer on Successors' Innovativeness

Marina Letonja *

GEA College – Faculty of Entrepreneurship
Dunajska cesta 156, 1000 Ljubljana, Slovenia

Mojca Duh

Faculty of Economics and Business
University of Maribor
Razlagova 14, 2000 Maribor, Slovenia

* *Corresponding author*

Structured Abstract

Purpose – The main purpose of the research is to increase our understanding of the factors which affect innovativeness of successors in smaller family firms (SFF) and what is the role of the founder in strengthening (deterioration) of successors' innovativeness.

Design/methodology/approach – We research which factors affect – supportive or dampening – innovativeness of the next generation, and as well, if the innovation potential of the founder can be transferred to the next generation. Especially we study effect of knowledge transfer on innovativeness of successors. Therefore, the research questions are: *Why and how transfer of experiential knowledge and routine knowledge of founders affects innovativeness of successors? Why and how academic knowledge on the field of entrepreneurship affect innovativeness of successors? Why and how external working experiences affect innovativeness of successors?* We adopted a qualitative empirical research approach – using multiple-case study research method where replication logic was possible.

Originality/value – The originality and the value of the paper lies in the identification of factors affecting successors' innovativeness; we limit our research on those factors which are tightly linked to the knowledge and knowledge transfer during a succession process.

Practical implications – The empirical findings will have practical implications for key stakeholders in the SFF succession process and provide basis for a broader empirical research.

Keywords – Smaller Family Firms, Founders, Successors, Innovativeness, Knowledge Transfer.

Paper type – Academic Research Paper

1 Introduction

Family firms represent an important share in the structure of all firms. According to some recent research results, 70 % of all firms worldwide are family ones (Mandl, 2008) and most of them are micro, small or medium-size (smaller family firm: SFF). SFF, innovation marketing and excellent research systems are recognized as drivers of innovation growth in EU, thereby the increase of SFF's innovativeness is of crucial importance in every national economy in order to become innovative societies (Innovation Union Scoreboard, 2013). Since SFF's innovativeness is closely connected with the innovativeness of their key stakeholder (e.g., owners who are very often also managers), we limit our research on innovativeness of founders and successors in SFF. Previous research has revealed that innovativeness of founders differs from innovativeness of successors (e.g., Ganzarolli *et al.*, 2006; Litz and Kleysen, 2001).

Since knowledge is viewed as relevant and actionable information based on experience and education (Cabrera-Suárez *et al.*, 2001; Nonaka, 1994), and as such an important source of innovation, creativity and competitive advantage (Nonaka *et al.*, 2000; Delgado-Verde *et al.*, 2011), we focus our research on knowledge transfer during the succession. Many research findings show that the transfer of ownership and management to the next family generation is crucial period in the SFF's life, and many family firms do not survive this transfer. However, several authors (e.g., Dyck *et al.*, 2002) suggest that succession (i.e., the replacement of incumbent with capable leader) can represent a strategic opportunity in rapidly growing firms or firms in emerging and dynamic markets which are facing changing managerial needs. Due to complex and rapid changes in firms' environment we believe that the survival of SFF across generations depends on their ability to renew through innovation. Members of succeeding generation should bring fresh perspectives in the family firm and add new knowledge to the firm's existing knowledge base thus fostering innovation.

Research findings suggest that the firm's specific knowledge (so called tacit knowledge) and the ability to transfer it, are the key strategic asset that may be positively associated with higher levels of performance and sustainable competitive advantage because they are difficult to trade and imitate, scarce, appropriable and specialized (Cabrera-Suárez *et al.*, 2001 Chirico, 2008). Sharma (2004) specially points to strategic importance of transferring tacit knowledge to the next generation in order to maintain and develop a family business after taking over the control by the next family generation.

However, also knowledge created outside a family firm and transferred to a successor is of crucial importance. Especially, the academic education (in entrepreneurship), external working experiences and additional training outside a family business play an important role and are positively related to innovation ability of the next family generation. Namely, founders/managers of SFF often do not have education and training related to innovation, invention, diffusion processes (Romano, 1990), and innovativeness in SFF is positively related with employing managers with relevant external training and formal education.

The goal of our study is to broaden our understanding on knowledge transfer during family firm succession and its effect on innovativeness of the next family generation.

The following research questions have been addressed in our research study:

Q1: *Why and how transfer of experiential knowledge (tacit knowledge shared through common experiences) and routine knowledge (tacit knowledge routinized and embedded in actions and practice) of founders affects innovativeness of successors?*

Q2: *Why and how academic knowledge on the field of entrepreneurship affects innovativeness of successors?*

Q3: *Why and how external working experiences affect innovativeness of successors?*

The case research study has been conducted on the case of Slovenia. SFF of the first generation still prevail in Slovenia and large transfer to the second generation is expected. As the research results of Duh and Tominc (2005) show, less than 60 % of founders/managers of SFF, age 51 or more, actually already plan transition of ownership/management to the next family generation in the next five years. This is the reason why the question of innovativeness of the second generation of owners and/or managers of SFF is of key importance. We believe that our research results are important not only for Slovenian family businesses but also for family businesses in other environment due to the fact that only small proportion, 30 %, of first generation family firms survive to the second (e.g., Morris *et al.*, 1997; Miller *et al.*, 2003).

Limitations of our research are the size and geographical location of the included family firms. Research has been conducted in micro, small and medium-sized family firms (SFF), as we assume that many micro family firms with up to 9 employees as well face the problem of transfer of ownership and of management to the next generation. As the research is limited to Slovenia, the findings and conclusions are acquired on the basis

of experiences of the Slovenian SFF. Additional limitation is in very few theoretical sources with combination of studied research fields – innovation management and family businesses. Many researchers explore individual aspects of succession in family firms, but not as well the factors that have impact on innovativeness of successors in SFF.

The paper is structured as follows: following the introduction chapter the theoretical backgrounds of research (i.e., family business succession, successor's innovativeness, knowledge typology and knowledge transfer), are briefly discussed. Research design based on case study approach and sampling strategies with data collection are presented. They are followed by data analysis and findings with development of propositions. The paper ends with a conclusion chapter indicating main future research directions.

2 Family business succession

One of the major problems family businesses face is the transfer of ownership and/or of management to the next family generation (e.g., Miller *et al.*, 2003; Sharma *et al.*, 2003), although in most SFF (as well non-family firms) both processes go hand-in-hand (e.g., Gersick *et al.*, 1997; Sharma *et al.*, 2003). A family member as a potential successor is especially preferable when so-called idiosyncratic, family business-specific experiential knowledge is considered especially important for gaining competitive advantage (e.g., Bjuggren and Sound, 2001; Royer *et al.*, 2008). Research findings indicate that family business succession should be seen as a multistage process that occurs over time, beginning before heirs even enter the business (Handler, 1994) and is characterized by growing involvement of a successor in the business (Cabrera-Suárez *et al.*, 2001). Due to high proportion of SFF (30 %; e.g., Miller *et al.*, 2003), which fail to move to the second and subsequent generations, considerable amount of research have explored factors impacting success of a succession process (e.g., Dyck *et al.*, 2002; Le Breton-Miller *et al.*, 2004).

Success of a succession process crucially depends on the next generation which has to develop some important characteristics (e.g., Cabrera-Suárez *et al.*, 2001; Chrisman *et al.*, 1998; Mazzola *et al.*, 2008; Sharma and Rao, 2000): business and industry knowledge, several abilities (e.g., decision-making ability), networks and social capital, passion, innovative spirit, legitimacy and credibility from both family and non-family stakeholders. For this reason, several research studies explore nurturing, preparation and development of successors (e.g., Dyck *et al.*, 2002; Le Breton-Miller *et al.*, 2004; Morris

et al., 1997) as an important predictor of successful succession. Morris *et al.* (1997) found that succession is realized more smoothly when successors are better prepared and a family firm's performance after transition is positively affected by successors' education level. Tightly linked to questions on how to prepare the competent leader is research that deals with the transfer of knowledge during the succession process (Sharma, 2004). Especially the transfer of tacit knowledge from predecessor to successor and successor's training to assume the top management functions have been found to be key processes in developing and protecting knowledge (especially tacit one). It should guarantee the survival of a family business across generations since family firms often "... maintain their own ways of doing things – a special technology or commercial know-how that distinguish them from their competitors" (Cabrera-Suárez *et al.*, 2001, p.38). Customers believe in a high level of products and services, when specific family techniques and knowledge are transferred to the next family generation (e.g., Dumas, 1998).

3 Successors' innovativeness and knowledge transfer

3.1 Successors' innovativeness

In family firms, innovativeness is regarded as a highly important dimension of entrepreneurial orientation for long-term performance, together with autonomy and pro-activeness (Nordquist *et al.*, 2008). It is a necessary condition for a family firm continuity; firms must constantly seek ways to recognize and exploit new opportunities as well as refine existing resources in order to successfully grow and compete (Zahra, 2005). McCann *et al.* (2001) find that younger and SFF are more likely to be innovative than older, larger family firms. Furthermore, innovativeness is described as having greater potential for high performance, if it is driven by comprehensive strategic decision-making and long-term orientation (Eddleston *et al.* 2008; McCann *et al.*, 2001). Innovativeness refers to "a firm's tendency to engage and support new ideas, novelty, experimentation, and creative processes that may result in new products, services, or technological processes" (Lumpkin and Dess, 1996, p. 142).

Previous research has revealed that innovativeness of founders differs from innovativeness of successors, some authors argue that successors are less innovative, others say opposite. But, it has not been researched yet how innovativeness of founders affects innovativeness of successors. According to some research findings family firms

are found to become more conservative and less innovative over time (e.g., Donckles and Frölich, 1991; Zahra, 2005), and second generation family firms often fail due to inaction and reluctance to seek out new business opportunities (Ward, 1997).

Ganzarolli et al. (2006) determined that succession does not have positive impact on increase of firm's innovativeness (innovation capability); on the other side Kepner (1991) says that while family firms of the first generation wish to maintain status quo, successive generations wish to introduce new modes of operation, as they are necessary to maintain the same level of growth and of financial success of the previous generation (Jaffe, Lane, 2004). Litz and Kleysen (2001) even argue that the next generations are the driving force of innovation in family firms. Salvato (2004) agrees with the argument, as well.

As previous research has shown a family environment affects innovative potential of individuals (e.g., successors; proper education, family values, size of family, birth order) (Mumford *et al.*, 2002).

Factors leading to innovation at the individual level (for references see Litz and Kleysen, 2001) are: divergent thinking (Guilford, 1963), a propensity for risk-taking (Glassman, 1986), cognitive style (Kirton, 1976), intrinsic motivation, domain relevant skills, creativity skills (Amabile, 1988), political prowess (Maute and Locander, 1994), self-confidence, autonomy and openness (West and Farr, 1989), energetic charge, talent, creativity of individual family members (Kanter, 1988), family culture, freedom, flexibility, intergenerational respect, and family atmosphere (Kanter, 1988).

On the level of organization, factors that affect innovativeness, according to Fatur and Likar (2009, 52-63), overlap with some internal factors, as predicted by Srića (1999, 28), and are: culture and climate, goals, strategy, HR, rewarding, communication, management, management of ideas, creativity, organization, perception. As regards the innovation measurements, some authors (see e.g. Brower and Kleinknecht, 1999) classify indicators distinguishing whether they are based on inputs or on outputs of the innovation process. Indicators based on inputs are, for example: research and development (R&D) budget, existence of formalized R&D, educational background of staff, etc. Indicators based on outputs (see for references Massa and Testa, 2008) are, for example: number of patents (and Lampert, 2001; Chin et al., 2009; Deyle and Grupp, 2005; Jaffe and Trajtenberg, 2002), information disseminated in literature (Sorenson and Fleming, 2004), the absolute amount of sales of innovative products (Negassi, 2004), the number of innovations, the number of new products (Brower and Kleinknecht, 1996), and the

increase in market share (Mascitelli, 2000). New indicators such as perceived innovation effectiveness have been put forward in recent decades (Kivimaki et al., 2000).

3.2. Knowledge and typology of knowledge

Knowledge is defined as “justified true belief” and is the capacity to define situation and act accordingly (Nonaka *et al.*, 2000; Nonaka *et al.*, 2006). Knowledge is embodied in the individual, and is therefore history dependent, context sensitive, specific and aimed at problem definition rather than problem depiction and problem solving (Nonaka *et al.*, 2006). Nonaka et al. (2000, p. 7) especially point to the fact that knowledge is context specific; according to the authors “... information becomes knowledge when it is interpreted by individuals and given a context and anchored in the beliefs and commitments of individuals.” One of the most recognized typology of knowledge is the one which differentiates between explicit and tacit (implicit) knowledge (e.g., Nonaka, 1991; Nonaka, 1994; Nonaka *et al.*, 2006; Nonaka and von Krogh, 2009). Explicit or codified knowledge is the one which can be transmitted in formal, systematic language. So it can be uttered, formulated in sentences, captured in drawings and writing (Nonaka *et al.*, 2000). On the other hand, tacit knowledge has a personal quality and therefore this kind of knowledge can hardly be expressed or formalized. Tacit knowledge is deeply rooted in actions, procedures, routines, commitment, ideals, values and emotions (Nonaka *et al.*, 2000) and involvement in a specific context – a craft or profession, a particular technology or product market, or the activities of work group or team (Nonaka, 1994). According to Nonaka and von Krogh (2009) tacit and explicit knowledge are not two separated types but inherently inseparable and dynamically interact with each other in creative activities by individuals and groups. Therefore knowledge will hardly be entirely of one type or another (Schulze and Hoegl, 2008).

3.3 Knowledge transfer during succession

Firms need to transfer and acquire new knowledge as they seek to innovate and enhance performance (e.g., Nonaka et al., 2000; Nonaka and Von Krogh, 2009). In SFF it is very important how and in which way predecessors/founders transfer their tacit knowledge to successors thus enabling successor to get »hands-on« knowledge about the SFF and the industry.

According to Nonaka (1994, 22) the enhancement of individual tacit knowledge subjected to a continuous interplay with the evolution of relevant aspects of explicit knowledge raise the total quality of an individual's knowledge. Therefore, the quality of successor's knowledge and capability to innovate depends on the possibility to enhance tacit knowledge by diverse high quality experiences and combined it with different explicit knowledge. Successors should acquire knowledge within and outside the SFF and actively participate in a wide range of business and management activities within and outside the SFF (Duh, 2014).

Early exposure to a business is a critical period for forming successor's impressions of the family business (e.g., a sense of the quality life the family business provides; the business's impact on the parents' marriage and family relationships) and lesson which are learned intentionally or unintentionally during that period will not be easily changed later and will importantly impact the family business's continuity in the future (Gersick *et al.*, 1997).

When the next generation enters the business, successors should become familiar with the culture, values, mission and philosophy of the firm (e.g., Mazzola *et al.*, 2008). They should also learn about other aspects of the business (e.g., products and/or services, productions processes, technology, suppliers, customers) and acquire knowledge or "recipes" about the firm's industry and management skills (e.g., Cabrera-Suárez *et al.*, 2001; Duh and Belak, 2008; Mazzola *et al.*, 2008).

Tacit knowledge can be transferred to the next generation in the form of apprenticeship (Chirico, 2008) or by mentoring, which is an effective way of transferring critical skills from a founder to a successor. According to Nonaka (1994) it can be passed as well through a process of "learning-by-doing". Practical training courses within the family business also allow individuals to acquire, share and transfer knowledge across generations (Chirico, 2008). As well, family meetings (e.g., in the form of a family council) are an excellent opportunity for successor's to learn about the rights and responsibilities that come with ownership (Gersick *et al.*, 1997). Involvement of successors in decision-making process and strategic planning process enables them to learn how to make strategy (Mazzola *et al.*, 2008). The main advantage of such involvement is a "progressive transfer of tacit knowledge" (Cabrera-Suárez *et al.*, 2001), both at the firm's level as well as the individual level. Team work is another important

way of passing knowledge to the next generation since it expands the previous boundaries of the knowledge of the individuals (Nonaka and von Krogh, 2009).

The knowledge transfer activities discussed are important for the development of successors managerial carrier (e.g., Ganzaroli *et al.*, 2006) and enlarge domain relevant skills and creativity relevant skills as well as enhance intrinsic task motivation of successors (Litz and Kleysen, 2001), thereby positively influencing successors' creativity. However, acquired knowledge may make successors "... more productive within the firm but not necessarily outside the context of that business" (Sardeshmukh and Corbett, 2011, p. 113). So it could be dangerous if the successor preparation and development to take over the leadership role relies only on internal tacit and explicit knowledge. Nowadays rapid changes in a firm's global and complex environment require from succeeding generations to be up-to-date with recent technological, product, market and industry developments in order to contribute to the dynamic nature of their family businesses. Research findings suggest that more innovative R&D projects draw on greater amounts of external information (Turner and Makhija, 2006 and there cited references) and high-impact innovations are made by people who based research on scientific knowledge (for references see Amar and Juneja, 2008). When conceptualizing and developing new product, the project team can create valuable new knowledge by exploring and synthesizing of diverse existing explicit knowledge within and outside the firm (Schulze and Hoegl, 2006).

Therefore, several authors (e.g., Cabrera-Suárez *et al.*, 2001; Chirico, 2008; Duh, 2014) emphasized the importance of academic courses and practical training outside the family business in schools, universities, firms, institutions, which enables successors' to add new knowledge and offer new perspectives for the sustainability of the SFF. Successors' experiences gained by working outside the family firm are found to be of great importance in developing specific abilities, getting different view of the business and how to do business (e.g., Cabrera-Suárez *et al.*, 2001; Chirico, 2008; Le Breton-Miller *et al.*, 2004; Ward, 1987). Such experiences are of special importance since they offer exposure to new ideas and perspectives (Sardeshmukh and Corbett, 2011) and provide "... access to new bodies of knowledge that are relevant for the future development of firm's innovation capacity" (Ganzaroli *et al.*, 2006, p. 14).

4 Method

4.1 Case study approach

In our research we adopted a qualitative research approach, which we found as a suitable research approach due to the nature of research questions and the field development level on the topic researched. We used a case study research methodology (e.g., Yin, 2003), which has been widely accepted in family business research (e.g., Chirico, 2008). A multiple-case study approach was applied since multiple cases “... permit replication logic where each case is viewed as an independent experiment that either confirms or does not the theoretical background and the new emerging insights” (Chirico, 2008, p. 435). Although there is no general agreement on the ideal number of cases, Eisenhardt (1989) suggests that between four and ten cases is best in order to increase rigor. We selected ten cases from the database which authors of the paper have been creating for many years. Case studies' analysis was used to identify themes emerging from the data in relation to succession, knowledge transfer and innovativeness of successors in SFF.

4.2 Sampling strategies and data collection

We selected ten cases of family firms in the size class of micro, small and medium-sized family firms (from 0 to 249 employees). Namely, not only small and medium-sized firms but as well as many micro firms face the problem of transferring ownership and management to the next generation. Limitation for the sample was that founder of the firm is employed in a firm, still owns a firm or is active in the firm, although retired, and that next generation is involved in a firm. For the purpose of our research we defined a family firm as the one in which a founder (i.e., an owner/manager) considers the business as a family one (e.g., Chua *et al.*, 1999; Sharma *et al.*, 2003). Research was geographically limited to Slovenia.

The authors conducted personal interviews with a founder and a successor since they are very well qualified to provide information and insights as well as there might be significant differences in perceptions between founders and successors (e.g., Zahra and Sharma, 2004). Interviews took place at premises of a company during the working days. We built ten extensive case studies and interviews of two respondents from each firm. When analyzing cases we were guided by a theoretical framework created from

existing literature. Interpretation and propositions were refined in several iterations before finalizing them.

4.3 Findings with development of propositions

In this section we discuss findings and provide propositions for the future research arising from our case studies analysis. Our research is exploratory and thus seeks to stimulate further work focusing on innovativeness of the next generation and innovative performance of SFF (a case of Slovenia).

4.3.1 Innovativeness of SFF and their successors

Different authors define innovativeness/innovation ability as “skills and knowledge, needed for effective absorption and improvement of existing and creation of new technologies, products and processes” (Kim, 1997; Lall, 1992).

Our research revealed that although most founders report constant development of new products, services, and processes, in order to remain competitive in their industry, only four (40 %) have protected know-how, one of them (10 %) has registered six and one (10 %) eight patents on his name, two founders (20 %) report over five registered patents on the name of the company. One founder (10 %) has protected brand. Three successors (30 %) are developing new processes and services with their parent. Successors all (100 %) report constant development activities, seven (70 %) report up to ten own developments of new solutions, especially in IT, improvements of existing services and processes, simplifications, which lead to cost reduction. They are less involved into development of new products. This is result of their non-technical formal education (only one successor, 10 %, has technical background). In the recent five years eight (80 %) of the studied SFF have introduced more than 500 new products, services and processes. According to our observation successors are taking active role in introducing rationalization of processes, development of new solutions, leading to reduction of costs, they are taking lead in innovation activities of SFF – they are self-confident, open, and creative, have the necessary energetic charge, thus confirming Litz and Kleysen (2001) and Salvato (2004).

4.3.2. Knowledge transfer

Knowledge transfers in SFF origins from two main sources and according to our opinion, both are very important for successors' innovativeness:

- from the founders, who expose their children/successors early to the family business environment, who mentor their children, supervise their apprenticeship in SFF, involve them in planning and decision-making processes, and
- from the outside, from external environment of the SFF: when successors study and get formal education, when they look for external working experiences before they formally enter the SFF, when they attend external training programs at universities or other institutions, or when these institutions provide training programs for them and other workers in SFF environment.

4.3.2.1 Founder related knowledge transfer

In our research we explored different methods of tacit knowledge transfer (experiential and routine knowledge) from founders to successors of SFF.

Many authors (e.g., Cabrera-Suárez *et al.*, 2001; Gersick *et al.*, 1997) suggest that early exposure to a family business through summer and lower category jobs are valuable experiences for successors since they acquire in this way tacit knowledge, which is usually linked to a founder and therefore of particular importance during the transfer from the founding to the second generation (e.g., Cabrera-Suárez *et al.*, 2001). The successor can also absorb tacit knowledge about the business at home (Gersick *et al.*, 1997, 71) and maintaining creative families' environments are prerequisite for creativity and innovation in businesses (e.g., Litz and Kleysen, 2001; Zenko and Mulej, 2011).

The findings of our research show that majority (seven, 70 %) of successors found early exposure and involvement into SFF as an important way of acquiring founder's tacit knowledge. Most of them (nine, 90 %) were exposed early, already as small children, to the family business environment. Successors who have been early exposed to the family business, have mostly done simple work on the week-ends (e.g., folding paper in the office, sweeping parents' office or a workshop with a broom); they were around, when their parents were discussing business with their workers or even business partners, they were observing, listening and were involved in discussions at the family dinners or at Saturday breakfasts, tackling the business issues; some were accompanying parent at the business travel, listening to parent's explanations why and how he/she did something;

most of them have worked summer-jobs since they were in the primary school, age of 12 and up. The only successor who has not been exposed and involved in the SFF as a child is a son-in-law of the founder.

Another important way of knowledge transfer is by mentoring and supervising relationships with family business leaders since they believe that the close interactions between them and their successor is a superior form of experience supporting development of tacit knowledge by successors (e.g. Cabrera-Suárez *et al.*, 2001; Chirico, 2008). Mentoring is an effective way of transferring critical technical and managerial skills, knowledge on managerial systems (especially of informal ones) as well as norms of behavior and firm's values (Swap *et al.*, 2001). There is no common agreement on whether the parents are the most suitable mentors (e.g. Gersick *et al.*, 1997). Some authors argue that parents are not the best mentors since they find it very difficult to give honest feedback to their children (e.g., Gersick *et al.*, 1997) and suggest to include non-family mentors (e.g., a trusted non-family senior manager) who can provide the potential successors with knowledge on how to run the business (e.g., Ward, 1987). Research carried out by Boyd *et al.* (1999) showed strong presence of informal mentoring by a family member. Even though this kind of mentoring have numerous strengths (e.g., flexibility; unforced, unstructured, and opening-up communication; establishing caring relationship), the weaknesses should be considered such as the absence of objectives or an agenda, the presence of emotion (e.g., potential for bias, personality conflicts, unrealistic expectations) and lack of feedback or review. Therefore, it is recommended to incorporate positive aspects of formal mentoring such as "... goal setting and review, recognition of milestone events, and a time line on the relationship" (Boyd *et al.*, 1999, 307).

Our analysis revealed that all ten (100 %) successors found mentoring as an important way of assimilating critical knowledge and skills (technical and managerial), mostly informal knowledge about management, norms of behavior, and SFF values. Nine (90 %) of successors were informally mentored by their parent, minority were formally mentored by a non-family member. Mentoring their children in an informal way means there were no plans, no programs have been worked out in advance. Often founders defined a problem and then jointly developed possible solutions with their children; often they told them how something has to be or has to be done, so their children developed their own living concept and gained experience; some have simply tried to motivate their children to do certain work in a best way. As well technical knowledge, "hidden recipes", tricks were

more likely subject of transferring knowledge by learning-by-doing, a kind of internal training, then mentoring. Mentoring has been more transferring knowledge about management and managerial practices. Early insight into family business has enabled most of the successors (90 %) to grow with the firm.

As one of the founders said: “.... *my daughter is not a technical type, and I can't transfer my technical know-how to her; but she, being a ski and board teacher, perfectly understands how the products should work for the benefit of the customer. Thus she enables feed-back I need to improve development of the final products....*”, and more: “... *having pedagogic and entrepreneurial education she understands easily the managerial issues of the family business and I am preparing her for the role of a manager, while technical know-how and support will have to be provided by a non-family member in the future.*”

The research has revealed that mentoring by a parent/founder contributes to emotional interactions between him/her and the successor; often parents understand successors' standpoints very personally, as an objection and successors have to remind their parents to treat them as responsible adults, not as children anymore.

Another way of transferring knowledge across generations is in the form of apprenticeship (Chirico, 2008), which can constitute excellent training especially in traditional industries that do not operate in environments of rapid change. However, such type of training is insufficient, when markets change quickly (Le Breton-Miller *et al.*, 2004).

The findings of our research reveal that most (eight, 80 %) of successors went through the apprenticeship in their SFF and four (40 %) of them stressed that apprenticeship with observing, imitating and practicing represents an excellent method of transferring founder's tacit knowledge and their training.

“My father has often said, that he rather sees me learning from his mistakes, not from my own ones, knowing it would be better that I learn from my own mistakes. As if he wanted to save the pain and time. And although he has not shown specific technical design, at the age of five, I assembled alone my first car-battery as a result of observing him at work. Later on he has always asked me to think with my own head and to apply in practice what I studied at the faculty. He has never specially praised me for my achievements, and he has always found something, so he could comment that I could still do better. So, practice, practice, practice....” one of the successors revealed in the

interview. Successors have the opportunity to learn directly from founders in a “learning-by-doing process” how to run the family firm, and all the ‘tricks of trade’ related to the business (Chirico, 2008). The findings showed that learning-by-doing, according to all ten (100 %) successors' high agreement, enables them indirect access to founder's knowledge about technical solutions, managing the family business and business tricks. Seven (70 %) of successors could learn about their family business directly from their parents.

Successor should also be involved in meetings and communication with business partners since this way the tacit knowledge of customers and suppliers can be acquired (e.g., Becerra-Fernandez and Sabherwal, 2001; Nonaka *et al.*, 1994) and incorporated into new concepts, technologies, products or systems (Nonaka *et al.*, 2006). Nine (90 %) of successors said that they have accompanied their parent at the meetings with business partners, so they could listen and observe how the deals have been negotiated. This enabled them insights in and information about the business, they could not find in the books; early established personal contacts with business partners contributed to development of trust into them. This is an important factor for the future development of the SFF. One (10 %) of the successors has been taken to the meetings with partners already as a child, but could negotiate the first deal only at the age of 26, while the others (eight, 80 %) have been involved into meetings first as observers, later as active participants. Mostly successors had to show serious interest for their career in the family firm before they could participate actively in the meetings and this coincided with their study time and before they formally entered the family firm.

In terms of successor's skills requirements, the decision-making ability is ranked as the most important besides successor's commitment to the business and interpersonal skills (Motwani *et al.*, 2006). Therefore, it is of crucial importance that preceding generation allows succeeding generation to actively participate in decision-making, where both generations should have opportunity to offer suggestions for improving processes and to learn from the other (e.g., Kellermanns and Eddleston, 2004). Mazzola *et al.*'s (2008) findings on the role of strategic planning in the strategic decision-making process revealed that the involvement of the next generation family members in the strategic planning benefits their developmental process. Such involvement enables the creation of shared vision, provides the next generation with important tacit business knowledge and skills as well as contributes to building credibility and legitimacy for the next generation.

Regarding strategic planning and decision-making processes situation is different in explored SFF. Eight (80 %) of successors reported that they have started to participate in the strategic planning and decision-making processes since they were employed in the family firm, which coincides with the finding, that they did not participate actively in meetings with business partners, before they showed serious interest for the SFF. One (10 %) has not been involved as he is still a student and one (10 %), being son in law of the founder, has started to participate in strategic planning and decision-making processes only when he became a director of the SFF. The only exception, where they mostly get involved earlier is the challenge of succession.

Case analysis revealed that majority (seven, 70 %) of successors highly agree, while eight (80 %) of them were also included, that involvement in the planning processes, especially strategic planning, enables them to assimilate critical tacit (business) knowledge and skills, insight into industry development, improves successor's relationships within SFF and with business partners out of the SFF thus contributing to their innovativeness.

“We have daily meetings. Problems are promptly addressed and solved. When one of the children does not find a solution by him/herself, I get involved, in up to 80 % of all problems. Family life is pervaded with constant transfer of knowledge,” said one of the founders.

According to Shahid (2009) always bigger share of discoveries are result of team-multi-disciplinary cooperation, associating knowledge, functionality and insights of professionals from different fields. Team members articulate their own perspectives and reveal hidden tacit knowledge (Nonaka, 1994). Thus, team knowledge is viewed as an important source of innovation since the combination of team member's knowledge creates the new knowledge (Delgado-Verde et al., 2011). Team work is important for preparing a successor for a leadership role (e.g., Ganzaroli et al., 2006) and is essential for a family firm to be creative and innovative entity (e.g., Litz and Kleysen, 2001). Family members' specialized knowledge and its recombination in a team work enables the adaptation of a SFF to shifts in environmental conditions (Chirico and Salvato, 2008).

Majority of successors (eight, 80 %) agree on the importance of the team work for knowledge transfer and creation of new knowledge as a source of innovations. Eight (80 %) successors reported on working in teams as part of their training. Team work of family

members is often related to development of new projects, improvements of processes, products and services.

The founders are well aware how crucial it is to transfer their experience and knowledge to the younger generation in order to assure competitiveness and sustainability of a SFF. Mostly they share their knowledge and experience also with non-family members, but never tacit knowledge.

In the light of the above discussion the following proposition has been developed:

Proposition 1: Early exposure to a family firm (socialization of the successor), mentoring, apprenticeship, learning-by-doing, as well as successor's active involvement in decision-making, strategic planning and team work are effective ways of knowledge transfer from founders to the next generation, thus positively influencing innovativeness of the next generation in SFF.

4.3.2.2 Outside the SFF related knowledge transfer

Outside the SFF related knowledge transfer is very important since it enables successor to bring fresh insights into the firm, get new ideas and in combination with tacit (experiential) knowledge transferred from the founder and leads to new developments and improvements of products, services, processes in SFF.

The knowledge absorptive capacity of successors, which is needed for assimilation of knowledge during a succession process, depends as well on their previous academic and professional education (Szulanski, 1996) which teaches successors concepts and generic skills that can be applied to most business contexts. It also enables them to develop analytical skills and abilities that are crucial for decision making. During education process successors are also exposed to new ideas and trends in management and technology (Sardeshmukh and Corbett, 2011). Nowadays, formal education is getting more and more important since successors are selected also on the basis of their experiences and skills (e.g., Ganzaroli *et al.*, 2006; Cabrera-Suárez *et al.*, 2001; Steier, 2001). Successor's educational level should meet requirements needed to be an entrepreneur in a knowledge-based economy. It is no longer enough just to know how to perform a specific activity and/or function. Being competitive requires being able to create new knowledge.

Successors in our study are all very well educated, on average better than founders: one of successors has a technical university degree, one in economics, others graduated or

(three) still study entrepreneurship. In the eyes of successors, the most important significance is given to formal education's impact on development of technical knowledge and competences, followed by marketing, administrative knowledge and competences and attitude toward team working. The least impact is given to working commitment and motivating skills. Formal education is basis for formation of human capital. In teaching the accent should be given to skills like critical thinking, creativity, communication, user orientation and team work, using domain specific and language knowledge. Entrepreneurship studies cover all these. The research has revealed that formal education in the eyes of successors affects development of creativity, but not to the same extent as e.g., technical knowledge and competences.

All of the founders in our research believe that academic knowledge is important for competitiveness of the firm as it opens horizons, but they also believe that this knowledge should be combined with work experience of successors, their joy for work, feeling for trade. They believe that academic knowledge was not as important for their generation as it is for the generation of successors.

On the basis of above discussion we develop the following proposition:

Proposition 2: Formal education (e.g., entrepreneurship) is positively related to innovativeness of successors in SFF.

Previous working experience, especially from working outside the family firm gives the successors "a more detached perspective over how to run and how to introduce changes and innovation in the business" (e.g., Cabrera-Suárez *et al.*, 2001; Chirico, 2008, p. 447) and usually occurs before a successor enters a family business for full time. Having previous working experience in another firm a successor can integrate the knowledge transferred by the founder with the knowledge acquired during training process (e.g., Cabrera-Suárez *et al.*, 2001) and especially, in circumstances of fast changing markets is training in competing organizations or in firms that are leaders in a related industry of crucial importance (Le Breton-Miller *et al.*, 2004). Experiences gained outside the family firm enable successors to bring in a family business new knowledge on markets, technology and industry, and apply it effectively in the context of a family business (Sardeshmukh and Corbett, 2011). Such experiences play a crucial role in creativity and innovation processes (Litz and Kleysen, 2001) on the individual and firm level.

Findings of our research reveal that most of successors (seven, 70 %) have no previous working experience in other firms; only two (20 %) of the successors have previous working experience from the other firm in a different industry, and one (10 %) has worked before in two other firms, in a different and same industry. Two (20 %) successors also report internships in other firms in a different industry, as well in a different country. Lack of working experience in other, but family firms, is strongly connected with economic situation and lack of job opportunities in Slovenia.

According to opinion of seven (70 %) successors, the ones that have and the ones who have no previous working experience in other firms, working experiences from other firms can foster development of communications skills, of attitude toward negotiation and of marketing knowledge. They say as well, that according to their opinion, previous working experiences are not significant for development of the attitude toward risk or toward problem solving.

Zahra (2005) claimed that long tenure of predecessor negatively affects a family firm's emphasis on innovation and new market entry as well as lead to strategic simplicity. For this reason, many authors (e.g., Cabrera-Suárez *et al.*, 2001; Chirico, 2008; Duh, 2014) exposed the role of academic courses and training in schools, universities, and institutions, that allow successors to acquire new knowledge that is essential when a family business is active in markets which undergone fast changes (Chirico, 2008).

In our research most of the founders find external training programs very important for further development, increasing and upgrading of successors' potential for future management of the SFF. As most of successors (70 %) do not have previous working experience in other firms, it is crucial, that they have opportunity to absorb/adapt other up-to-date knowledge and skills enabling them competitive edge in the future operations of SFF. In some cases they invite external experts into their environment and enable "internally" training for all employees, not only for successors, but micro firms tend to send their employees to training programs outside the firm. Some examples of such training programs are: quality management, accounting and financial practices, insurance programs, ISO standards like ISO9001, preparation of applications for tenders, safety at work, rhetoric, marketing, foreign languages, working with customers etc.

A right mix of out- and inside training experience is fundamental to acquire technical and managerial knowledge of the business and leadership abilities (Cabrera-Suárez *et al.*, 2001). It plays a key role in creativity and innovation process (Litz and Kleysen, 2001).

The following proposition is derived upon above described findings:

Proposition 3: Previous working experiences outside a SFF and access to expert know-how through external training programs are positively related to innovativeness of successors in SFF.

5 Conclusions

Combination of different methods is a usual way of transferring knowledge to the generation of successors in SFF. Founders in our research believe that it is very good to let successors observe them at work, get involved in daily operations, into business meetings and negotiations with partners and to let them find solutions by themselves, to learn by problem solving, and also take responsibility for decisions. Studying and getting academic knowledge in combination with early socialization, as well as work experience in other firms is important for the development of successors, of firm's products, services and processes.

In the recent five years founders and their successors report intensive and constant development of new or of improved products, product models, services and processes. Thus they maintain and improve SFF's operations. This is a result of a strong and dynamic relationship between the parent/founder and successor, of a high level of confidence and successors' willingness to learn. Younger generation is sparkling with new ideas, which mostly result in introduction of improvements or new processes in a firm, many of them leading to rationalization of business processes.

We believe that our research findings contribute to broadening our understanding of family business succession from the knowledge transfer perspective as well as it opens some new research directions. The future research should address the ways of managing the early exposure of children to a business as a part of knowledge transfer process. It should address as well social networks, social capital. According to Steier (2001), innovation ability of firms is complemented by social capital, which is defined as a stock of resources and abilities in a network of relationships between firms and/or people. Social capital facilitates mobility of know-how and its sharing between firms and individuals. This contributes to promotion of innovation. It is extremely important that

SFF are well connected as this enables access to complementary resources of production, know-how. Another direction of future research can be corporate entrepreneurship, as innovativeness is connected with it. According to Kellermanns and Eddleston (2006) corporate entrepreneurship is of key importance for survival of SFF, their profitability and sustainable growth. The future research should address as well the question of founder's management style. A too strong involvement of the founder into operative decisions and family issues can decrease his/her readiness for risk-taking, and risk taking is related to innovativeness of a SFF (Sethi et al., 2001). According to Szulanski (1996) there might be some obstacles that hinder knowledge transfer from founders to the next generation in SFF, which affect innovativeness of the next generation, and that are: random ambiguity and unproven correctness, founder not interested to transfer knowledge, successor not motivated to accept knowledge, factors of circumstances, like limitations in organizations and bad relationship between predecessor and successor. These obstacles and how they affect innovativeness of the next generation in SFF can be another direction of the future research.

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Turning knowledge assets into innovative business processes: an empirical example in the asset management industry

Yasmina Khadir-Poggi * Mary Keating

School of Business
Trinity College Dublin
College Green, Dublin 2, Ireland

Stephen Chandler

International Business Department
Irish American University
2 Merrion Square, Dublin 2, Ireland

** Corresponding author*

Structured Abstract

Purpose – This paper introduces initial insights into how Mediolanum Asset Management Limited (MAML), an innovative and expanding Italian asset manager based in Ireland, relies on a knowledge-based organisational structure fostering innovation in order to generate a sustainable competitive advantage. Knowledge-based SMEs such as MAML face a recurring challenge in the highly competitive asset management industry: they rely heavily on their staff expertise in order to generate innovation while trying to downplay at the same time their dependency on their human assets. The company fosters innovation while resting on KM practices and IC to build a social and organisational capital.

Design/methodology/approach – Primary and secondary data are gathered from observation, documentation and semi-structured interviews and provide the material on which this study is based. Knowledge management and intellectual capital theoretical lenses are elicited for the critical analysis and interpretation of the results.

Originality/value – This paper based on empirical evidence demonstrates how intellectual capital stocks and knowledge management practices are actually approached and implemented in order to create value through innovation-led processes. To our knowledge, MAML constitutes a rare case of a SME in the asset management industry that is positively and consciously concerned with managing and capturing intellectual capital so thoroughly.

Practical implications – This paper provides interesting and valuable insights to other small asset managers on how they can employ intellectual capital and knowledge management practices as an alternative way to generate an innovation-led sustainable competitive advantage while reducing at the same time their dependence on human assets.

Keywords – Knowledge Management, Intellectual Capital, Innovation, Asset Management, Ireland

Paper type – Academic Research Paper

1 Introduction

The asset management industry has dramatically changed since the beginning of the millennium under the combined influence of a profound mutation of the prevailing business models and the consequences of the last financial crisis. The historical supply-led, product-push distribution model has been revealed as increasingly obsolete in the current environment. Understanding clients' needs and demonstrating a real capability in delivering value translates into a shift of power towards those nearest the client (Griffin et al. 2013; Rajan 2013). Asset managers are no longer in a stable and predictable business environment. In the aftermath of the financial crisis, they suddenly became part of an increasingly dynamic industry fraught with uncertainties and with a heavy and prolific regulation that stretches companies' resources further while adding complexity to operating models. Griffin et al. (2013) identified that asset managers are evolving towards a more focused and better-structured approach to their markets. They also stress that companies are better off moving away from fragmented or silo-based ways of working to make coordination, collaboration and effectiveness their new organisational philosophy. Furthermore, asset management firms need deeper skills and capabilities in order to develop relevant client-centric dialogues while at the same time simplifying and flattening their operating models.

One of the favoured avenues for creating a better fit between market requirements and company's resources and capabilities is to foster and nurture innovation. Innovation is viewed as an intellectual agility driven primarily by competition, an ability to use knowledge and skills, and an ability to build on prior knowledge and generate new knowledge (Roos et al. 1997). It is the implementation of both discoveries and inventions, and the process at the origins of new products, systems or processes (William 1999). Creating new ideas that add value for clients under a certain time frame in the same fashion as Apple, Johnson & Johnson or Toyota has gradually gained popularity among asset managers. Firms will generate a sustainable competitive advantage by implementing the four sequential activities of the innovation value chain that consist of idea generation, evaluation, design and delivery. Idea generation emerges from spotting gaps in the

product market; then the feasibility of a business case is studied; design consists in stress-testing the chosen solution and delivery involves convincing the client and making things happen (Rajan 2013). Scholars made a compelling argument in demonstrating the intrinsic dependence of innovation on intellectual capital (IC) stocks and, how knowledge management (KM) processes and practices support organisational innovativeness (Andreeva & Kianto 2011; Kianto et al. 2013; Santos & Wane 2013).

IC is understood as a collection of intangible assets and flows that contribute to the company's value creating process (Bontis et al. 1999). IC is traditionally understood as a combination of human assets, structural assets and relational assets. Stewart (1997) defines it broadly as a "package of useful knowledge" introducing as such the approach in terms of IC stocks. KM is a broad and multi-dimensional concept that covers most aspects of an organisation's activities. Whereas, knowledge encompasses data, information and tacit knowledge, KM can be seen as a management function that consists in creating or locating knowledge, in managing the flow of knowledge within the firm and in ensuring that knowledge is used efficiently and effectively for the long-term benefit of the organisation (Darroch & McNaughton 2002). It is understood in terms of processes or practices such as knowledge creation, acquirement, organisation, storage and distribution, and application between people, technique and technology (Bhatt 2001; Nonaka 1994). In other words, the overall objective of KM is to make a firm act as intelligently as possible in order to secure a sustainable competitive advantage, achieve organisational performance and optimize the use of its knowledge assets (Wiig 1999).

Within a background of both a rapidly changing asset management industry and a rising interest in the innovation potential of using a combination of IC and KM, Mediolanum Asset Management Limited (MAML), a Dublin-based asset manager, part of an Italian group, with circa €28 billion assets under management (AUM), is singled out as an organisational exemplar within a broader research project involving several firms. Led by Furio Pietribiasi, MAML demonstrates a clear focus for innovation, knowledge management practices and intellectual capital in order to create a sustainable competitive advantage and build social and organisational capital. And, this is clearly asserted in its strategic statement.

This paper aims at introducing initial insights into how MAML strives to design a knowledge-based organisational structure instilling an innovation-driven culture that is able to generate a sustainable competitive advantage within a highly competitive industry.

Exploring one case study can be seen as problematic if one looks for generalizations. However, this is not the purpose here. Following the example of Starbuck (1992), gaining exceptional business success does not rest on imitation of other firms and exploitation of shared properties and in our views, MAML fits the profile. In addition, the value creation process is firm and context-specific (Bollen 2005). Focusing only on one particular case is sometimes the best avenue to make a contribution to knowledge (Starbuck 1993). The first section reviews the relevant literature. The research design is then introduced followed by the initial results stemming from the study in a second section. A conclusive section discusses the findings. Finally, the limitations of the study and potential further research are suggested.

2 Relationships between intellectual capital stocks, knowledge management practices and innovation

The rationale for intellectual capital (IC) and knowledge management dates back to the 1980s where it became obvious that business differentiation and sustainable competitive advantage could not rest solely on tangible assets but more and more on developing unique resources, capabilities and endowments. Hence, the resource-based view of the firm introduces knowledge as a driver for the definition and implementation of a business strategy (Grant 1991; 1996). How the literature envisages the possible relationships between IC, KM practices and innovation is explored in the following paragraphs.

2.1 Intellectual capital and innovation

Bontis et al. (1999) defines IC as the collection of intangible resources and their flows. The former are under the control of the company and contribute the company's value creating process. Formatively, IC is divided three pillars: human capital, structural capital and customer capital. Human assets encompass individual tacit knowledge, intelligence, skills, expertise, learning, capability, changing, innovativeness, creativity (Bontis 1998; Lynn 1998), problem solving, leadership, entrepreneurial skills, and managerial skills (Roos et al. 1998). Brooking (1996) includes also competence, attitude, motivation, and leadership qualities of top management as well as intellectual agility, innovation and adaptation capabilities into these assets.

Lynn (1998) defines structural assets, the second pillar, as organisational routines consisting of systems that organise the intellectual efforts in order to generate more routine, a supportive culture, information systems, efficiency, and procedural innovativeness. They are the mechanisms, structures and systems that turn individual assets into group assets (Bollen 2005). They also comprise infrastructural assets such as corporate culture (Roos et al. 1998), internal structures such as management and legal structure (Edvinsson & Malone 1997), proprietary software, networks, corporate culture and policies (Bontis 1998), relationships with external organisations and, structural capital renewal development (Brooking 1996).

The third pillar, relational capital, supports the organisation's market orientation and relations with other organisations (Bontis 1998; Lynn 1998). Edvinsson & Malone (1997) depict the idea of external structure of the company versus the internal structure that is market assets such as brands, customers, repeating business, licences and, franchises (Roos et al. 1998).

Intellectual Property Rights (IPRs) are legal mechanisms aiming at protecting corporate assets and infrastructure assets (Brooking 1996). They are the most tangible element of IC and the one most widely embraced by management and shareholders (Bollen 2005). This creates an issue when determining which category they belong to. Consequently, Bontis (1998) suggests supplementary family of assets that constitutes a fourth pillar of IC. Brooking (1996) considers IRPs as part of the structural assets groups while Roos et al. (1998) assign them as relational assets. This issue is of importance as following Edvinsson & Malone (1997), IPRs would rest whether in realm of the firm and strengthen its position vis-à-vis human assets or on the contrary, shift towards human capital.

Bollen (2005) establishes a clear connection between IPRs and company's performances in the pharmaceutical industry. He outlines that a comprehensive understanding of IC including IPRs impacts positively on company's performance. In his views, IPRs constitute a kind of "interface" between human capital, structural capital and relational capital.

While human capital is best approached as human-centred assets that cannot be owned by the company, structural capital refers to organisation-centred assets supporting employee's productivity which are left behind when the employees go home (Edvinsson and Malone 1997). In turn, we can suggest that relational assets may be viewed as a

shared attribute of the human and structural capital. Resting on firm-specific structural capital, employees are usually ensuring the relationships with clients and carry company's culture with them. Furthermore, the existing dichotomy between human, structural and relational assets should not be so strict in our view. It can be argued that corporate culture for instance is a determinant for stirring innovative capabilities, creativity or a positive attitude to work. In the same manner, it influences the customer relationships. Table 1 offers a general view of different elements of IC. Consistent with a view following which a classification of IC elements pertains more to general guidelines rather than a strict compartmentalisation that could be counterproductive within the rationale of intangible assets, the elements of IC in Italics in Table 1 refer to the elements that are viewed as overlapping.

Table 1. Elements of Intellectual Capital

<i>Human capital</i>	<i>Structural capital</i>	<i>Relational capital</i>
<ul style="list-style-type: none"> • Individual tacit knowledge • Intelligence • Skills • Expertise • Learning capability • Competence • Leadership capability of top management • Intellectual agility • Adaptation capability 	<ul style="list-style-type: none"> • Organisational routines • Risk assessment methods • Information database • Communication systems • Management • Legal structure • Manual systems • Attitude • R&D • Proprietary software • Networks • New plants and new products 	<ul style="list-style-type: none"> • Knowledge of marketing channels • Relations with other organisations • Brands • Repeat business • Organisation's image and reputation
<ul style="list-style-type: none"> • <i>Innovativeness</i> • <i>Creativity</i> • <i>Attitude</i> • <i>Motivation</i> 	<ul style="list-style-type: none"> • <i>Corporate culture, values and policies</i> • <i>Relationships with external organisations</i> 	<ul style="list-style-type: none"> • <i>Customer relationships</i>
	<i>IPRs</i>	
	<ul style="list-style-type: none"> • Brands, licences, franchises, know-how, trade secrets, copyrights, patents, trade, service marks 	

2.2 KM practices and innovation

KM is best understood as the principles, models, approaches, techniques and tools aimed at developing and using organisation knowledge in order to deliver organisation performance (Carlucci & Schiuma, 2006). Knowledge-based processes are typically composed of four elements: knowledge creation, intra-firm knowledge sharing, external

knowledge acquisition and knowledge repository (Davenport & Prusak 1998; Andreeva & Kianto 2011). KM is posited as the fundamental prerequisite for innovation (Nonaka & Takeuchi 1995) with Santos & Wane (2013) demonstrating a positive relationship between the four steps of the knowledge cycle and innovation performance. However, knowledge creation is paramount and mediates the three other steps (Andreeva & Kianto 2011). Knowledge creation depicts the firm's ability to generate novel and useful ideas and solutions in terms of products, technological processes or managerial practices (Nonaka 1991; Un & Cuervo-Cazurra 2004 in Andreeva & Kianto 2011). Darroch & McNaughton (2002) provides empirical evidence of the existing relationship between types of innovation and knowledge management practices. Six managerial implications that positively affect innovation are identified: *"being sensitive to information about changes in the marketplace, having a science and technology human capital profile, working in partnership with international customer, using technology, and being flexible and opportunistic"* (Darroch & McNaughton 2002 p. 219). KM is viewed as the perfect medium for the networked, interactive and knowledge-driven nature of the innovation process. It is itself an outstanding example of what is referred to as interactive innovation, a practice that is knowledge-based and team-based that is dependent on the collaboration of a wide variety of groups (Scarbrough 2003).

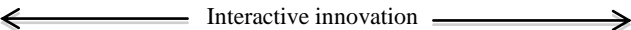
Leadership is an important element in choosing an implement KM practices in a knowledge-based innovative organisation. By instilling a supportive culture, leaders may influence innovation of both teams and individuals. Leaders stimulate innovation by influencing creative self-efficacy and by introducing a framework conducive to team reflection processes (Denti & Hemlin 2012); creating the environment and decision-making capability within which knowledge is generated and implemented (Noruzi *et al.*, 2013). They stimulate a shared vision of knowledge and emphasise its importance (Nonaka 1994). Organisational culture influences the behaviours central to knowledge creation, sharing and usage. Culture shapes the connection between employees and organisational knowledge, hence creating the environment for social interactions and shaping the processes by which knowledge is managed (De Long and Fahey 2000). Top management is then a catalyst, an architect and protector of knowledge, considering the personnel in its entirety rather than through the intermediary of management (Hedlung 1994). Furthermore, the choice of flatter organisations favours collaboration, adaptability and lateral communication. Flexibility and opportunism are two other organisational

attributes to consider as they foster particularly incremental innovation (Darroch & McNaughton, 2002). Transformational leadership or inspirational leadership are phrases that better reflect leadership as a KM practice as it inspires employees through constant motivation, intellectual stimulation, charismatic speech and being an exemplar.

On a continual basis and through heuristics organisational learning and performance as they encompass any process, KM mechanisms participate in enhancing the practice of creating, acquiring, capturing, sharing and using knowledge wherever it resides (Scarbrough et al. 1999). It facilitates strategic renewal (Crossan et al. 1999). In turn, information technologies create an infrastructure and environment that support knowledge processes and ensure that individuals play an active part in knowledge management processes (Dalkir 2005). KM reinforces its underlying dynamics, scope and overall synergy (Alavi & Leidner 2001). It supports working in teams and seeking out knowledge (Lee & Choi 2003). However, empirical evidence shows that the quality of information actually overrides the importance of IT investments (Andreou & Boone 2002).

Finally, Scarbrough (2003) makes a compelling case for the role of human resources management (HRM) activities in organising the flow of people (selection methods, compensation strategies and career systems) for the development of innovations. More specifically, HRM is of a particular concern for innovation-driven firms. Knowledge resides in individuals; hence knowledge needs must be properly managed. In order to strengthen their IC, firms should design HR architectures that fosters knowledge acquisition, knowledge sharing and knowledge application (Intan-Soraya & Chew 2010).

Table 2 – Sample of knowledge management practices leading to innovation

KM processes	KM practices	Innovation dynamics
<ul style="list-style-type: none"> • Knowledge creation dynamic • Intra-firm knowledge-sharing orientation • External knowledge acquisition capabilities • Useful and usable knowledge repositories 	<ul style="list-style-type: none"> • Transformational leadership • Supportive corporate culture • Network-based structure and infrastructure • KM-driven HR architectures • <i>Ad hoc</i> organisation structures • ICT and science friendly structure and infrastructure • Etc. 	<ul style="list-style-type: none"> • Incremental innovation • Radical innovation • Intellectual property portfolio
		

The literature overall establishes clear relationships between IC, KM and innovation. Kianto et al. (2013) explore the potentials that accrue from a holistic understanding of IC and KM and identify seven groups of KM practices: strategic KM practices, organisational structural arrangements, KM-friendly organisational culture, ICT practices, learning mechanisms, KM-related HRM practices, knowledge protection practices. Intan-Soraya & Chew (2010) suggest a framework capturing the ways in which an organisation's knowledge management capacities have a positive relationship on its IC, which in turn has a positive influence on its innovative capabilities. Fig. 1 suggests a representation of a holistic view of KM, IC and innovation, which is the one that is retained for this study.

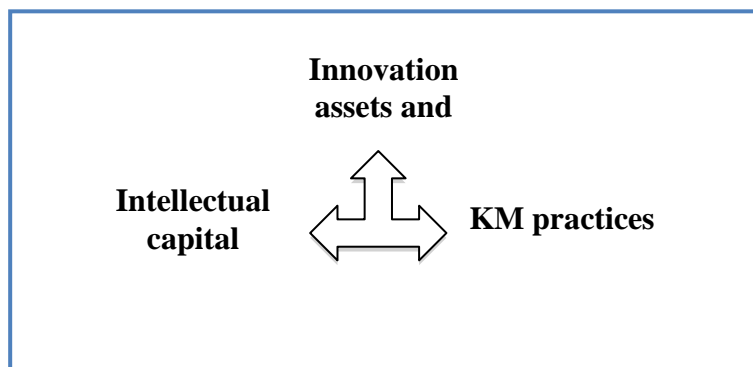


Fig. 1. The relationship between KM, IC and innovation

3 Mediolanum Asset Management Limited: KM practices, IC and innovation

An exploratory strategy of inquiry is implemented drawing on multiple sources of evidence inclusive of observation, documentation and semi-structured interviews. Documentation includes company documents and electronic data. Fourteen executives of the company identified as decision-makers were interviewed at the Dublin-based premises of the MAML. This process allowed a certain degree of observation, in particular on the layout of the working stations and the culture of the company. The KM and IC theoretical lenses are elicited for analysis and interpretation while considering at the same time how the firm is interacting with its business environment. At the end of the inquiry process, clear concerns are identified and constitute at the same time the drivers

and the framework of the innovation dynamic. The data collected was analysed using Dedoose.

MAML is one of the asset management companies of Mediolanum Banking Group, an Italian financial market leader based in Milan and founded in 1982 by Ennio Doris. It provides portfolio management, cash management and investment advisory services. MAML is characterised by a client-centric approach and targets principally a retail market. The Dublin-based asset manager works very closely with Mediolanum International Funds Ltd (MIFL), which has a proprietary product development process (MedInSynC®), leveraging on open innovation, and develops and markets mutual funds through its distributors to a very broad network of clients primarily located in Italy, Germany and Spain. Consistent with the current business and economic environment requirement, MAML addresses several challenges with a view of maintaining and developing its sustainable competitive advantage through innovation. It strives to (1) identify clearly how it creates value and convince its clients that Alpha (i.e. active return of an investment) does not rest on luck or minor accidents; (2) align its business operations and ethos with the industry requirements and the emerging business model while (3) develop business agility; (4) build organisational skills and capabilities. (5) Systemic tensions such as reducing firm dependency on its human assets or determining plans that are too ambitious are other challenges the firm must address. While the previous points are more concerned with process innovation, the last point (6) is about product innovation. The following section introduces the initial results of the data analysis. Using IC and KM practices lenses, document analysis as well as coding, axial coding and selective coding techniques were applied. For the purpose of clarity, the IC and KM-related results are shown consecutively. However, the separation is only theoretical as in practice, IC, KM and innovation in MAML constitute a sole entity.

3.1 The IC view: a process-driven innovation in the first place

When considering the three foundational pillars of IC, MAML favours with no doubt structural assets. For this case study, IPRs fit then naturally within these structural assets. Prior developing further the three elements of IC, Fig. 2 describes the approach MAML has on its entire capital. It reflects clearly the emphasis on structural capital that is echoed by our findings.

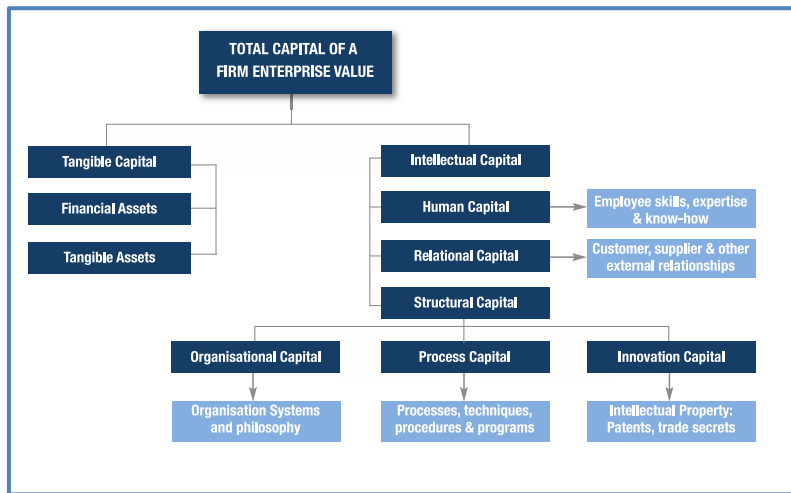


Fig. 2. Mediolanum’s view of corporate tangible and intangible capital

(1) Structural assets

Structural assets are identified as the backbone of MAML’s success and instil an innovation-driven culture and performance. Basically, they encompass a solid portfolio of IPRs that protects unique processes in terms of investment, product development, R&D and risk assessment. MAML refers to the previous as “innovation capital”. It also overlaps with “Process capital” mentioned in Fig. 2 and outlines the reliance on clear processes, techniques and procedures that are developed in the following section. These items are the core value-adding centres that have been identified by the firm, conceptualised and protected. In particular, Med3® encapsulate MAML’s investment process and captures the know-how and IC accumulated over the years. It is constantly refined and amended by reviewing each active investment choice pay-out to improve decision making (“Hit Ratio”) aiming at better future outcomes. Also this process leverages on global intelligence and delineates different identified steps to translate into investment decisions the opportunities and risks arising from financial markets (see appendix). These processes constitute strong points of reference for company’s and Group’s stakeholders, foster a strong corporate culture, organisational routines and participate in communicating the company’s strategic vision. Those processes are designed with a view to generate innovation.

A network-based philosophy is central to internal and external organisational structure and infrastructure. Focusing primarily on value-adding activities, the philosophy strives to

outsource other functions to selected external partners with whom they build long-term relationships, i.e. other companies, universities, research centres or governmental bodies. MAML refers to this as ‘Global Intelligence’. In MAML’s view, this pertains to relational capital and outlines the endeavours to ‘collaborate with partners’ rather than ‘work with suppliers’. Internally, a so-called flat organisational structure is observed together with an open-plan layout office where the desks are not attributed following the ranks (only two individuals have closed offices as they handle confidential matters). This facilitates lateral communication, learning, knowledge sharing and collaboration between all staff. This pertains to the ‘organisation capital’ section of the company’s structural assets.

Supporting IPR and the network-based ethos, information technologies are another strong structural asset on which company’s organisational performance rests. Within budget constraints and a prioritization agenda, it strives to implement the most updated systems that are deemed relevant. Substantial investments are made into information systems, equipment and software with a view to alleviating staff workload, gaining flexibility and speed and enhancing risk assessment. This infrastructure is also key in easing knowledge flows. Proprietary systems are developed in-house such as their Data Warehouse (Big Data platform), a Virtual Library with its collaboration tool MedCred® or, its Knowledge-Network Platform (KNP). The KNP is an idea management tool involving local and Group stakeholders and guaranteeing maximum transparency and collaboration among the different stakeholders that often inadvertently work in silos when it comes to managing their relationships even if they are all dealing with the same provider.

(2) Relational assets

Relational assets are strongly embedded in the client-centric culture of the company. Consistent with their value-centred outsourcing model, final investors’ relationships are primarily in the hands of MIFL distributors and their network of ‘family bankers’ in Italy, Spain and Germany. Those ones are professional ‘Financial Advisors’. Following the model and spirit instilled by the original founder, Family Bankers possess a very deep knowledge of the local market and their clients’ needs; but they also demonstrate a certain level of expertise in the product itself that bring them closer to asset managers *per se*. A very close relationship exists between the asset management unit based in Dublin and the distributors. Consistent with its technology-driven and client-centric philosophy, MAML has bespoke services (Connect and Learn® and MedRadar®) to provide to MIFL

distributors' final investors regular training on investment strategies, product investment updates, etc., in the Dublin offices or through video-conferencing. They also provide insights to the Irish-based teams about their experience. All sessions are video-recorded and made available to the staff and distributors via the Virtual Library.

(3) Human capital

In terms of human capital, the leadership capabilities of the top management are a very strong asset. This represents a good example of transformational leadership with the individuals in charge constantly stimulating and sharing the company's vision, instilling a supportive innovation-driven culture, organising a framework favouring team reflection and nurturing a creative self-efficacy. The people interviewed that were not part of the top management had a positive reaction to leadership and a positive attitude towards providing inputs into the in-house processes under copyright.

MAML demonstrates also a strong emphasis on managing its employees and address the pertaining issues in terms of 'Human Capital Management' (HCM) and Talent Management instead of Human Resources Management (HRM). The company applies HCM practices and policies in order to increase its innovation capability. The senior management plays a central role in nurturing tacit knowledge which is understood as *"personal, context specific and hard to formalise; (...) it gets embedded into our corporate memory through collaboration and learning by doing"* (quote from 2013 Financial Statement).

The IC foci and design of MAML are geared towards open innovation that consists in tapping into and exploiting technological knowledge available outside the firm's area of expertise or R&D structure. It represents a solid competitive advantage accruing to companies that do not rely exclusively on in-house approaches to innovation (Whelan 2013). MAML refers to this in terms of 'crowdsourcing' that is a type of incremental innovation; it consists of the use of external resources in order to start or strengthen existing assets in a cost-effective manner.

3.2 The KM practices view: identified supporting knowledge management practices

We found overall that KM practices participate actively in strengthening MAML's IC. They act as bridge between IC and innovation and set the bases for a dynamic of knowledge creation. The coding and decoding process run during the qualitative analysis outlined in the following eight themes.

- (1) *Collaborative and knowledge sharing organisational platforms* based on networks and team-based work and this is constantly incentivised for example through MedCred®, a virtual rewarding in-house tool. This rests on an extensive internal network connects the different employees in the company and sets the foundations for learning and sharing knowledge. It fosters a positive attitude of individuals for sharing knowledge which reflects their intertwined relationship of dependence. External networks are also of importance and it is the vector that allows access to global intelligence. The latter referred also as crowdsourcing, is composed of external research companies, consultants, brokerage firms, etc, that provide complementary expertise.
- (2) *Organisational learning aimed at building the company's knowledge repository* at the centre of which the company's in-house processes play a major role. They generate an internal dynamic of incrementally building a knowledge base. Continuous learning and understanding is constantly emphasised and the staff show a positive attitude towards learning and sharing. The Virtual Library and the project around the development of the Knowledge Network Platform is set to contain also the tacit knowledge generated.
- (3) *Innovation is process-driven and stems from organisation learning*. It focuses on contemporary value-creating activities.
- (4) *Transformational leadership* is a strong quality of the top team which is in charge of creating the right environment for creativity, motivation and innovation. They actively encourage employees to stay close to the company and closely follow market developments as well as adopting any new information and technology innovation.
- (5) A strong *worker engagement and commitment* characterises the company. The employees mentioned on many occasion how much they learned and they were learning everyday and how they appreciated the challenges they had to face. The company was considered to be very supportive of them with its talent management programme.
- (6) MAML can be viewed as possessing the *organisational structure and infrastructure* that favours innovation. There are very few hierarchical level with people working in an open-plan structure and within teams.

- (7) MAML is considered as a *technology-intensive* firm by its drive to be a “high-tech” company, but also by the substantial investments made in updated IT and the training provided to the staff. It also strives for a paperless working environment.
- (8) The last important theme identified relates to the *portfolio of IPRs* the firm possesses and intends to develop.

Table 3 provides practical examples of knowledge management practices that relate to the eight themes.

Table 3. Identified knowledge management practices generating innovation

	Leading themes	Identified corresponding KM practices
1	Establishing a collaborative platform fostering knowledge-sharing	<ul style="list-style-type: none"> • Establishing external networks for open innovation • Outsourcing – focus on core activities • In-sourcing global intelligence / relationships with suppliers • Partnerships with Irish leading universities • Intra-group client-supplier relationships – client-centric culture at all levels • Teamwork
2	Organisation learning – fostering an incremental knowledge base	<ul style="list-style-type: none"> • Company culture for learning and sharing • Staff teaching to other staff on specific issues • Regular meetings for sharing topics chosen by the staff • Importance of attitude • Knowledge Network Platform project
3	Process-driven innovation and organisational learning	<ul style="list-style-type: none"> • Product development process • Investment process • R&D process • Other processes currently under development
4	Transformational leadership	<ul style="list-style-type: none"> • Physical office space shared by all staff levels • On-going communication • Collaboration incentivised by MedCredit • Constant sharing of insights • Innovation-driven attitude • Engagement based on freedom and responsibility/accountability
5	Worker engagement	<ul style="list-style-type: none"> • Corporate culture and working environment • Outsourcing repetitive and non-value adding tasks when possible • Requirement for regular contributions in the processes • Commitment partly driven by the in-house processes
6	Organisational structure and infrastructure	<ul style="list-style-type: none"> • Flat organisation • Open-plan offices • Prevailing teamwork culture • Use of collaborative technologies
7	Technology-intensity	<ul style="list-style-type: none"> • Substantial investment in up-to date equipment and

		technologies <ul style="list-style-type: none"> • Regularly upgrading with relevant information technologies • Striving for paperless environment • Keeping staff up-to-date in terms of training
8	Building an Intellectual Property portfolio	<ul style="list-style-type: none"> • MedInSync, Med3, MedLab, etc • Drive for protecting and patenting any new innovation

4 Discussion

The eight themes identified for MAML in the previous section demonstrate the existing interdependence between IC, KM and innovation (Fig. 2). The leading themes pertain to the different components of IC while pointing overwhelmingly to the structural assets and are backed by a whole set of knowledge management practices. A strong relationship exists then between innovation and KM (Darroch & McNaughton 2002). The IPRs that exists in this case in process innovation provide evidence of the outcome generated by a combination of IC and KM practices. This illustrates the idea of interactive innovation (Scarbrough 2003).

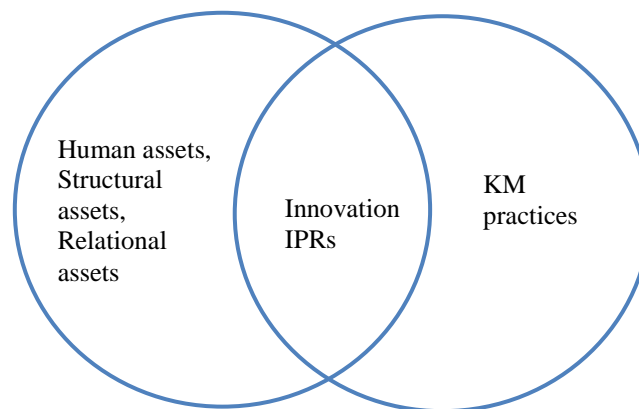


Fig. 3. The relationship between IC, innovation and KM practices

This study shows that the company demonstrates a conscientious and strong concern for knowledge management practices and IC. It positively addresses the issues and strives to identify and implement the right organisational structure and infrastructure that is a “flat” one in order to foster knowledge creation and sharing (Hedlung 1994; Noruzi et al. 2013). Such features are synonymous with hierarchical levels which are reduced to the

minimum and simplified internal communications. This is consistent with Andreeva & Kianto (2011) who put knowledge creation at the centre of the processes that drives knowledge sharing, acquisition and storage and, ultimately innovation.

MAML demonstrates its reliance on a strong transformational leadership that plays a key role in instilling the cultural and supportive environments that are innovation-friendly (Denti & Hemlin, 2012). This can be observed at the level of the Dublin-based business unit where “*Even when our Managing Director is in London, he is still here*” (employee’s quote). At the group level, the presence of the original founder who lives in Italy is also very perceptible as numerous examples of his actions were regularly mentioned. The business style and culture he adopted decades ago is still strongly imprinted in today’s company culture. Furthermore, an *ad hoc* understanding of HRM called HCM and Talent Management provides a compelling account of MAML’s investment in managing its human assets. The right HR architecture fosters knowledge acquisition (Intan-Soraya & Chew 2010) and participates in achieving the strategic objectives (Scarborough 2003).

Next, there is a strong emphasis on IT that is crucial in supporting the company’s knowledge processes and innovative intent (Dalkir 2005; Alavi & Leidner 2001; Lee & Choi 2003). The quality of information that constitutes one of the primary inputs shows also as a concern. Consistent with Andreou & Boone (2002), it overrides the knowledge creation process and, MAML’s investment decisions, for example, rest primarily on independent research companies.

In terms of addressing the challenges emerging from the asset management industry, MAML develops a clear market orientation that is relayed by technology and a strong historical client-centric culture allowing a good understanding of clients’ needs (Griffin et al. 2013; Rajan 2013) providing investment solutions and not products that leverage only on specific market opportunity (Alpha versus Beta). It perfectly illustrates the rationale for incremental innovation whose purpose is to meet immediate market needs. It accrues both to market-oriented firms that are sensitive to information about market changes and the ones that respond to knowledge about technology. MAML is also driven by radical innovation that manifests in the launch of new products or significant organisational changes. The latter type of innovation is said to preserve the future and, is an outcome for firms with a technological orientation (Darroch & McNaughton 2002).

MAML is well positioned to deal with its identified challenges mentioned at the beginning of the second section. (1) It has a clear view of its value-creating assets that are protected legally. (2) Its business operations are very much aligned with the industry requirements and it shows so far an adequate business model. (3) Its focus on IC and KM practices provides the company with agility and adaptability. (4) It is well equipped to build organisational skills and capabilities. (5) The strong process-driven rationale and the focus on relational capital on which the firm is firmly grounded provide some relief from its reliance on human assets. (6) Finally, product innovation is an outcome of process innovation that constitutes the backbone of MAML's business model and strategic intent. Meeting those six challenges enables the Dublin-based asset manager to address asset management industry competition that is briefly described in the introduction in terms of changing business model, market approach, hectic pace in regulatory changes, etc.

5 Conclusion

Consistent with the leading extant literature, the importance of intangible assets in achieving a sustainable competitive advantage is corroborated once again in this study. Moreover, this paper provides an interesting and in-depth illustration of IC and KM approaches within an original small asset management company - firms that are usually excluded from the realm of knowledge-intensive organisations in literature. MAML constitutes a unique organisational exemplar as it negotiated the worst of the financial crisis not only in terms of surviving it, but also in terms of thriving through product development accompanied with new investment solutions and the evolution of the existing ones. This has enabled MIFL and its distributors to grow in terms of AUM. Its innovation-driven culture implying a heavy reliance on its IC stocks and KM practices is at the core of MAML's organisational performance. The firm managed to build a strong knowledge-based business process that fosters innovation. Another interesting practical implication worthy of note is that this paper provides insights into how the human capital has been transformed into organizational capital, aiming at reducing the firm's dependence on the individual capital.

The results of this empirical study are limited from some aspects and first, by its reliance on a single case. The qualitative analysis and interpretative approach chosen here to make a contribution to research is highly subjective and reflects the authors' points of view. Then, the choice of the particular context offered by the Irish asset management

industry is not random as it is assumed to exacerbate companies' strategic actions in order to compete successfully. Further research should consider investigating more cases in an attempt to generalise results. A fruitful avenue would also emerge from a comparison with small asset managers' competitive moves in a more stable and bullish environment.

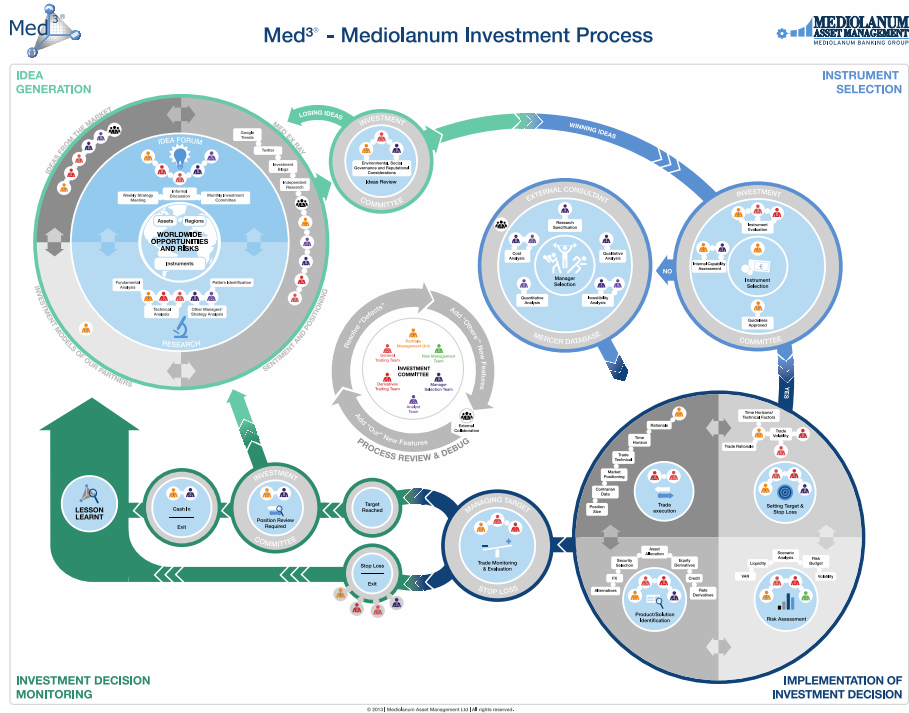
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Appendix – Med3 – Mediolanum investment process

Available at <http://www.maml.ie/med3-investment-process>



Using the knowledge to implement innovations versus changes of business models at SME

Jan Brzóska *

Institute of Management and Administration
Silesian University of Technology
Roosevelta St. 26-28, Zabrze 41-800, Poland

Structured Abstract

Purpose – The competitive edge is to great extent connected to the development and use of knowledge based economy (KBE), and in particular to innovation being the result of the knowledge. The aim of the paper was to present relationships between the selected knowledge components (relevant to innovation implementation) as well as between innovations and changes of business models. These relationships are shown both in terms of theoretical - cognitive and empirical aspect in the enterprises applying innovations. The research problem concerned the identification of business model elements changes caused by the implemented innovations.

Design/methodology/approach – Creating and implementing innovations in the enterprise is possible by the use of knowledge. The research hypothesis concerned the impact of innovation on the change of business models. The basic survey was carried out in the form of an enhanced diagnostic survey which attracted 150 intentionally selected Polish enterprises, belonging to SME sector. The structural analysis of the business model is based on the concept of "The new age of innovation." Prahalad C. K, M. S, Krishnan, by modifying it to the research needs.

Originality/value – This research focused on two important issues of the knowledge-based and innovation -based management. The first of these is the importance of particular elements of company knowledge (both knowledge about potential business and environment) for creating and deploying innovation. Another important issue of the research was to assess the changes in business models under the influence of implemented changes. The research results underline a significant importance of innovations (as an important element and stimulus of KBE) not only for a strategically management of enterprises, but also for the dynamics of their business models.

Practical implications – The outcomes of the application of the research show that companies have implemented various kinds of innovations. Presentation of the nature and relationship between knowledge components, innovation and modern business models represent an important knowledge and tips for both the entrepreneurs wanting to implement such innovations and for organizations that decide about financial support of innovation at SME. The results of the tests should contribute to understanding of the

importance of innovation related to gaining competitive edge and encourage companies to use modern business models that are able to create and implement innovations.

Keywords – Innovation, Knowledge Based Economy (KBE), business models, small and medium enterprises (SMEs)

Paper type – Practical Paper

1 Introduction

The growing competition and globalization have a substantial influence on changing strategic and operative action of the company. As a result, it is important to search new ways of reaching and keeping competition advance. The competitive advance is to a great extent connected with the development and use of Knowledge Based Economy (KBE). Modern and competitive enterprises are not only the part of KBE, but they also make use of its basic elements such as innovation system, Research and Development environment, business environment and ICT system. Nowadays the crucial factor and condition of competitiveness and efficiency of running a business is its ability to implement innovations. Such a capacity affects the changes of business models' conceptions and structures. However, these models enable the diffusion of various kinds of innovations. The research concerns the relations between knowledge components and innovations implemented based on them and the changes of business models. The research problem concerned the identification of business model elements changes caused by the implemented innovations. The following hypothesis was formulated, that the creation and absorption of innovations is accompanied by changes of business models in companies implementing such innovations. The following research questions were asked:

1. What are the most crucial components of knowledge used during implementation of innovations?
2. What are the most important changes in the business models caused by the implemented innovations?

The object of research was to show some changes of business models innovatively - run companies, called small and medium enterprises(SMEs).They implemented at least five various innovations in three recent years. The article presents the results of the research on changes in business models as far as the implementations of innovations are

concerned. The innovations mentioned above were conducted in carefully selected 150 Polish companies.

2 The increasing role of knowledge and innovation in business models

Gaining competitive advantage is to a large extent made possible by capacity and effectiveness of companies to use knowledge and implement innovations. These are both closed (internal) as well as open (external) innovations applied because of the transfer or diffusion of knowledge from the environment. The ability to create and absorb innovation is the biggest challenge for the company because of their complexity and risk, which often condition its existence and development. Innovations represent also one of the four, next to knowledge, trust and the business connected with the organizational culture, paradigms of "sustainable enterprises"[Grudzewski, Heduk, Sankowska, Wańtuchowicz,2010], Regardless what innovations will be applied by company they are always the result and element of the management of knowledge.[Stankiewicz, 2006; Dohn, and Gumiński and Matusek and Zoleński, 2013] Within the environment of enterprise operating on a competitive market, knowledge management is the most important method for its growth in the knowledge-based economy (KBE). It includes both the base elements, such as data and information, but also knowledge and wisdom creating innovations deciding about skills and competences to absorb innovations and their effective use. Although knowledge is a concept that is difficult to define (as evidenced by variety of its understanding in the content-related literature), as well as the lack of one, generally accepted definition, it is treated as a resource that has a particularly high importance for the company. This is due to the fact that the resources of tangible nature are relatively more available than ever and easier to imitate than knowledge resources. Creation and absorption of innovation is influenced by possession and use of appropriate knowledge base by an organization. It is considered as a unique and non-depleting resource. This last great feature means that the knowledge, not only is not consumed, but rather increases as it is used. Knowledge, after data and information, is another (third) level of hierarchy leading to the most precious result of knowledge management for organizations which is innovation

For the purposes of the research, results of which are presented herein, it is assumed based on the Oslo Manual, that „An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisation” [Oslo Manual , 2005].Innovations play a significant role in the

operation and development of companies, representing a factor conditioning their competitiveness. However, as A. Szmal[Szmal, 2013] noticed, creating competitive edge depends on the selection of the type of innovation and ability to transfer and diffuse it.

Innovations may take different forms in four dimensions of innovation space ("4P"): product, process (technological), standing (position) and paradigm innovations [Tidd ,and Bessant , 2011]. Differentiation of incremental innovations, improving, linearly affecting competitiveness and radical one of step-wise nature, creating new products and services, processes, business models and sources of competitive edge is important from the business model changes point of view. Innovations implemented by evolution are necessary in a company, but the value is created and competitive edge is won by radical innovations [Hamel ,2002]. Market transformation necessitates new look on current innovativeness paradigms, affecting the business model changes. The rooted propensity of a company to respond to existing needs of the best clients may hinder to see and use development opportunities on the markets of less demand or on peripheral markets of potential clients [Anthony and Johnson and Sinfield and Altman ,2008]

Noticing the real opportunities of break-through innovations may also be impeded by improper market segmentation. The concept of "tasks to do" assuming that clients do not buy products or service but rather "employ" them has better chances comparing to traditional segmentation. [Christensen, and Anthony, and ., Berstell, and , Nitterhouse,2007] An element that might affect company's innovations is taking decisions based on the most important competences. Lack of knowledge concerning the most important competences may lead to missing development opportunities appearing within the environment [Christensen, and Overdorf,2000]

New look at innovativeness processes require critical assessment of the applied operation schemes and changes towards the creation of an organization apt to create break-through innovations. Break-through innovations is the key to fill a gap to increase and constantly surprise the market. Restructuring towards innovative company covers creation of environment for innovations: change of business model and organizational structure in aid of innovation propitious for creation, implementation of new financing methods, partnership cooperation strategies or development of technological factors. It is also important to build innovative organizational culture and the change of current principles of human resources management. Important element favourable for open innovations is creative cooperation, common solution of problems by people of different

qualifications and experiences, which is a valuable component of assets of each team and the source of company competitiveness. Contacts and cooperation between economic companies is of increasing importance, including developing and using wider network of relationships that allow achieving creative synergy. Open innovations require creating of innovation networks based on variety of participants, including suppliers, partners, competitors, market regulators and other players [Chesbrough, 2003].

In the economic practice, creating and implementing innovations in the enterprise is linked to the relevant strategy and business model [Brzóška,2013]. Hence the business models problems, during the last decade, faced the increasing interest of both theoreticians and practitioners. In the literature both scientific and practical one can found the opinion, that there should be a common scientific base for a better and more efficient research of business models.[Zott, and , Amit, and Massa, 2010]At the moment, researchers of business models still have different approach to their definition and creation. Despite differences in concepts and approaches of different researchers to business model, you will find a number of common elements.

- Business models are a new way to analysis of the product, company, sector or enterprise networks. Their center is enterprise, but research limits go much further.
- Business models provide a holistic approach explaining the company functioning and its business concept;
- Processes (operations) play an important role in virtually all concepts of business models.
- Business models attempt to explain the creation of value, and its measurement. .[Zott, and , Amit, and Massa, 2010]

Due to the subject matter of the presented business model concept, it is worth to mention the ones that are oriented at application of innovations. It is to emphasize that in many enterprises, creating and implementing innovations affect the business model dynamics [Brzóška, 2012;Kramarz, and Kramarz ,2012].

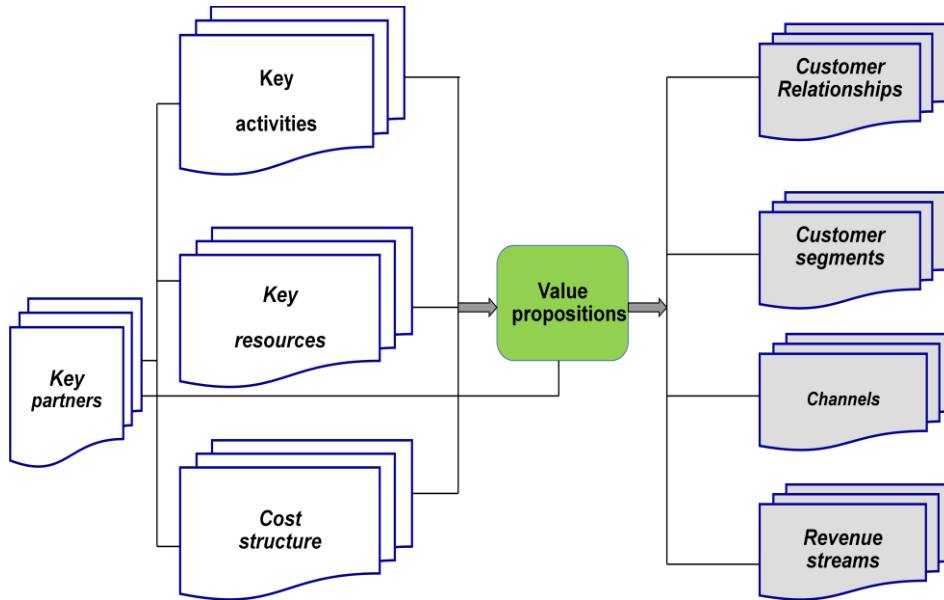
Referring to the impact of innovation to increase of the competitiveness and development organization, G. Hammel [Hammel ,2002]formulated business concept innovation, the result and application base of which is proper business model. His opinions are expressed in the business concept innovation, the result of which and basis

for application is proper business model. In order to use business model for carrying out radical (revolutionary) changes (innovations), one must understand business model as the whole consisting of many elements cooperating with each other. G. Hamel creates architecture of such model consisting of four main components: basic strategy, strategic resources, communication and customers relation, value of the network. The two last elements of the model require innovative utilization and generation of information to create knowledge for innovation. Business models oriented at innovations, to significantly higher extent, than e.g. new technologies, change the existing system of competition, frequently destroying the existing state of the art. Companies and sectors perceived as modern (IT telecommunication, pharmaceutical industry), are the space for such radical changes

K. Oblój [Oblój, 2002] in his paper, when defining business model “as combination of company strategic concept and technology of its practical execution understood as a construction of value chain that allows for efficient operation and restoration of resources and skills” - sees threats emerging from competitive surrounding. The most severe are related to imitations. Elimination of such threats requires the need for continuous improvement of business models that can be specified as some form of “running forward”. The most important instrument of their improvement is partial and breakthrough innovations. The first of them are such changes within the scope of the existing model, which express themselves with constructing competitive edge. Introduction of breakthrough innovations is the second way of “running forward”. It consists in innovative shaping of the value chain in order to create innovation that initiates a wave of creative destruction on the market leading to creating completely new business model, which fact is represented by market successes of many companies [Oblój, 2002]

Business model concept based on nine components was developed by A. Osterwalder A., Y. Pigneur. [Osterwalder and Pigneur, 2010]. It is interesting that authors of the model (Figure 1), presented it in terms of Blue Ocean Strategy developed by W. Chan Kim and R. Mauborgne [Chan Kim and Mauborgne, 2005], that is based on construction of a new market space. Attaining this space is possible by two types of operations. The first operations are to lead to a reduction of the costs which can be attributed to the elements on the left side of the business diagram, which are not shaded. The second group are operations leading to step-wise increment of value for both the customer and for the

company. Business model elements presented on the right side of the diagram are held responsible for that (shaded part).



Source : [Ostrewalder, Pingeur ,2010]

Figure1.The business model canvas template

Blue Ocean Strategy developed by W. Chan Kim and R. Mauborgne [Chan Kim and Mauborgne ,2005],, that is based on construction of a new market space. Attaining this space is possible by two types of operations. The first operations are to lead to a reduction of the costs which can be attributed to the elements on the left side of the business diagram, which are not shaded. The second group are operations leading to step-wise increment of value for both the customer and for the company. Business model elements presented on the right side of the diagram are held responsible for that (shaded part).

The performed own research (partial results of which are included herein) is based on business model presented by the authors of the principles of so called new age innovations, i.e. .C.K., Prahalad and M.S, Krishnan[Prahalad and Krishnan,2008] . They treat business model as one of the most important elements of the business transformation structure.

Two principles are the pillars of the transformation:

1. Value is based on exceptional personalized experience and expectations of customers. Companies must focus on individualization of value for customer. Regardless of the customers number, attention should be centrally focused on the position of a single person. The pillar is identified as $N = 1$ (experience of a single customer in time).

2. All companies have the access to the global ecosystem that also covers resources. Attention of the companies is focused on the access to the resources, not only on possessing them. This pillar is identified as $R = G$ (global resources from many suppliers, frequently from many places around the world).

Elements of this model are:

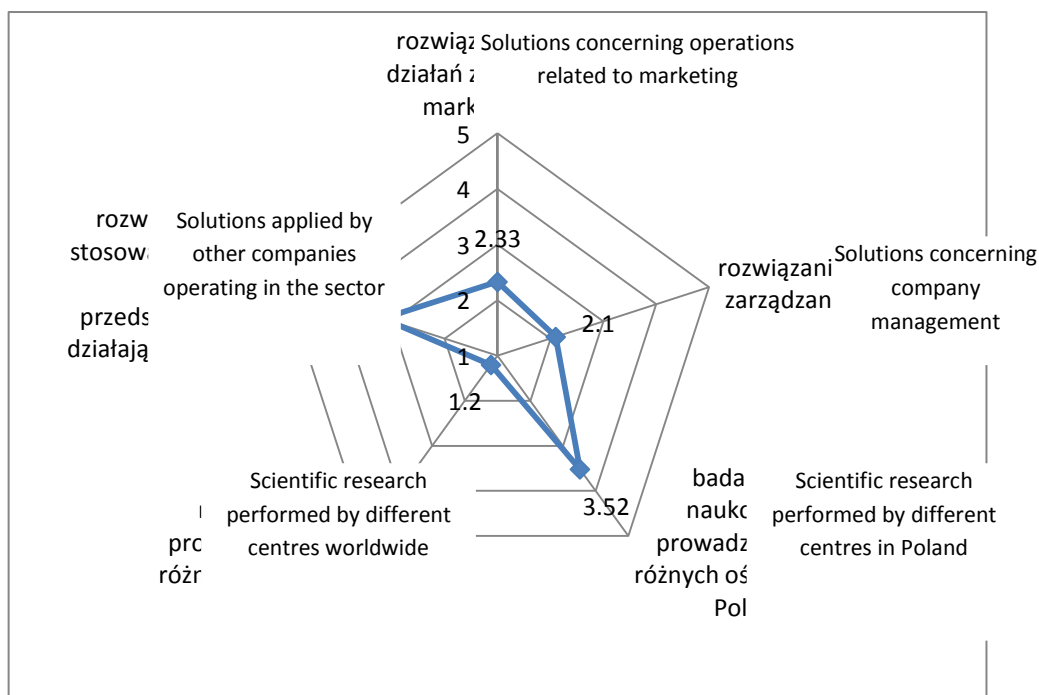
- Social architecture covering: management systems, human resources, competences, skills and HR development systems.
- Business processes: marketing, production, customer service, services, sales.
- Technical architecture: ICT systems, technical systems, equipment, logistics

3 Research related to changes of business model in the companies.

The research covered 150 economy entities. The survey consisted of 26 specific questions concerning knowledge components and various aspects of innovation processes and their impact on business models. Selection of the samples was purposeful. The entities were categorized according to the below criteria. Examined companies:

- - belong to SME sector,
- represent different sectors of the industry, services and trade,
- implemented at least 5 innovations (of any kind) within the last 3 years,
- they are not companies under liquidation

Question 1 assessed the level of knowledge components in the enterprise closely related to the innovation field before its implementation(Figure 2). In the five-grade knowledge scale (from 1-low knowledge to 5- very high knowledge) the highest average grade was related to knowledge about research conducted in various centres in Poland (3.52). Knowledge about solutions used by other operators in the industry has received an average of 3.17. The level of knowledge about solutions to marketing activities has been estimated at 2.33. Knowledge about the possible solutions for business management gained low result (2.1). The lowest result was gained by the knowledge of the research carried out by centres worldwide (1.2).



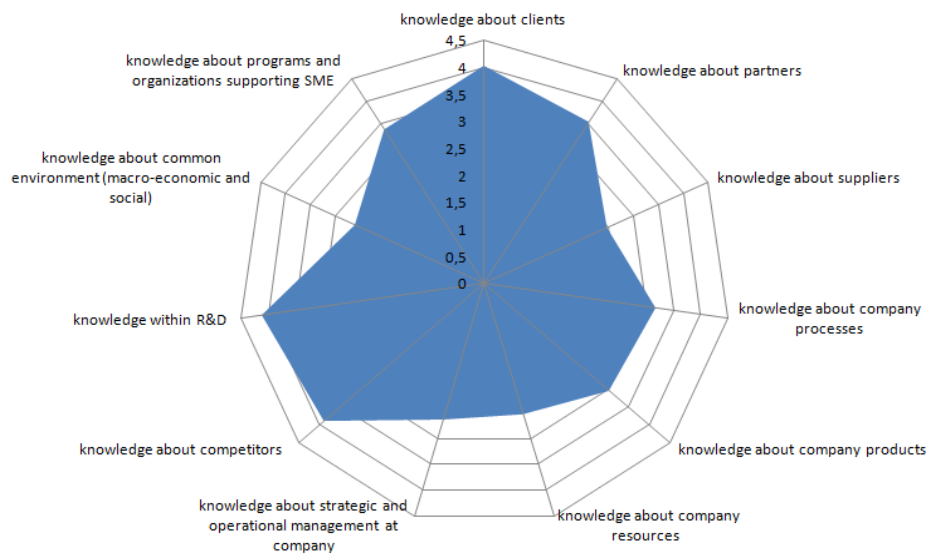
Source: own study

Figure 2. Level of knowledge in the company before implementation of innovation

The interviewed, when assessing the knowledge level in enterprises, found the knowledge of scientific research conducted in various centers in Poland and the solutions used by other operators in the industry, to be at the highest, although average, level. Deficiency of knowledge about solutions for marketing activities, solutions for business management was diagnosed together with the lack of knowledge on the tests conducted by centers worldwide. Knowledge about the results of the studies performed by research centers in Poland, having the highest result, is rather surprising. It has proved to be higher than knowledge about the business environment operations, thus the knowledge which determines possible competitive operations. Such a result suggests better communicativeness while exchanging common information by Polish research and scientific centres, and at the same time acknowledges that business relationships in Poland have not so many elements of potential synergetic cooperation that allow building a knowledge-based market advantage reinforced with cooperation.

The next question concerned general knowledge in the aspect of its importance for creating and absorption of innovation (Figure 3). In the five-grade knowledge scale (from

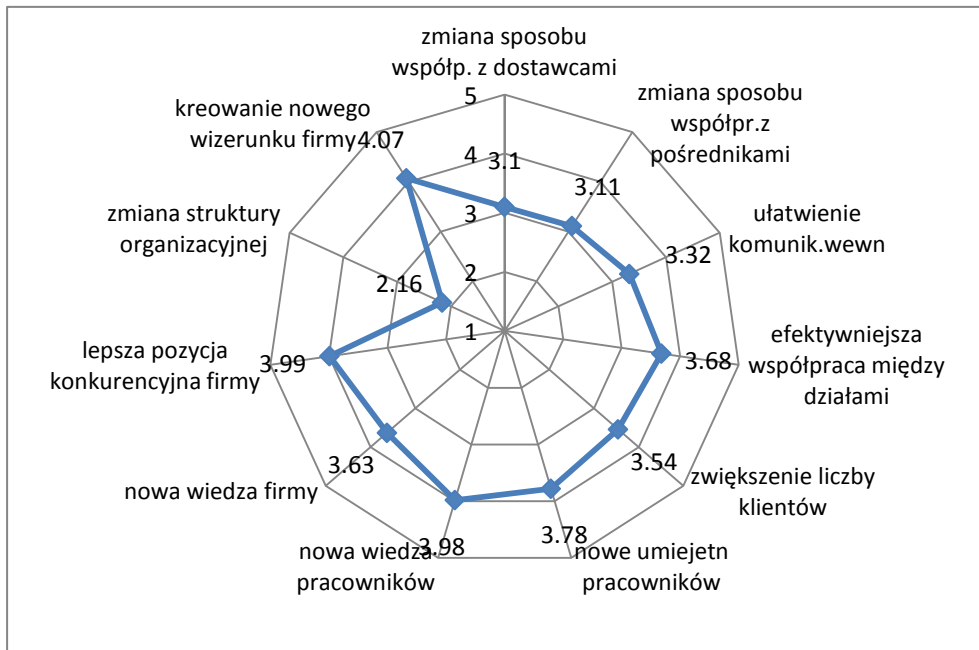
1 - low meaning of knowledge - to 5- very high meaning of knowledge) knowledge of the research and development was found to be the most important (4.11) and also the knowledge about business clients (4.02). The knowledge about competitors (3.88) and partners (3.55) is also placed high. In the situation of significant EU funds to support innovation in SME, quite high recognition of the importance of knowledge about programs and support SME (3.38) is not surprising. The meaning of knowledge about the processes and products is found to be higher than average (respectively: 3.18 and 3.03). The following types of knowledge were found to be close to average: importance of knowledge within strategic and operational management (2.62), knowledge of macro-economic and social environment (2.60), of resources (2.52) and suppliers (2.48). The feedback indicates that enterprises find the meaning of knowledge components important while creating and absorbing innovation.



Source: own study

Figure 3. Meaning of knowledge components important while creating and absorbing innovation

In the next question the interviewed made the assessment of the impact the implemented innovations had on the company operations(Figure 4) . In the five-grade scale - the impact of improvements to the way of creating

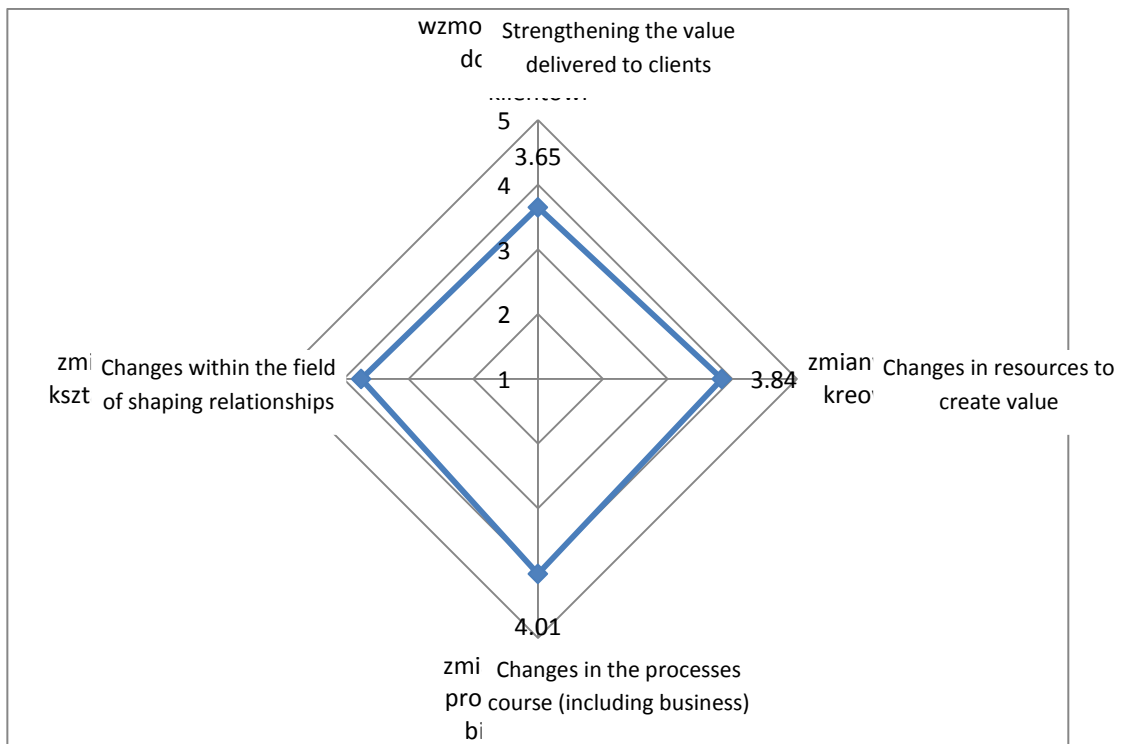


Source: own study

Figure .4.Magnitude of implemented innovations to company operation

the image of the company gained the highest result (average 4.07). Attaining better competitive position has been given the average result of 3.99. Acquiring new knowledge (i.e. hidden knowledge) gained very high rating rating of 3.98 and the category "new skills" was slightly lower (3.78).

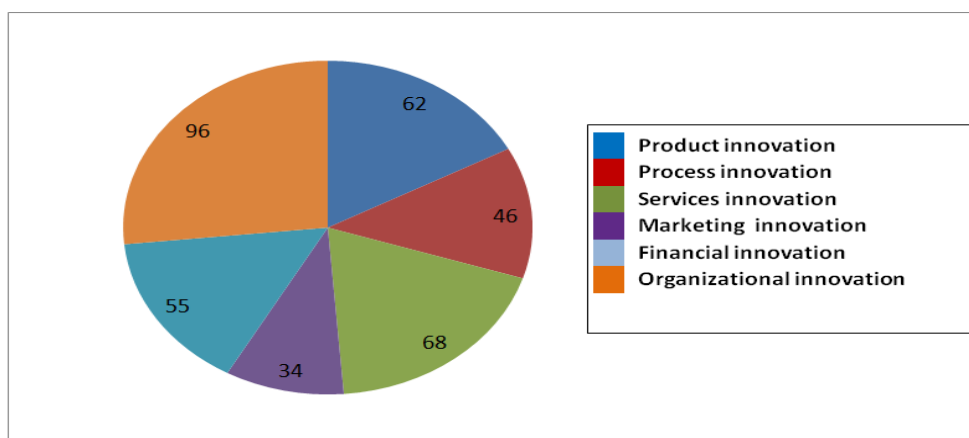
Question 5(Figure 5) concerned directions and magnitude of implemented innovations on organizational



Source: own study

Figure 5. Direction and magnitude of business model change after innovation implementation

business model. In the five-grade scale, the highest result was obtained by the category "change of business process courses" (4.01). Impact of innovation onto resources necessary to create value (tangible and intangible resources) was rated to 3.84. The interviewed noticed also to impact of innovation onto the field of creating company's relationships (3.73). It may be stated that innovations affected, but not strongly, the reinforcement of value delivered to clients (3.65). When analyzing the structure of implemented innovations (Figure. 6), one may see that the companies were

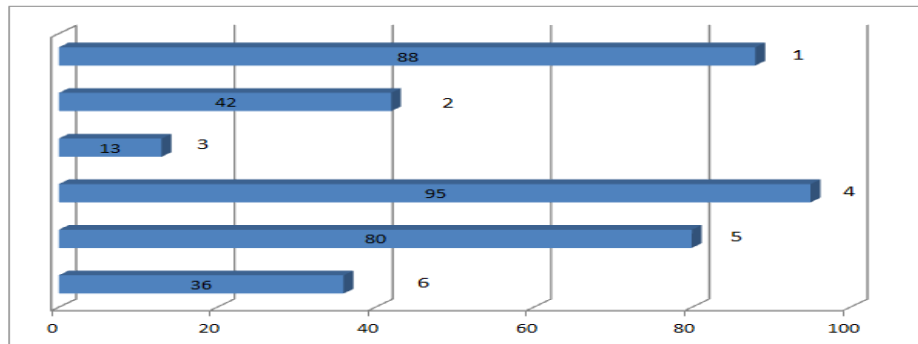


Source :own study

Figure 6. Generic structure of implemented innovations

not limited to improvement of only one area of its operations – the sum of all indications was 361 innovations. Organizational innovations (96 indications) were the most frequent. The second, as regards popularity, was the category of services innovation / related to customer service (68 indications). Product innovation was slightly less popular (62 indications). In 55 cases, the companies changed their approach to the method of financing the investments. Process technological innovation was performed 46 times. The least number of indications was related to marketing communication with the market innovation.

Assessment of business model changes under influence of the implemented innovations was a very important part of the research. The research results are presented in figures: 6, 7, 8.

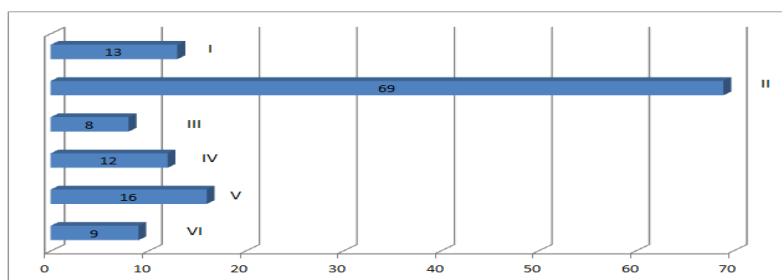


- 1 Key resources important for the company
- 2 Building product portfolio
- 3 Awareness of approach to cluster – network partnership
- 4 Competitive edge concept
- 5 Competitive standing
- 6 Structure of hierarchical and functional relationships system

Source :own study.

Figure. 7. Areas of business model change as a results of implementation of innovations – part 1.

The following categories were included in the group of the most frequent changes of the business model: change of the competitive edge concept (95 indications), change of key resources important for a company (88 indications), change of company competitive standing



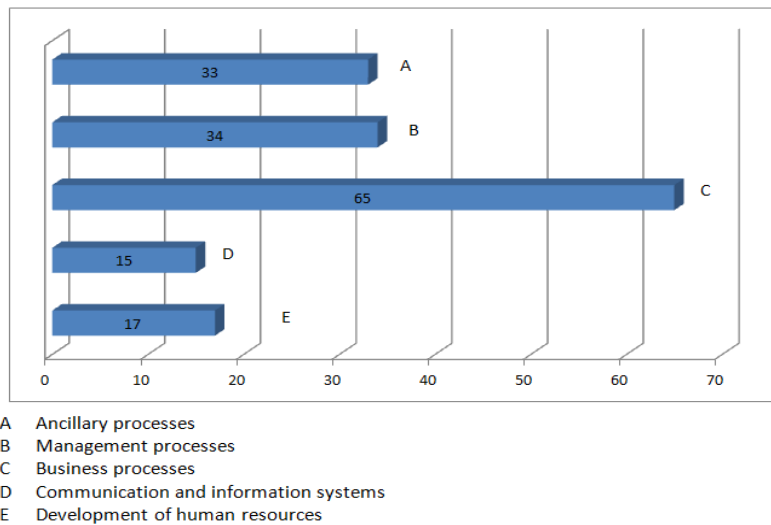
- I Better utilization of intellectual capital
- II New approach to organization social potential
- III Organizational identity and culture of the organization
- IV Support on e-business
- V System of sales and shaping marketing operations
- VI System of customer relationships

Source :own study

Figure 8. Areas of business model change as a results of implementation of innovations, part 2.

(80 indications), change of approach to social potential of an organization (69 indications) and

change within the area of business processes (60 indications). The following categories were change within the area of business processes (60 indications). The following categories were



Source :own study

Figure 9. Areas of business model change as a results of implementation of innovations, part 3.

included in the group of frequent changes of the business model: structural changes in the system of hierarchical and functional relations (36 indications), change of philosophy of creating product portfolio and financial stream generated by individual products (42 indications), changes within the area of management processes (34 indications) and in the area of auxiliary processes (33 indications). The following options belong to the group that was seldom indicated: HR changes and development (17 indications), changes of the sales systems and advertisement operations (16 indications), changes of the IT and telecommunication systems (15 indications), changes leading to better utilization of intellectual capital to define the basis of market distinguishing (13 indications), changes of approach awareness to cluster – network partnership (13 indications), changes

consisting in more significant involvement of e-business and Internet sales support (12 indications), changes in the customer relations (9 indications) and changes of organizational identity and entrepreneurship culture (8 indications).

4 Conclusions

The implemented innovations have influenced the way to create the image by the examined organizations, helped to achieve a better competitive position and gain new skills for workers. Through the innovations, cooperation between departments became more efficient, and the organization and its employees gained new knowledge. Gaining more clients, facilitating internal communication (although not at the highest or high level) was also reported. The implemented innovations did not affect the method of companies' cooperation with agents and suppliers. Even though the organizational innovations were found to be the most common, they do not affect the changes of organizational structures at companies, in the interviewed opinion. The most common benefits related to implementation of innovations were the options to compete within the scope of: company image, special features / product usability as well as variability of the assortment (56 indications). Innovation implementation allowed the companies to compete with quality of service in 44 cases and with price in 28 cases. Innovations also made it possible to broaden the scope of activities: in 32 cases it was found that a company entered new, additional fields of business and in 21 cases it entered new fields of business withdrawing from the previous ones. The most common changes of the business model concerned re-capture of competitive edge concept, change of key resources important for the company, change of competitive standing of a company, new approach to social potential of organization and reorganization within business processes. Referring to the working hypothesis work" that the creation and absorption of innovation is accompanied by changes of business models at companies implementing these innovations", the research results enabled its positive verification.

The research results related to the first question indicate an extensive meaning of knowledge about the research and development field and knowledge about customers, partners and competitors. Selection of the meaning of knowledge about the environment as an important for innovation implementation depicts orientation of companies to open innovations. In the case of the second question, answers clearly show the impact of innovation on business model changes linked to value creation for the customer (new

concept competitive edge based on customer value, increase market position, business processes).

The research (part of which is presented in the paper) was a diagnostic survey concerning relationships between utilization of knowledge during implementation of innovation and the nature changes of business models. Because of their nature, they represent an opinion about the investigated phenomenon. At the moment, more thorough studies are performed, based on multiple case studies, which should be a valuable addition to knowledge concerning this field.

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Reflective Competence Assessment

Sanna Hildén *

Tampere University of Technology
Industrial Management / Cost Management Center
PO Box 541, FI-33101 Tampere, Finland

Kati Tikkamäki

University of Tampere
School of Information Sciences/CIRCMI
FI-33014 University of Tampere, Finland

* *Corresponding author*

Structured Abstract

Purpose – The purpose of this paper is to present a theoretically grounded model for incorporating reflective practice into the competence assessment process for measuring human capital in organizations. The literature on knowledge capital and intellectual assets contains many tools to identify, assess, and plan critical strategic knowledge resources. This paper responds to the need for determining how an assessment can activate and drive the knowledge processes, i.e., generating and sharing knowledge. We propose that reflective practice can be considered as a primary enabler for developing, structuring, and organizing knowledge resources and optimizing their use.

Design/methodology/approach – The paper presents an explorative single-case study based on a conceptual analysis of reflective practice in organizations and the potential of reflection to further develop the existing competence assessment practices. A process model for Reflective Competence Assessment (RCA) is built and tested in a case organization. The concluding analysis enables an investigation of the gap between theoretical intentions and practical realization. The RCA process consisted of the following five parts: incorporating four necessary dimensions of reflective practice, activating reflective capacity, engaging in reflective dialogue, experimenting, and building on reflective control. The competence areas assessed included multi-professional collaboration, sharing of knowing, partner collaboration, and the meta-competence of reflective practice.

Originality/value – The main contribution of this study is the RCA model for incorporating reflective practice into the process of competence assessment. The literature on reflective practice offers very little guidance for researchers or practitioners developing reflective practices as part of everyday work. Based on the four necessary elements of reflective practice, an ordinary competence assessment can be created to evaluate and actively develop the selected strategically critical competencies. The case

example further explores the possibility of utilizing measurement tools in a reflective manner to activate and explore the learning process attached to measuring.

Practical implications – The RCA process model is a measurement tool that evaluates critical knowledge assets while simultaneously functioning as a reflective practice itself. As a practical case description, this paper offers management practitioners and human resource development professionals a model for implementing competence assessment in a reflective manner to measure and also construct new know-how. The study also offers argumentation for considering reflective practice as a primary tool for breaking away from routine thinking and extending competencies. In addition, it provides a concrete tool for arranging measurement and evaluation in a manner that activates and revives learning and renewal.

Keywords – Reflective competence assessment, business-critical competences, reflective practice, management control

Paper type – Academic research paper

1 Introduction

Knowledge management has been defined as the set of processes, approaches, practices, and systems used to generate, develop, renew, and integrate knowledge-based resources into capabilities that the organization can leverage to seize opportunities quickly and proficiently in order to create market value and increase and sustain competitive advantage (see the full list of references in Moustaghfir and Schiuma 2013). Earlier research presents many tools to identify, assess, and plan critical strategic knowledge resources (Brooking 1996, Edvinsson and Sullivan 1996, Edvinsson and Malone 1997, Lev 2001, Schiuma 2009, Schiuma et al. 2008, Sveiby 1997 in Schiuma 2012). More recently it has been pointed out that we need to understand the “means and ways how” an assessment can actually activate and drive the knowledge processes, i.e., generating and sharing knowledge (Schiuma 2012).

In this paper we present a practical intervention case in which a reflective competence assessment (RCA) was constructed by deducting competence drivers from the business’s critical competencies. A guiding principle was that the employees’ professional competence needs to be evaluated against the value it adds to organizational competence, and not merely its input to a particular profession, task, or process. Since organizational competencies are dynamic, cumulative, and constrained by past experience, the assessment method should also respond to the challenges of asset asymmetry, social complexity, and causal ambiguity (Moustaghfir and Schiuma 2013, Zollo and Winter

2002). Competencies, though rooted in individual characteristics and skills, are essentially learned patterns of collective activity through which an organization generates and modifies its routines (Nelson and Winter 1982). This is why the assessment process has to include not only self-reflective components, but also dialogue between all stakeholders, i.e., employees, top management, owners, and the customers.

Knowledge management literature benefits from utilizing the theories of psychology and sociology to advance the understanding of competence and learning in organizations. The very core element of learning – reflection – has been both widely neglected and/or restrictedly conceptualized in management research; however, it is very much present in educational literature. Reflection is often associated with individual, intellectual exercise, and we wish to present a more holistic overview of its potential as a source of professional and organizational competence.

The notion of reflection has been strongly present in recent research on management and organizational learning, and has been mentioned in many other distinct fields of management theory as a core process of individual and collective learning (e.g., Boud et al. 1985, Hoyrup 2004, Mezirow 2008, Reynolds and Vince 2004), sense-making (Weick & Sutcliffe 2001), reconfiguring the mental frames (Schwandt 2005), and as a driver of profound strategic change (e.g., Crossan et al. 1999). Reflection is suggested to offer organizational actors increased awareness in critical and complex situations which require new responses and broad action repertoires (Zundel 2012, Keevers and Treleaven 2011). Though the significance of reflection is broadly accepted, it has been discussed mostly as a separate exercise outside the normal activities of an organization. On paper the construct of reflective practice is considered as a potential means to complement *assessing* competence with *creating* competence. In the organizational context, we look at reflective practice as an individual and collective way of working that manifests reflective skills and experimentation and is enabled by the institutionalized structures. Reflective practice allows the members of the organization to slow down and engage in critical evaluation of their own thinking. It also allows them to investigate the shared, collective assumptions and expectations as well as the institutionalized rules and routines. It captures the idea of a style of working, thus reflecting both on-action and in-action (Jordan et al. 2009).

This study presents a process for reflective competence assessment (RCA) developed for a single case organization providing occupational health care services for various

business organizations. The process is based on a review of literature of professional competence evaluation contents and techniques. More specifically, it emphasizes the elements of reflective practice throughout the process to enable learning, sense-making, and taking action as an outcome of the process. A notable difference between the assessment tradition present in earlier research and the case organization's practice is that the drivers of professional competence elements were deducted from acute and business-critical competencies. Technical knowledge and skills related to tasks and professions were left out.

2 Literature

2.1 Identifying competence

Due to the changes taking place in society, professional cultures, knowledge production, and the nature and content of professional expertise are challenged. Professionals are expected to be talented in social relations and communication; to be able to reflect on and integrate different aspects of expert knowledge; and to act based on the ethical base of their profession. The expertise has to be constructed and reconstructed continuously in a process of life-long learning (Tynjälä, Nuutinen, Eteläpelto, Kirjonen & Remes 1997). Nowadays the skills of developing oneself as a professional and of developing work practices and organizational functions are emphasized.

Though there are numerous definitions of professional competence (e.g., Bloom 1956; Eraut et al. 1994, Nordhaug 1993), there is no single agreed-upon definition that would encompass all important domains of each professional's practice. Epstein and Hundred (2002; 2014, 226) have defined professional competence based on prior definitions as "habitual and judicious use of communication, knowledge, technical skills, (clinical) reasoning, emotions, values and reflection in daily practice for the benefit of the individual and community being served." Based on Cheetham and Chivers's (1998) model, which harmonizes the reflective practitioner and competence-based approaches, professional competence is seen as consisting of knowledge/cognitive competence, functional competence, personal/behavioral competence, values/ethical competence, and meta-competences (e.g., communication, problem-solving, learning, reflection). Competence is context dependent. The context of work and the physical, cultural, and social conditions of work are considered to affect competence. In other words, a person

may be highly competent in one particular context or environment, but less so when these change. Competence is also developmental. It is based on ongoing updating, through which individuals and groups/teams secure their ability to carry out and develop continuously changing work practices (Cheetham & Chivers 1998; Epstein & Hundert 2002).

Here, competence is examined as a personal, social, and organizational asset. Referring to the definitions below, personal competences include, e.g., self-confidence, interpersonal skills, and control of emotions. These are gained through learning from experiences. In addition to self-perception, competences are constructed and developed based on feedback from others. The social dimension of competence can be examined as an interprofessional competence. Interprofessional competence reveals how different professionals meet and work together in groups/teams. In practice, this means carrying out collaborative practice, e.g., joint discovery of a problem, sharing knowledge with other professionals, searching a common language for communication and general working methods, and reflecting (Wilhelmsson, Pelling, Uhlin, Dahlgren, Faresjö & Forslund 2012).

There is always a context in which professionals think and act. However, what the individuals or groups learn is not automatically embedded as organizational knowing (i.e., institutionalized). Based on the situational and practice-based approaches, the organizational context and the work context create the frame of reference for practice and competence construction as well as development.

There is a particular emphasis in this paper on a meta-competence – reflective practice – which is seen to be the grounding of the other competences. Following Schön's (1983; 1987) idea of a reflective practitioner, reflection is the primary professional competence and key to acquiring other competencies and maintaining a process of continuous development and learning. Reflection is thought to act as a “gate-keeper” (Cheetham & Chivers 1998, 274) to developing the competence. Although people reflect on their experiences by nature, systematic reflection differs from what professionals are accustomed to doing (Korthagen & Vasalos 2005). Therefore, professionals need to learn how to reflect. At the heart of professional competence is individuals' reflective capacity consisting of self-awareness, description of experiences, analysis of situations, synthesis to develop new perspectives on a situation, and evaluation of the learning experience (Atkins & Murphy 1993).

2.2 Reflective practice as a meta-competence

Both researchers in academia and practitioners have shown a growing interest toward development interventions that pay attention not only to employees' knowledge and skills but also their personal qualifications and meta-cognitive capability to practice professional self-reflection, constructive dialogue, and creative sense-making (e.g., Schön 1987, Cope 2003, Elkjaer 2001 Vince 2002, Reynolds 1998). As a practice-based approach, reflection can be seen as a "tool" for questioning routine thinking, triggering learning, and sense-making through practical managerial methods. According to broadly established learning theory frameworks (e.g., Boud et al. 1985, 2010, Hoyrup 2004, Kolb 1984), reflection represents the necessary link between experience and goal-oriented learning. In other words, no experience leads automatically to learning unless we reflect it against our existing understanding and assumptions. Thus reflection is needed for changing routine thinking and behavior – for innovations and renewal.

The study defines reflective practice as the actual ways that reflection is manifested through individual and collective action within the organizational realm. Reflective practice allows the members of the organization to slow down and engage in critical evaluation of their own thinking. It also allows them to investigate the shared, collective assumptions and expectations as well as the institutionalized rules and routines. It captures the idea of a style of working, thus reflecting both on-action and in-action (Jordan et al. 2009).

Evaluating the reflective practice of an organization involves analyzing three distinct yet intertwined levels: reflective practice on the individual, group (collective), and organizational levels. These levels are broadly accepted as critical levels of analysis regarding organizational learning processes (Crossan et al. 1999).

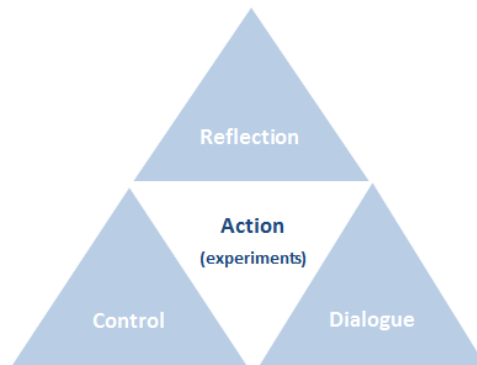


Figure 1: Reflective practice in organizations – four dimensions

Reflection - Reflective capability

Reflection has been defined as questioning one's intuitive understandings, taking on-the-spot experiments, and engaging in thoughtful dialogue about the situation with others (Schön 1983). The grounding premises for reflection to occur relates to individuals' capability of reflectiveness. Jordan (2010) describes the reflective practitioner by 1) the ability and 2) willingness to question routinized ways of thinking and acting, either after having acted or in the midst of acting. This requires meta-cognitive capabilities, self-awareness, and the ability to regulate cognitive and affective processes (e.g., Mezirow 1981, Hodgkinson & Healey 2011). Yanow and Willmott (1999) describe the attitude suitable for reflective practice as *passionate humility*, which allows one to be surprised and to view a situation from diverse perspectives. Reflective capacity consists of self-awareness, description of experiences, analysis of situations, synthesis to develop new perspectives on a situation, and evaluation of the learning experience (Atkins & Murphy 1993). In practice, professionals should be able to reconstruct their professional competence based on the demands springing from practice.

Dialogue - Reflective dialogue

In situations where an individual notices that the old patterns of thinking do not apply, he or she needs to test his or her emerging thinking and develop it further. Collective reflection is a way to make visible and investigate the inter-subjective mental models and

shared frames of reference. The crucial prerequisite for this type of collective reflection is individuals' ability to dialogue. Based on Raelin (2001; 2002), the skills needed for this collective form of reflection include being, speaking, disclosing, testing, and probing. Being means opening up to the experience and to the interpersonal environments around oneself (see also Isaacs 1999). Speaking refers to articulating the collective voice at a given time, for example, by suggesting group norms and/or bringing out uncertainties or unfounded assumptions. When disclosing, the participants share their doubts or voice their passion. By disclosing, participants unveil their feelings or tell stories to reveal their deep experiences. In testing, members try to promote the process of collective inquiry. Through probing, members of the group attempt to point out inconsistencies in members' reasoning patterns and uncover the assumptions behind the actions. Dialogue is a process of discovering and interrogating to achieve understanding or agreement (Isaacs 1999).

Reflective dialogue is a process involving internal and external dialogues. In internal dialogue one examines one's own articulations and listens to one's own voice aiming to understand one's values, assumptions, and blind spots (Tsang 2007). In the external form of dialogue, individuals together try to find something new, surprising, or touching in open interaction. In the organizational context, one can use various reflective tools to facilitate reflective dialogue, including storytelling, reflective and reflexive conversations, reflective metaphors, reflective journals, critical incident analysis, repertory grids, and concept mapping (Gray 2007).

Action - Reflective experimenting

Sense-making and learning underlie the coexistence of thinking and acting. In addition to the cognitive and analytical level of reflection, reflective practices take the form of embodied reflection that widens the experience into the embodied level and re-embodies the experiential knowledge and learning (Jordi 2010). The aim of the experiment is to apply and explore the ideas and principles in practice, and thus acquire new experiences to be reflected upon. This means exploring new ideas and work practices with a "reflective mentality."

However, we believe that if reflective practice is not automatic for the members of the organization or in the predominant culture, then reflective thinking and acting might not happen simultaneously. There might be a need for a reflective group session or internal dialogue, after which the ideas can be experimented with and implemented in daily work

practices. Then these new experiences are taken back again into group sessions or an individual's internal dialogue under critical evaluation. This follows the ideas of the classical cycle of experimental learning, where an individual's learning takes place through a process of concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb 1984).

In the process of experimenting, experiences and knowledge become a professional activity, i.e., knowing.

Control - Reflective management control

Collective reflection, processes of interaction, sharing interpretations, and experimentation are all strongly affected by social, cultural, and political factors (Reynolds 1998) and supported by organizational routines and practices (Elkjaer 2001, 2004, Korthagen 2005). In order to assess and develop an organization's reflective practices, there is need for a structured analysis regarding those managerial systems that represent the organization's structural aspects, rules, and routines. In this study, the management control system (MCS) framework presented by Malmi and Brown (2008) is utilized for understanding the means of control and how they influence and drive competence. The reflective practice should be visible in MCS, so that the forms and use of control encourage individuals and groups for reflection, create time and space for reflection, and follow the results of reflection. On the other side, it also means that the MCS should be utilized in a reflective manner. For example, only through reflection can measurement information be utilized in provoking new interpretations and critical questions. This active and dialogic use of control tools is necessary for the self-renewal of a control system, as the observations and insight changes the control in use (Hilden et al. 2012).

Reflective practice in organizations also deals with how we do things around here (in our organization) and how we are organized to reach our goals (Boud et al. 2006, Jordan 2010, Vince 2002). A reflective culture is defined as one which allows voicing and criticism without a fear of retaliation. There should be "a structure that reflects" (Nicolini et al. 2011), i.e., practices that mobilize dialogue. Organizations might endorse encouraging the use of supporting reflective actions (e.g., reflective note taking, debriefing episodes after meetings) on the individual and team levels. They may also build learning communities for small groups to share and test ideas and knowledge,

exchange good practices, and/or give feedback to each other. Feeding the culture of learning enables reflective work behavior to become a way of living in the organization (Raelin 2002). The ideal is to integrate the reflective practices into the present strategy and work practices.

Raelin (2002) proposes the following strategies that organizations might endorse to encourage use of reflective practice: *supporting reflective actions* (e.g., reflective note taking, debriefing episodes after meetings) on the individual and team levels; *building learning communities* for small groups to share and test ideas and knowledge, exchange good practices and/or give feedback for each other; and *feeding the culture of learning*, which enables reflective work behavior to become a way of living in the organization. However, we believe that the ideal is to integrate the reflective practices into the present system of management control, including strategic plans, work practices, measurement systems, rewards, and embodiments of the culture. So far, ideas for incorporating reflectivity into corporate practice unfortunately remain largely unrealized (Vince 2002).

2.3 From measuring to reflective assessment

Measuring professional competence is a necessary element of developing and managing an organization's human intellectual capital. However, the human focus in IC metrics is often focused at the amount of training and support programs, level of degree, or employment duration (Liebowitz & Suen, 2000). These metrics, as clear and precise as they are, do not capture the full prism of employees' professional competence or the value-added to the organization. The critical change needed in evaluating professional competence as a source of competitive advantage relates to understanding and managing the relationship between what people know and their value delivery (Marr and Spender, 2004).

Typically, a comprehensive assessment is targeted at evaluating the core components of professional competence, such as cognitive and functional knowledge related to the task; behavioral or personal competence; values or ethical competence; and meta-competences, such as creativity, analytical capabilities, learning, and reflection (Cheetham and Chivers 1998, Delamare le Deist & Winterton 2005, Epstein and Hundert 2002). Epstein and Hundert (2002) have reviewed assessments of professional competence in the field of medical practice. They conclude that most of the assessments concentrate on cognitive and technical knowledge and skills, and underemphasize some

critical areas of professional competence. The areas that lack attention in the assessment tradition include integration of knowledge and skills, context of care, information management, teamwork, health systems, and patient-physician relationships. In their analysis, the authors emphasize that assessments must take into account what is assessed, how it is assessed, and the assessment's usefulness in fostering future learning (Epstein & Hubert 2002, p. 228).

Epstein and Hubert (2002) have pointed out that assessment should provide useful feedback for employees regarding their strengths and weaknesses and guide future learning. It encourages self-reflection as an institutionalized practice and as a professional habit. Assessment also expresses institutional values by determining what is assessed and how assessment is conducted. Lerro and Schiuma (2013) have proposed a typology for IC assessment practices according to their strategic significance. The typology is based on an idea that, in this case, an assessment can be considered as both competence management and competence communication. The authors distinguish between the following four main strategies of assessment: measurement strategy, domain assessment strategy, asset accounting strategy, and asset communication strategy. The assessment process explored in this paper could be utilized for at least measurement and communication strategies, but also proposes a fifth strategy, i.e., a "knowledge asset reflection strategy," the purpose of which is to use assessment to renew the interpretations of asset value, thereby making the knowledge asset enablers visible and questioning routine knowledge that is inadequate or passive.

The goal of reflective competence assessment (RCA) responds to the challenge voiced by Schiuma (2012) that knowledge management activities, such as competence assessment, should *activate* knowledge processes and *drive* the development of strategic organizational competences (p. 518). Through reflective practice throughout the process, the assessment actively challenges the existing perceptions of competence, thus creating a more honest opportunity to look into the mirror, both privately and together with others.

3 Research design

The paper presents a process model for reflective competence assessment for evaluating, critically investigating, and creating shared understanding in the organization regarding the state of selected organizational competencies. The process model has been developed as a part of the interventionist (Suomala & Lyly-Yrjänäinen 2012) research

program, REFINNO¹, investigating the potential on reflective practice in improving the performance and innovative capability of organizations. It has been noted the interventionist mode of research may be particularly fruitful in intellectual capital discourse as it allows the researcher to be “grounded in action,” thus helping to reduce the gap between theory and practice (Dumay 2009, p. 499, Chiucchi 2013).

The research aim presented in this paper deals with investigating how reflective practice could improve the assessment and management of professional competence and the organization’s capabilities. One of the case organizations within the research program had a practical challenge to renew their competence assessment tool, and they were ready to engage in an interventionist and constructive (Kasanen, Lukka and Siitonen 1993) effort, where a process model would be developed in a dialogue between the management team and the researchers.

In the first phase, the researchers formulated an idea of a process that utilizes the guiding ideas of reflective practice developed by the researchers earlier in the research program (Hilden & Tikkamäki 2013, Tikkamäki & Hilden 2014). In addition, the process needed to make visible how measuring and reporting of competence issues is able to increase attention and mobilize actions toward competence management (Chiucchi 2013).

The theoretical groundwork was discussed together with the top management of the organization. The practical challenge identified by the management was that the traditional competence measurement tool was focused too heavily on technical competence, thus providing little inspiration for future competence development plans. Much of the competence development initiatives were formal and classroom training, and there was increased attention to more reflective methods, such as mentoring, peer learning groups, and coaching. In addition, it had become obvious for the management that the strategic focus should be aimed at competencies related to working together as professionals and partnering with the customer. Both competence types were thought to benefit from more reflective working practice. In the end, four central competence areas were selected for a renewed competence assessment.

Based on this interaction, the researcher constructed a new questionnaire, which was to be the individuals’ self-reflective tool to become familiar with the vocabulary and to

¹ *The authors wish to acknowledge the REFINNO research team, Petri Suomala, Sanna Pekkola, Johanna Rämö, Minna Saunila, Juhani Ukko and Sanna Vauranoja, for the insightful and constructive academic discussions and joint efforts in case interventions. They have enabled the multi-disciplinary development of the interpretation of reflective practice. Moreover, funding by the Finnish Agency for Technology has enabled the research projects underlying this publication.*

find personal meaning in the capabilities. This was to represent the critical point of pausing to reflect and analytically detach from the routine thoughts and action (Kolb 1984). The RCA process is described in more detail in the next chapter, but according to the interventionist research tradition, the researchers were closely involved during the process, offering practical support for designing the organizational communication during the intervention and pedagogical approaches in the team sessions for ensuring the collective reflection.

The researchers facilitated the process, which was meant to be led by the management team and result in concrete actions regarding the assessment results. Toward the end of the process, the role of the researchers shifted more toward observing, understanding, and evaluating the effectiveness of the process in promoting the capabilities, the levers, and obstacles along the way. At this point, the researchers actively searched for dialogue with the management team in order to strengthen the process in the detected weak points. The dialogue has meant management team coaching, discussions, and focus group interviews, which have been used both in gathering information for the theory advancement and to intervene in the practical challenges in the organization. The observations regarding the potential of RCA are discussed in the final conclusions of this paper.

4 Reflective Competence Assessment

4.1 Selecting the key competences and the drivers

The key competences were selected regarding the current organizational challenges, competition, changing legislation, and other perceived drivers of success. The health care sector is very much driven by the professions' assumed roles and duties. It is a fairly new phenomenon that doctors and nurses work closely together (Figure 2, point A), and authority over each patient's care is distributed among various professions, such as physiotherapists, psychologists, nurses and doctors. In occupational health care, another issue is to share (Figure 2, point B) not only the patient-specific knowledge between professions, but also the customer's company-specific information between service teams. The health problems are often specific to the working environments, and thus the history of problems, treatments, and solutions are valuable in the service production. Though the

need for trans-professional knowledge-sharing is widely accepted, the practice does not reflect the ideal.

Another challenging area was the customer interface (Figure 2, point C). In an occupational health care organization the nurses or doctors are actually the sales force for the service. It was noted that a lot of timidity and sensitivity is present in the negotiations related to selling the service. The managers knew that some individuals excel in the customer interface, while others feel intimidated. While the health care professionals are not expected to be hardcore salespeople, they should feel confident in discussing the impact of the service on customers' business and should actively search for a partnering role. This was another highly crucial competence area which the researchers realized required more attention in order to figure out what kind of support people need.

During the course of the discussions between the researchers and the management, it became obvious in many ways that the company needs a cultural change in order to become more innovative and proactive. The competence that enabled the organization to succeed in the past does not seem to be enough for it to thrive in the future. Many old ways of thinking need to be questioned, and new foundations need to be identified for greater competitiveness. For this purpose, the reflective practice (Figure 2, point D) was selected as a critical meta-competence. It was seen as a "gate-keeper" (Cheetham & Chivers 1998) to developing the other competences.

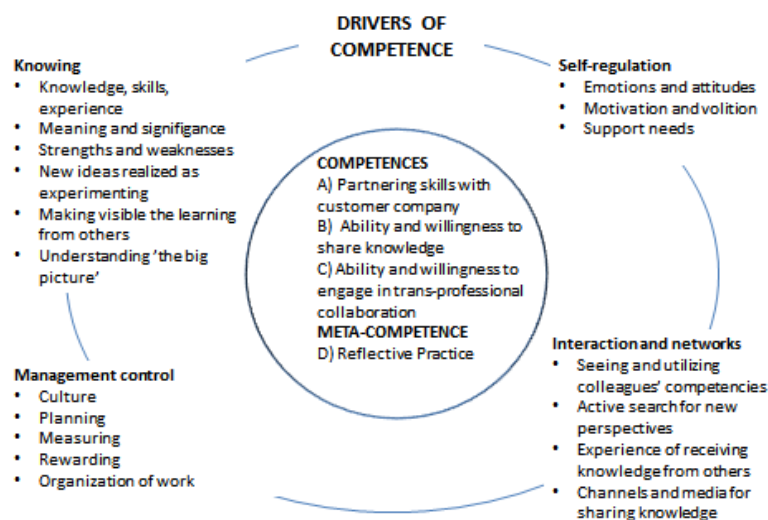


Figure 2: Business critical competencies and their drivers

The drivers of the competences (Figure 2) were constructed hand-in-hand with these organizations' strategically critical competences. For example, the active sharing of knowledge was seen as a matter of constructing and sharing knowing, self-regulation, networks, and organizational structures. These drivers, presented below, were seen as certain types of focus dimensions of promoting reflective professional competence and practice. In the RCA model the competence drivers consist of individual (self-regulation and knowing), social (knowing, interaction, and networks) and organizational (management competence) dimensions (Crossan et al. 1999, Hilden & Tikkamäki 2013).

Knowing consists of knowledge and competences constructed in practice, during the processes of participation in the organization's daily life. It means co-creation of competences where learning and doing are intertwined. Thus, knowing is socially constructed. Knowing includes thinking, doing, and feeling (Wenger; Nicolini et al. 2003). It gives the significance and meaning for actions and makes both individuals' learning experiences and learning from others visible. It helps employees to understand the "big picture" of professionalism and the work organization. In the RCA questionnaire, using the customer partnering as an exemplary competence, the professionals were asked to estimate their knowing by answering questions (see Table 1).

Table 1. Examples of the questions related to knowing in the RCA questionnaire

- I have enough knowing related to partnering skills with customer
Scale 1–5 (totally agree – totally disagree)
- My strengths in being a partner to our customers are as follows:
- What kind of support do I need to become more successful in partnering with our customers?

Self-regulation means the willingness, patience, and emotional awareness to use (Epstein & Hundert 2002) the knowing. Self-regulation is the individual's competence to guide themselves toward important goal states (Vohs & Baumeister 2004). In practice it means acting quickly to take opportunities, ignoring dis-interactions, acting flexible in response to various situations, overcoming obstacles, and managing conflicts between goals (Fitzsimons & Bargh 2004). Good self-regulation also aids group membership, e.g., by controlling emotions and directing behavior toward social belongingness (Vohs &

Ciarocco 2004). Several examples of questions related to self-regulation are presented in Table 2.

Table 2. Examples of questions related to self-regulation in the RCA questionnaire

- I'm enthusiastic about my work Scale 1–5 (totally agree – totally disagree)
- I'm motivated the most in my work by (1–3 factors)...
- I can set, get enthusiastic about, and achieve goals at work Scale 1–5 (totally agree – totally disagree)

Interaction and networks refer to interpersonal competence. In practice this means, e.g., effective communication with customers and colleagues (Epstein & Hundert 2002), seeing and utilizing others' competences, and searching actively for new ideas and perspectives. It is the co-creating and sharing of knowing inside and outside the organization. Several example questions related to interaction and networks are presented in Table 3.

Table 3. Examples of questions related to interaction and networks in the RCA questionnaire

- I understand and utilize our customer's viewpoint in my daily work Scale 1–5 (a lot – very little), especially when...
- I utilize our organization's networks in my work Scale 1–5 (a lot – very little). How do you do this in practice?
I like to share my expertise with my colleagues
Scale 1–5 (a lot – very little). How do you do this in practice?

Management control defines the strategy, structures, routines, and procedures for individuals and groups to construct and develop their competence and practice reflection in their everyday work. In this study, the typology presented by Malmi and Brown (2008) is utilized for understanding the variety of managerial tools and systems (related to culture, planning, measuring, rewarding, and work organization) that may or may not induce the utilization of competences and reflective practices (see examples in Table 4).

Table 4. Examples of questions related to management control in the RCA questionnaire

- Efforts to partner with our customers are visible in my personal work goals
Scale 1–5, (to a great extent – not at all). How? (This question is not clear. How what? I would recommend writing a more complete question here.)
- I'm rewarded when customer partnership is successful
Scale 1–5, (to a great extent – not at all)
- My organization's structures and work practices support developing partnerships with customers

In the RCA model all four of these drivers, i.e., knowing, self-regulation, interaction and networks, and management control, were seen to affect the realized competence to develop and practice partnering with customers, along with other strategically relevant competences needed at work.

4.2 The process of RCA

The process (Figure 3) follows a classic planning, implementation, follow-up schema, complemented with special attention toward the theoretical prerequisites of reflectivity.

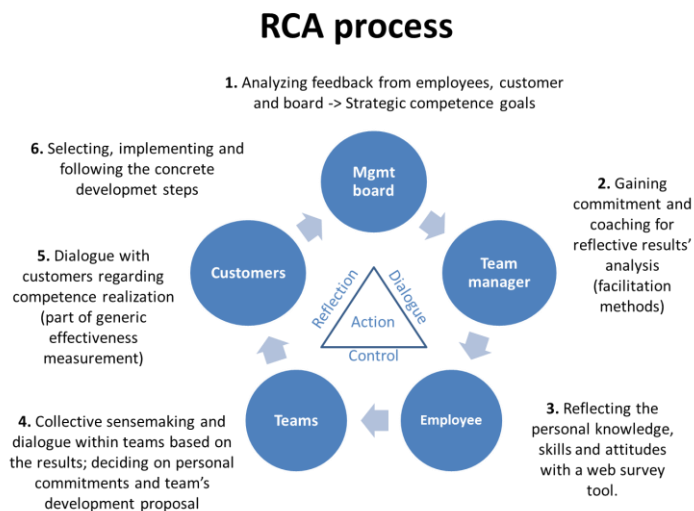


Figure 3: The process of reflective competence assessment (RCA)

In the first phase, the strategic competencies were identified in a reflective discussion between the core management team and the researchers (1). The point was not to settle with picking the capability goals from the official strategy slides, but to stop and question whether the managers truly feel that strategy is up to date and provides concrete support for deciding on competence development issues. The management team was interested to learn which drivers are behind trans-professional collaboration and active sharing of professional knowledge.

The competencies and needed cultural change was discussed among all the organization's team leaders in order to verify and modify the goals if needed (2). This was to ensure the commitment of all managers, and also to practically coach the team leaders in communicating the questionnaire and dealing with the team sessions after the survey. The researchers offered a set of reflective facilitation techniques, from which the team leaders could choose the applicable methods for their own team sessions. The goal was to ensure that all members of the organization are heard. Furthermore, the focus is on open and dialogical interaction – not on the statistical results. The development ideas were supposed to be created with the inspiration of the assessment information and based on collective reflection.

Based on the four final key competencies, the researchers deducted the drivers (Chapter 4.1) behind each area. Based on these drivers of competence, propositions were formulated and a web questionnaire formed. The goal of the questionnaire was to construct propositions that encourage employees to reflect on the meanings they relate to each competence and to investigate their emotions and perhaps hidden assumptions (3). The purpose of the self-reflective part was primarily to offer the time and space for critical self-inquiry, and only secondarily to gather measurement data.

In the fourth phase, the team leaders arranged sessions where the team's results of the web questionnaire were presented and collectively reflected upon (4). The teams experimented with the facilitation methods presented earlier by the researchers. These methods were aimed at activating the participants, changing perspectives, voicing different opinions, and searching for personal meaning and development goals.

During the process, it had become clear that the organization needs to learn both how the customer sees the collaboration and how the competencies look from the outside. A regular customer satisfaction survey does not necessarily provide detailed information on the service impact or on the critical competencies of the customer perspective. Therefore,

at this point, it was decided that in the future, the RCA model should include the idea of shifting the perspective from the inside of the organization to customers and perhaps other parties as well (5). The customer interviews, which will be integrated in the next round, need to tackle the following three goals: first, to assess the real customer value and impact of the selected capabilities; second, to intentionally change the perspective from resources to expectations, perhaps searching for new interpretations through the customers' eyes; and third, the customer could provide new information regarding what the critical competence areas could be during the next process round.

Finally, the fruits of each team discussion, together with the entire web questionnaire results, were discussed in the management team (6). (No customer dialogues were available during this preliminary test round.) The researchers presented the major observations by utilizing images, paradoxes, and dilemmas that were intended to trigger curiosity, open debate, and even emotional reactions.

Throughout the process, the prerequisites of reflective practice were held present; i.e., actively questioning the routine thinking and management structures, engaging in open dialogue with colleagues, different levels of the organization, customers, researchers, and practitioners. Avoiding overconfidence in the cognitive exercise, the process encourages practicing reflection in managerial and team work by approaching and asking the customer.

When reflecting back on the process, the following highlights are worth mentioning. The process was facilitated by researchers who, in addition to their expertise in management theory and practice, have an education and practical experience with adult education, learning at work methods, work counselling, and reflective facilitation methods. This was a significant help in the co-creation of the model with the organization.

The facilitation for team leaders was necessary in order to ensure reflective dialogue during the team sessions. The "learning cafes" related to the questionnaire results were considered extremely good and personally meaningful as they were filled with a positive spirit and produced concrete development ideas. This was probably related to using the assessment information in an interactive and dialogic manner.

Since the researchers were not present at the team session, the ideas produced were left on the flip chart and were never consolidated and presented to the management board. This reveals how the process is vulnerable to any discontinuities in the facilitation. Team

members felt frustrated as the ideas were not put forward, and thus no actions really followed the facilitation. Deciding on responsibilities is highly necessary if the process is meant to continue without the researchers' active facilitation.

Throughout the process it seemed that an outsider or a dedicated facilitator can provide significant support for the reflective assessment process, working as an objective party to handle the feedback and feed forward processes. It is perhaps valuable that the process never becomes too routine-like and maintains its quality of producing surprises with the help of critically reflective questions.

As a final remark, it needs to be noted that many of the observations may be valid only in the selected case organization in the context of its current culture, market situation, and management structures. The idea of investigating the potential of reflective practice in the competence development area has analytical generalizability which is based on the conceptual analysis – not based on the illustrative case example. Dubois and Gadde (2002) point out that the essence of single-case studies lies not in their power to generate generally held theories but in their capacity to understand phenomena (Dubois & Gadde 2002, Halinen & Törnroos 2005, Lukka & Kasanen 1993).

5 Discussion and conclusions

The purpose of this study was to incorporate the theoretically further developed concept of reflective practice into the competence assessment process for measuring human capital in organizations. As the model was constructed along interventions in a real-life organization, there was also a possibility to evaluate how well the process enabled reflection and provided added value to competence management.

The RCA process was aimed at stimulating awareness, discussion, and development actions through the help of a facilitated self-reflective questionnaire, the results of which were shared and discussed among teams; furthermore, development ideas were collected and provided to the management team. After the researchers had provided the assessment tools, the analysis of the results, and technique coaching, the organization was expected to take the leading role in driving the process. The feedback from team sessions was very positive, and the reflective brainstorming techniques were widely accepted. Yet, the development ideas collected in the sessions were not put actively put forward to implementation, and the process seemed to be paralyzed in the “actions and experimenting” phase. This observation is similar to Chiucci's (2013) case narrative,

where the change process tended to stop in the abstract conceptualization phase and did not lead to real changes in principles and practice without the researcher's strong support in increasing the aptitude for concreteness.

As researchers, we felt that throughout the process there was a paradox between the enthusiasm and expectations regarding reflective techniques and work practice and how much effort people were willing to put into an open-minded evaluation of their own work. This critique is directed at the management practices and organizational structures as well as the group of managers who could influence the organizational prerequisites. The biggest constraint for not utilizing reflection in developing competencies – or at work in general – was a perceived lack of time. We argue that based on what is known about human learning and changing mental models, reflection is crucial for any real change – in both individuals and in organizations (Hodgkinson & Healey 2011). We are thus presented with the following paradox: why is there no time to stop in order to speed up?

Regarding the competence goals, i.e., sharing of knowledge, trans-professional collaboration, partnering with customers, and reflective practice, the RCA process revealed another dilemma. Members of the organization at all levels wanted to have more assertive and systematic supervision. It was said that the common rules and guidelines are too vague and that good ideas rarely materialize. A common perception was that tight measurement of “billable hours” discourages formal and informal meetings where collaboration could be created. On the other hand, quite often it was admitted that perhaps the majority of the employees in health care strongly prioritize the work with customers, and that “internal or development work” should not take too much time in daily work. In developing the work practices toward strategic goals, people at the same time want independence, but do not necessarily accept full accountability for the results. This dilemma was discussed in the management board in order to reconstruct the collective understanding of expected results and the purpose of the organization as a service provider. The RCA slowed down the management team to enable them to understand the extent to which the orientations may differ within the organization as well as why it is practically indispensable to use all the time needed to agree on the values and mission of the organization in order to create the attitude and culture to support the competence development.

Toward the end of the process, the attention was directed at “the way we speak and express our concerns.” Practicing reflective skills pointed out how much significance lies

in voicing opinions and suggestions – or in the absence of such voices. In organizational contexts, we often believe that we can build the image of professional competence by making strong and absolute statements. Yet, in today’s volatile environment, we need the kind of competence that balances the experience-based, routine thinking and active questioning of existing interpretations and mental models (Weick et al. 2005). And thus we arrive at another paradox: how can one express doubt, ambivalence, and uncertainty without losing one’s convincing, professional reputation?

This leads back to the discussion of what constitutes professional competence. In the case organization, an intensive debate emerged regarding a “driver’s license for a health care professional,” and the value of meta-competences besides the traditional technical and clinical skills. Now if we consider knowledge formation and sharing as happening within the work practice (Lave and Wenger 1991), the role of the community (of practice) becomes critical. Professionals as learners learn the subjective viewpoint of the community and learn to speak its language (Brown and Duguid 1991). What is considered as competence is actually produced within the community, i.e., its sociopolitical, structural setting and power relations (Contu & Willmott 2003). Reflection offers a possibility to investigate and ultimately change the meaning structures, language, and forms of competence which are recognized and valued in the community.

Managing the organizational renewal, and consequently changing competence needs, is inherently a process of managing paradoxes and conflicting demands (Van de Ven & Poole 1988, p. 83). The complex and ambiguous challenge for renewal includes seemingly exclusive elements – demands, emotions, perspectives, and ideas (Cameron & Quinn 1988). This complexity can represent a source of organizational paralysis, as the actors struggle to make sense of the underlying tensions (Smith & Berg 1987). To summarize the value of reflective assessment, based on this preliminary case exploration, we suggest that its value is its ability to make visible the conflicting demands related to competence assets. Contrary to its reputation, reflection produces very concrete results, as it aims at changing the ways we talk, listen, understand, and act. Karl Weick had already posed the following question in 1979: “How can I know what I think till I see what I say?” Often the needed knowledge, or more broadly, the competence assets are already in the organization, and the solution can be seen by taking a closer look at the mirror.

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The boundaries of a performance management system between knowledge and control

Ernesto De Nito*

Dipartimento di Scienze Giuridiche, Storiche, Economiche e Sociali
Università degli Studi Magna Græcia di Catanzaro
Campus Universitario "Salvatore Venuta"
Viale Europa - Località Germaneto, 88100, Catanzaro - Italy

Vincenza Esposito

Dipartimento di Diritto, Economia Management e Metodi Quantitativi
(DEMM), University of Sannio
Via delle Puglie, 82 – 82100 Benevento - Italy

Mario Pezzillo Iacono, Marcello Martinez

Dipartimento di Strategie Aziendali e Metodologie Quantitative
Seconda Università degli Studi di Napoli
Corso Gran Priorato di Malta, 81043, Capua (CE) - Italy

Lorenzo Mercurio

Dipartimento di Studi Aziendali ed Economici
Università degli Studi di Napoli Parthenope
Via Generale Parisi, 13 - 80132 Napoli– Italy

Paolo Canonico

Department of Business Administration
Università degli Studi di Napoli Federico II
Via Cintia, Monte S. Angelo, Napoli

* *Corresponding author*

Structured Abstract

Purpose – This article aims to investigate the relationship between performance management systems (PMS) and knowledge in a service organization. A PMS could be defined as *a control framework which attempts to ensure that certain ends are achieved and particular means are used to attain these ends* (Broadbent and Laughlin, 2009: 293). The basic idea is to consider the PMS in the organization as an important process in order to go deeper on the level and quality of know-how of the member of the organization. Typically performance systems are used as a tool to plan and to coordinate activities and workers. Notwithstanding there is a key dimension related to the possibility of

interpreting PMSs not just as an information box, but as an opportunity to reflect on what is going on and why inside the organization (in terms of performance and activities).

Design/methodology/approach – Franco-Santos et al. (2010) point out that, although it is possible to design, maintain and use a PMS without organizational learning occurring, such an outcome is extremely unlikely: in fact, one of the primary effects during the system design is improved knowledge of the organization. In according to Ferreira and Otley framework (2009), we want to address these research questions: what type of use is made of information and of the various control mechanisms in place? Our studies relies on a single case study. We selected a service organization which could provide a consistent, differentiated and information rich setting for studying the phenomenon under scrutiny.

Originality/value – This paper would like to propose new lens in order to interpret PMSs, overcoming the positivist/functionalist paradigm characterized by a focus on the causes-effect relationships, statistical testing, and linear thinking (Latham et al., 2005).

Practical implications –This paper would like to offer a critical perspective (Micheli and Neely, 2010) regarding the use of traditional managerial tools in a service organizations, pointing out how the principles of efficiency and effectiveness risk to remain vague in their applications and overlooking the issue of knowledge.

Keywords –performance management systems, knowledge

Paper type – Academic research paper

1. Introduction

The role of knowledge in service organizations is generally described as the only way to compete in a market characterized by radical and continuous change. Common expressions such as knowledge economy or new information age are shared among scholars and practitioners and they are typically taken for granted. In many industries and particularly in the service one, knowledge plays a critical role in facilitating innovation and creativity. As stated by Kandampully (2002:21): “In this competitive environment, knowledge is progressively being perceived as the core driver of competitiveness”.

In coherence with the ideas even the accounting literature started during the 90’s to discuss about the role of knowledge in the control management systems, arguing that even this tools should be evaluated on the their capacity to contribute to manage knowledge (Bhimani and Roberts, 2004): control and knowledge became two different sides of the same coin.

This paper would like to offer a critical perspective regarding the use of traditional managerial tools in a service organizations trying to verify how and to what extent it is

possible to interpret a Performance Management System (PMS) as a typical control mechanism or in more innovative way as a knowledge enabler (Brudan, 2010). The paper is organized as follows: in the first paragraph is presented a literature review on the relationship between PMS and knowledge. We then describe the methodology used for the empirical analysis and analyze the research context. We then set out and discuss the data and information from the empirical research before summarizing the main findings and our conclusions.

2 Performance Management System and knowledge

The relationships between management accounting research and knowledge are not new in the literature. An important contribution coming from the accounting literature was published on Management Accounting Research in 2003 in a special issue related to the topic of “*Management accounting and knowledge management: in search of intelligibility*”.

The idea was to emphasize the role of accounting and control as knowledge enabler. In particular Bhimani and Roberts (2004; p.1) state: “If it is believed that within organisations, “future wealth and power will be derived mainly from intangible intellectual resources: knowledge capital” (Burton-Jones, 1999, p. 3), management accounting will increasingly be judged in terms of its impact on knowledge management activities.”

At that time we were experiencing the knowledge management fashion, scholars and practitioners were discussing about the role of knowledge within society and organizations: there was the common idea knowledge would be the most important resource, the only way to compete. Knowledge was becoming one of the main issue in the scientific community as shown also by the number of journals founded in that period (the first number of Journal of Knowledge Management appeared in 1997, the first number of Journal of Knowledge Management research and practice in 2003).

Notwithstanding the effort of scholars in the field, the relationship between control and knowledge was still underestimated in the mid 2000’s. As Turner and Makhija (2006:197) argue: “The literature provides us with only a rudimentary understanding of such organizational processes associated with the treatment of knowledge”. For this reason they proposed a contingent model in order to analyze the influence of control systems on the different kind of knowledge attributes. The main idea was that control

systems have inherent information processing properties that influence how knowledge is shared and disseminated within the organization (Turner and Makhija, 2006).

Ditillo (2004) used a contingent approach to investigate the interconnections between knowledge and control/performance systems in knowledge intensive firms. According to his model, Management Control Systems play a double role in knowledge-intensive firms: they help coordinate activities and foster a specific mode of knowledge integration.

During these years there was an effort to make control a more strategic issue, based on the concept of Performance Management System (PMS).

A PMS is “the set of metrics used to quantify both the efficiency and effectiveness of actions” (Neely et al. 1995, p. 81). As stated by Otley (1999, p. 364), PMSs provide the information that should be useful to managers “in performing their jobs and to assist organizations in developing and maintaining viable patterns of behaviour”. According to Ferreira and Otley (2009, p. 264) management control system has become “a more restrictive term than was the original intention and we prefer to use the more general descriptor of PMS to capture an holistic approach to the management and control of organizational performance. We see this term as including all aspects of organizational control, including those included under the heading of management control systems”. In other words, PMS is a new label for an old concept: it represents a way to describe a new theoretical framework, whose aim is the design and the implementation of the “package of controls”.

The main goal is to gather and provide information to help managers in their decision-making activities in order to efficiently and effectively achieve the desired organizational goals, acting on the employees motivation and the performance assessment (Canonico and Söderlund, 2010).

In the traditional accounting research (as mentioned in Melnyk et al., 2013:1) performance measurement and management is set up to facilitate *effective control and correction by reporting the current level of performance, and comparing it with the desired level of performance (i.e., the standard)*...To some researchers (e.g., Magretta and Stone, 2002), *PMM is more important than the mission statement: metrics enable the organisation to convey the strategy to everyone else in terms they can understand, thus making the strategy concrete and meaningful. The use of performance measurement and management systems is frequently recommended for facilitating strategy implementation*

and enhancing organisational performance (e.g., Davis and Albright, 2004) – a view that coincides with much of the Balanced Scorecard rhetoric.

Meanwhile many scholars are pointing out the broader functions of a PMS that should be implemented in order to accomplish different tasks and goals, among the others (Melnyk et al., 2013: 4): influencing behaviour – good and bad performance; stimulating action – identifying when to intervene; facilitating learning – both single and double loop; Implementation of strategy – ensuring change happens.

In particular the issue of learning refers to feedback and feed-forward information flows that characterize organizations (Ferreira and Otle, 2009): in this sense, PMSs could be interpreted as a process where interaction and communication among members support learning and the creation of knowledge within the organization, both in a tacit and an explicit dimension (Viavio, 2006).

Franco-Santos et al. (2010) point out that, although it is possible to design, maintain and use a PMS without organizational learning occurring, such an outcome is extremely unlikely: in fact, one of the primary effects during the system design is improved knowledge of the organization.

Brudan (2010) distinguishes between performance management as “command and control/ mechanistic system” and performance management as “systems thinking”. The first one focused priorities on volume, standards and control through product standardization, work process specialization and the use of goals, interpreting organizations as top-down hierarchies, where managers make decisions using budgets, standards and targets. Differently, systems thinking promotes a holistic approach to managing organizations, placing more focus on the learning and human relationships. In particular, a systems thinking approach to performance management focuses on the definition of the system, its purpose and the measuring of how its purpose is achieved. Instead of an isolated approach, the focus is on integrating all components of the system and mapping the relationship between them in addressing and satisfying demand. In other words, Brudan (2010) points out the tension between the measurement and rewards ethos to learning and improvement. In Table 1 we refer to the main characteristics related to PMS for control compared the features of PMS for learning.

In according to Brudan framework (2010) our study wants to understand how and to what extent PMS is used as a knowledge enabler, as a tool to facilitate communication inside the organization, or just as a traditional control mechanism.

Table 1 - Measurement for control compared to measurement for learning

Source: Brudan (2010)

Characteristic	Measurement for control	Measurement for learning
Measurement drivers	Management	Employees
Measures development	Top-down commands	Process-oriented bottom-up approach
Measurement role	Measuring and managing work in functional activities	Measuring and managing the flow of work through the system
Measurement focus	Productivity output, targets, standards: related to budget	Capability, variation: related to purpose
Results communication	Restricted	Open
Target driven by	Budget/political aspirations	Understanding achievement versus purpose
Follow-up to results	Rewards, punishment and action to improve results	Dialogue and improvement
Learning cycle	Single loop	Double loop learning
Link to rewards	Link to individual rewards and recognition system	Group rewards, based on improvement

3. Methodology

The empirical analysis is based on a qualitative investigation. The empirical analysis consists of a specific case study, carried out in the period January- April 2014, showing the relationship between PMS, control design and knowledge in an Italian airport management company (Gesac).

The collection of data was carried out using a heterogeneous plurality of instruments. Such pluralism is coherent both with the theoretical framework and with the differentiated nature of the information required by the multiple case studies method. The case study was developed, in the first phase, through 3 unstructured interviews (with the Human Resource Management, the Quality, Safety and Environment Manager and the Passenger Traffic Manager), to investigate the purpose and rationale of design that characterizes the PMS. Subsequently, the investigation continued with participant observation in the 3 different organizational units, involving two of the authors in all stages of the PMS.

4. Empirical Analysis

Gesac S.p.A. – *Società di Gestione Servizi Aeroporti Campani* – is the management company of the Capodichino Airport in Naples, based on a forty-year concession expiring in 2043. Capodichino is the third-ranking regional airport in Italy, with 5,8 millions of passengers in 2012.

The company was established in 1980 by the city of Naples, the Province of Naples and Alitalia as a majority state-owned company. In August of 1997, each of the state agencies sold 35% of the share package to BAA plc. Fully aware of the strategic importance of private management for the future development of not only the airport but the city as well, the public partners (City and Province) decided to privatize Naples airport making it Italy's first privatized airport. In June, 2006, the ADI Consortium – Airport Development and investment Limited – under the leadership of the Spanish Ferrovial Group, acquired ownership of the BAA Group thus become the management company's majority shareholder. Finally, on December 21, 2010, pursuant to an agreement signed on October 1st, the sale of majority shares in Gesac was finalized and the ownership of the company was definitively transferred into the hands of the Italian F2i – Fondi Italiani per le Infrastrutture- Group. The main traffic and infrastructure data are summarized in Table 1:

Table 2 – Gesac traffic and infrastructure data

5.444.422 million passengers in 2013
7.515 tonnes of cargo and mail
55.940 movements (take-offs and landings)
11 domestic destinations
40 international destinations
50 charter destinations
23 airlines
25/26 aircraft stands
56 check-in counters (T1)
15 check-in counters (T2)
15 gates
28 shops
9 café and restaurants
2 Exchange Bureau
2257 car parks and 74 motorbike parks
8 Car Rentals

The primary duties of the airport management company include:

- maintenance, management and development of the infrastructure and airport systems;
- coordination and control of the quality parameters related to all flight operation services;
- management, coordination and control of passenger boarding and arrival services;
- airport security and control of passengers and hold baggage;
- coordination and control of handling activities related to flight operations;
- development and control of the commercial services provided for airport users.

The company employs approximately 300 employees, to which are added (on average) 40 seasonal workers a year. In 2013, at the height of the financial crisis, the company launched a major process of change and organisational development, which began with the appointment of a new Chief Executive Officer.

Since privatisation, the company has always invested in the design and implementation of a PMS, the aims, features and functionality of which have subsequently changed over time in line with the different strategic approaches preferred by the management.

Currently, GESAC's *mission statement* gives the PMS a central connecting role between the operational management and strategic development of the employees. *“Working at Gesac means joining an organisation in which everyone is given a chance to participate and to express their own talents and professional skills, contributing towards high individual and team performance. Our strength, the mainstay of success and our competitive edge, is our people. In a service-providing company like ours, human resources are the fulcrum of each and every activity ... Our resources join a structured system in which training and continuous performance-monitoring activities enable them to enhance their technical and managerial skills, resulting in added value for the service offered ... For example, a structured Performance Management system enables the effectiveness of our training activities to be monitored continuously and new needs to be identified”.*

GESAC's PMS, strongly supported by top management, is managed by the Human Resources Department with the cooperation of the Quality, Safety and Environment Directorate, and by the Finance department.

The GESAC PMS involves about 30 managers and supervisors, and 8 sectors that make up the operational directorates.

The process is divided into the traditional four stages of strategic planning, operational planning, monitoring and measurement / evaluation of performance. Specifically:

A) The QA management assists senior management in strategic positioning with regard to benchmarking and the customer satisfaction with which the company is constantly engaged;

B) The HR team, in collaboration with QA and Finance teams, supports the leadership in the structuring of operational objectives;

C) The HR team, in collaboration with QA management, monitors the partial mid-term results;

D) The HR team, in collaboration with the QA team, supports executives and senior management in the collection of data to enable assessment of individual and departmental performance.

Performance management results are due strictly to an incentive system of variable remuneration. The instrument used for monitoring PM is a "*management dashboard*" divided into 5 strategic objectives connected to an MBO designed to evaluate managers and supervisors, and a productivity report for employees of different departments.

The MBO system is the key to the PMS. For executive / board bonuses, 50% will be based on organisational performance goals (EBTDA, traffic levels, quality) and the other 50% based on quantitative achievement of individual goals (from one to three), set by top managers in the various functional areas in accordance with the HRM unit (e.g. labour costs, results of *customer satisfaction* surveys, maintenance levels, employee absenteeism rates, team-working skills, etc.). Achievement of individual goals is divided into four levels of achievement: the bonus is, therefore, made on the basis of how close the result is to the stated objective (e.g. 25% - 50% - 75% - 100%). The total bonus can reach up to 20% of the gross salary of executives and up to 7% of gross salary for middle management. The evaluations do not include items related to organisational behaviour (if we exclude team-working).

The degree of achievement of organisational and individual objectives is closely linked to the measurements of highly centralised control systems and, at least in part, administered by bodies outside the company that oversee important functions of quality assurance and security levels at airports. Specifically, the objectives reflect the typical measurements of the following systems:

- the regulated system of 54 indicators endorsed by ENAC (the Italian Civil Aviation Authority), which is part of the company's list of services;
- the Quality of Service Monitor (QSM), for monitoring of passenger satisfaction in quality of airport services, both those provided by GESAC and those provided by other parties present at the airport, identified by 80 indicators based on face to face interviews with passengers. A system of “face-to-face” surveys of passengers is based upon a 5 level scale of satisfaction. The surveys regard all airport services provided by either the airport management company or other operator present at the airport and are conducted by an independent specialized company;
- the Quality Control System (QCS), aimed at monitoring the quality delivered by the various parties responsible for the management of airport services, through analysis of statistically significant samples of customers. QCS includes the measurement of waiting times considered to be critical to airport customersatisfaction based upon a statistically significant sample;
- the benchmark analysis system for a group of 250 airports in the world by perceived quality;
- trend analysis of performance with more than 4,000 interviews conducted each year by an external company.

The data published in the Table 2 have been obtained from QSM and QCS, complaints and other Quality Management System instruments. They represent the main indicator related to the airport quality (i.e. service regularity, cleanliness, counters and gate services, etc.) and the Gesac targets for 2014.

Table 3 - The targets for 2014, grouped together according to quality factors

	Indicator	Unit of Measure	Target
SERVICE REGULARITY	delayed departing flights due to airport operator	% (nr. delays/nr. flights)	0,3
	delayed departing flights	% (nr. delays/nr. flights)	21
	misrouted baggage	nr. misrouted baggage/1000 departing passengers	0,8
	baggage claim time	maximum waiting time in 90% of cases	first bag 24' last bag 33'
CLEANLINESS	perception of hygiene levels and working order of toilet facilities	% satisfied passengers	98
	overall perception of cleanliness levels in airport	% satisfied passengers	99
COUNTERS AND GATE SERVICES	waiting time in check-in queues	maximum waiting time in 90% of cases	15
	perception of waiting time in check-in queues	% satisfied passengers	95
	waiting time in security check queue	maximum waiting time in 90% of cases	7
	perception of waiting time in check-in queues	% satisfied passengers	98
	perception of waiting time in queues at passport control	% satisfied passengers	99
CONNECTIONS BETWEEN AIRPORT AND CITY CENTRE	perception of clarity, comprehensibility and efficacy of external signs	% satisfied passengers	95
	perception of the availability, frequency and prices of buses and taxis	% satisfied passengers	90

As mentioned, the HR department supports and negotiates with management to define of operational objectives that meet performance expectations drawn from the monitoring systems indicated. Finally, during the performance evaluation, the executives receive support from the HR department for guidance and homogenisation of their evaluation behaviour. The assessments determine the size of bonuses for executives and productivity bonuses for employees of different departments.

5. Discussion and conclusions

The discussion of the results of the case study focuses on two main points:

1. The functionality of the PMS;
2. GESAC's approach to the design of the PMS.

The GESAC PMS is interpretable as one of the most important and effective control levers employed by the company. During the interviews with the Director of HR, it was found that the PM is, in fact, identified as one of the essential operation systems for the company: "*Evaluation is an asset: if you stop performance measurement, the airport shuts down!*" The HR Director – process owner of PMS – also argues that it should be viewed primarily as an operations support system and only indirectly supports the strategic management of people. "*In our company, in terms of functionality, the system represents 70% of control functions and 30% innovation and staff development*". The HR director adds: "*The PMS is used for the remuneration policies of the staff but also has significant impacts, especially in terms of policy*". The same interpretation is shared by the leadership: that, under PMS, they are not only subjects for evaluation themselves, but are also themselves evaluating the management and control function's performance.

During the focus groups, the Director of Passenger Services says: "*The PMS is primarily a tool of control; certainly the PM system also improves the commitment of workers and generates satisfaction through rewards, but the real development lever consists in the definition of tools for the identification of clear targets and ongoing monitoring*"; the Director of Infrastructure confirms: "*The PMS mainly supports the ability of managers to integrate critical processes in a cross-cutting and strategic dimension*"

Finally, the Head of Quality highlights: "*The PMS is the essential link between the two planning moments: strategic planning supported by the important process of analysis and benchmarking, which our company is also undergoing to respond to regulatory requirements and contractual obligations on an international scale; and operational planning that defines our final management position with respect to the challenges posed by the markets in general.*"

The documentary analysis and interviews have revealed the level of maturity of the GESAC PMS. The results of management of this system are described by the Head of HR in terms of the timing of operational characteristics, the skills shown by operators in using the PMS tools, and the degree of homogeneity in behavioural evaluation. The Director of

HR says: *"The PM system has a long history in our company. This year alone, we are implementing an organisational development project that will permanently remove some small inconsistencies that we have highlighted in recent years. But essentially the system continues to provide good results: managers know how to interpret the goal setting phase, are encouraged in their role as leaders, are punctual in the delivery of schedules, and there are no contentious situations at the end of the evaluation cycle."*

The quality and robustness of the results are also described in terms of availability and involvement of employees in the different phases of the PM process, and the satisfaction that emerges from the connection to incentivising policies. According to the HE manager: *"The unions want the evaluation. Employees are motivated by rewards and would be in trouble without the strong leadership from management providing clear business objectives."*

The totality of the PMS' positive results is due, according to interviews with top management, to a clear managerial approach adopted in the design of the system itself. The PMS is known to deliver objectivity, especially in the measurement of the contributions of the various organisational units, and support for coordination through standardisation of objectives. During the redesign process of the PMS (which coincided with the last change of ownership of the company), management has decided, therefore, to entirely exclude measurements and evaluations of behaviours and skills associated with job performance from the system. According to the Director of HR: *"The behaviour measurements can be manipulated and are not objective... so these should not be linked to the bonus. Evaluating behaviour opens up potential for excessive margins for negotiation... and may open the way to opportunism for the evaluator. For this reason we have decided to remove these behavioural items from the set of tools used for performance evaluation."*

Official statements attribute the PMS with strong strategic value for HR development: *"Our resources are included in a structured system that, through training and continuous monitoring of performance, allows them to increase their technical and managerial skills, thus adding value to the service offered."*

Performance management is mostly driven by financial indicators and customer satisfaction quotas, used for checking if people were completing their tasks as assigned by top managers. The selection process of PMS objectives is, in fact, of the top-down type: those in charge of functions set the resulting targets using cascade logic. The high degree

of attention that the management holds for those targets "legitimised" by international certification and measuring systems outside the company results in a strong connection of the PMS to the focus of control tools through automated mechanisms. Through the objectives and standards of hetero-specific performance measurements, the PMS supports processes that centralise planning and boost the effectiveness of managerial control.

PM design emphasizes financial measures and a command and control approach, based on monitoring the achievement of targets: the measurement is driven by the management; measures development is linked to top-down commands; measuring and managing work is embedded in functional activities; measurement focus is on productivity targets, and standards related to budget; results communication is restricted (top management); follow-up are individual rewards, punishment and action to improve results (and non-inter-hierarchical dialogue); and the learning cycle is single loop way.

Observing the performance management practices, it emerges the dominance of the measurement and rewards ethos (as opposed to learning and improvement). In this sense, the gap between the formal intention of the company and the real implementation of the PMS is clear for all to see.

The higher degree of centralization and the use of PMS as a way to manage power are directly related to the real goal the management wanted to achieve: to have a higher level of control inside the organization.

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Challenges of knowledge management in transdisciplinary urban planning

Katharina M. Borgmann

IN-EAST School of Advanced Studies
University of Duisburg-Essen
Universitätsstraße 2, 45141 Essen

Structured Abstract

Purpose - This research paper is addressing the difficulties of interdisciplinary and transdisciplinary knowledge transfer in respect of urban textures and furthermore the impact of knowledge, about surroundings and environment, on sustainable and holistic growth. In order to channel resources and set the focus at the right place at the right time, one important key factor is understanding and therefore decoding the transforming urban structures. Generating a base for an interdisciplinary dialogue about the potentials, risks and possibilities of the existing urban structure and its development between business organizations, public authorities and organizations is one purpose of this paper.

Design/methodology/approach - It is the approach to contribute to the well-established discussion about urban textures and its complex structure connecting to correlating research topics, not only for the benefit of the community of architects and urban planners in research and practice but also for the larger target group of experts from other research fields and practices.

Originality/value - Are the known tools of Knowledge Architecture, knowledge transfer and knowledge management adequate to generate and transfer the necessary knowledge of complex urban structures? Do we need to rethink, question or expand those described methods in order to meet the transdisciplinary requirements by not only transforming but also translating knowledge for diverse, heterogeneous recipients in order to be applicable in research as well as in practice? Having the effect of the increasing globalization in mind the importance of accessible, understandable knowledge gains significance in order to follow the approach of supporting a sustainable and holistic growth on multiple levels.

Practical implications - Bridging the still existing gap between architecture and urban planning on one hand and non-architectural disciplines and professions on the other hand is a second aim of research. Hence it is a necessity to transform the knowledge about urban structures into a more universal accessible language. The identification and establishment of existing interdisciplinary knowledge transfer tools, in order to make possible recommendations. Spheres of influences for various fields of expertise might be discovered and identified. This is possible only by translating the respected expert knowledge and offering this processed, transformed knowledge to an audience of various disciplines.

Keywords – Urbanism, Transdisciplinarity, Sustainable Urban Growth, Knowledge Transfer, Innovation

Paper type – Academic Research Paper (Doctoral Consortium)

1 Introduction

The challenges, the possibilities and the chances to create sustainable growth, more specifically sustainable growth and sustainable transformation within the urban context are the main foci of this paper.

The complexity of sustainable urban development calls for transdisciplinary working partnerships. These collaborations have the aim to effectively create the best possible environment for sustainable urban transformation and growth. The research area of urban planning, among others, is strongly transforming from theoretical and disciplinary 'Mode 1' research approaches towards interdisciplinary more practical oriented 'Mode 2'¹ research approaches. Because of the existing multiple layers and diverse structures in the field of urban planning there is a demand for transdisciplinary approaches in order to respond to the challenges of today's professionals creating the cities of tomorrow.

It is not only important to understand the multiple factors of influence acting upon the process of urbanization, but also to keep in mind the actors and the process of creating and developing a sustainable urban environment. Urban growth is sustainable in its approach when it is considering and benefitting from all involved and respected disciplines in a holistic line of action in order to create individual urban solutions. Developing and translating the specific requirements (kind of project, recipients, demands of the surroundings 'genius loci', historical background, socio-cultural factors etc.) of each urban project into urban physical environment is the common intension of the involved stakeholders.

2 Development of Urban Planning

Urban design and urban planning as well as the research of urban design focuses on the physical, including topography, climate and many more up to the built components of the city. Urban planners and designers are trained to translate the needs and demands of the urban residents into physical environment considering multiple factors of influence in order to meet the requirements of today's as well as tomorrow's inhabitants and institutions. Fainstain describes this discipline, including some aspects which contribute to the complexity of urban planning: *„urban planning draws upon ,engineering, architectural, and social and political concerns, it is variously a technical profession, an*

¹ Page 10, Chapter '3.1. Mode 1 and Mode 2 research methodology' gives detailed information about Mode 1 and Mode 2

endeavour involving political will and public participation, and an academic discipline“ (Fainstein, 2014).

Because of the rapidly transforming factors of influence acting on urban agglomerations on one hand and on architects and urban planners on the other hand, the process of designing, shaping and creating urban structures is undergoing a transformation in order to fulfil on-going and future design and research approaches.

Processes of Urban Planning

The well-established disciplinary approach of urban planning transforms more and more towards joint ventures, formed by experts from involved disciplines depending on the respective project type, in the process of carrying urban projects into execution with a sustainable concept.

Certain factors of influence shape our urban environment physically as well as ‘atmospheric’ and contribute to the complexity of urban structures as much as the process of designing the city. These - in the following called ‘urban factors of influence’ - not only influence and transform all aspects and components of the city, but also influence the experts designing and creating cities.

On a superordinate level of influence, affecting the urban structure and its transformation, several factors exist: cultural influences, demographical-, ecological-, economical-, political- and technological influences, just to name some of them in alphabetical order, without claiming to be exhaustive.

The project initiator, the client, who is in direct dialogue with architects and urban planners, represents one further level of influence. Mostly public institutions like governmental agencies or semi- public contracting authorities, commission the architect or urban planner with the respective project types of urban scale. Most of the times the kind of client determines certain needs and expectations regarding the specific project. This could mean for example budgetary limitations, the external impact and image represented by the visual appearance of the project to name some. Furthermore the characteristics seen and experienced of the project results are very much related and determined by the project type. Redesigning the existing structure of a city centre in central Europe, developed during the 1960es, towards a shared space concept for example, differs to a considerable extend from an urban project type like developing a new central business district (CBD) or science park in the outskirts of an Chinese or

South American city. Despite the multiple differences of the just mentioned urban projects, there is still a uniting factor to them, the architects and urban planners challenged with these different types of projects² could be the same, working in a western architectural or urban planning office and dealing with these diverse projects.

Hence the transformation of the global urban environment is not only in the hands of and controlled by architects and urban planners but rather shaped by the respective factors of influence.

Architects and urban planners of course represent one of the proactive, shaping and creational stakeholders involved in urban growth, by translating the assignment of tasks into physical built innovation with impact on the visual appearance of the city (Fig. 1: ‘Urban Factors of Influence I’).

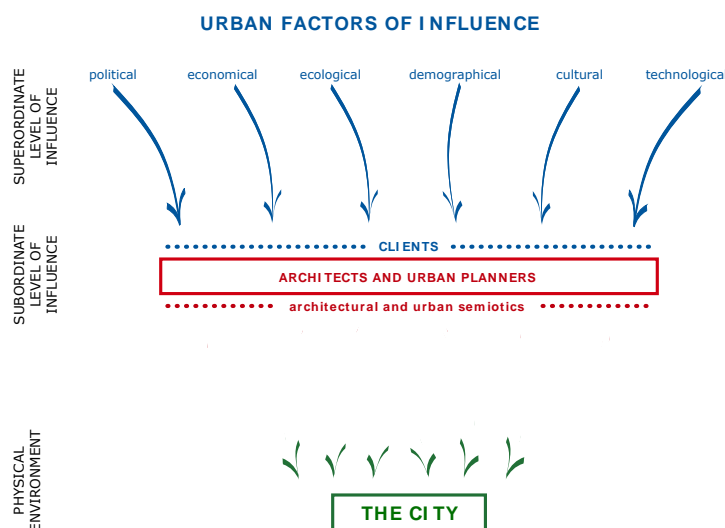


Fig. 1: ‘Urban Factors of Influence I’

Architects and urban planners are educated, affected and influenced by their surroundings as much as anybody else therefore the way they translate the individual

² Architectural and urban planning approaches of so called ‘signature architects’ are not taken into account within the scope of this paper since the purpose of these projects is not necessarily always coherent with sustainable approaches.

design tasks into physical urban space depends very much on the factors of influence mentioned above. The end product, our built environment, designed by architects and urban planners, needs to meet the current and future requirements of cities.

Challenges in Urban Planning

Disciplinary, Mode 1 approaches, of architects and urban planners both in practice and research, turn more and more out to be an insufficient approach for some of the future sustainable urban developments. The requirements and needs of cities got more and more complex and diverse within the last decades, environmentally challenging, and technologically trying to keep up with the highest possible level. Today's cities transform towards 'smart' and 'green' cities, and therefore the disciplinary design approaches of architects and urban planners alone are not always sufficient anymore in order to meet the future requirements of the complexity gaining different urban projects.

The rapidly happening technological progress, since the last century, leads to a raising demand of certain facilities provided by the respected urban environment. This process of meeting the claim of the urban population and trying to keep up with the existing technology by implementing whichever possible technological innovations further increased the already high complexity of the urban environment. This is even more relevant if we broaden our perspective to the global urban issues, the results of the described urban achievements get more obvious for example almost collapsing metropolitan areas in East Asia.

In the following several important factors adding to the raising complexity are going to be described in more detail. All of the below mentioned factors and urban challenges, without claiming to be limited to the enumeration, need to be considered, and focused on in order to find a sustainable approach and to lead current and future urban growth to a more sustainable direction.

One of the main urban challenges of today's and future's urban agglomerations is the *traffic overload*, a side effect of the growing demand and use for one's own means of transportation, especially in the East Asian raising countries like China and India. A result obtained from the above mentioned traffic overload is the increasing load of *pollution of the environment*, caused mainly by industries and traffic, concentrating in dense urban agglomerations. The so called mega cities stand highly at risk to cause and experience ecological collapses, like health effecting air or water pollution - as can be seen in Beijing

- by not being able to manage the problems or by acknowledging them too late (Lu, 2009, pp. 1–2). The sometimes underestimated challenges for the city and its inhabitants regarding the urban climate, water and energy supply is an additional layer necessary to consider. The global urban growth, affect both European industries and citizens on multiple layers, because of short and long term consequences like shortage of natural resources, environmental pollution, waste management and many more.

The constantly growing number of urban inhabitants, due to *migration* of the rural population into the rapidly growing cities, generate great demands on the urban *infrastructure*, such as social and educational infrastructure, local business and supply and the technical infrastructure, like transportation. To equip today's urban inhabitants with the widest possible range of options is an important factor to satisfy the claim for today's quality of urban life in western cities. The flexibility and immediate availability, everywhere and at all times, of multiple transportation options (metro, tram, bus, car sharing, city bikes, etc.) and the necessary basic requirements coming along with it (well-developed road networks, well extended rail and bus networks, etc.) became substantial components of the urban quality of life.

Since the past two decades the mental urban space (Contin, Paolini, & Salerno, 2013), the so called 'Cybercity' (Graham, 2004), reaches new levels of technologically demanding infrastructure. The demands of constant unlimited connectivity and access to digital and social media is one of them. Furthermore the increasing need for immediate availability of multiple choices for sports- and leisure time facilities (i. e. alternative break out spaces from the urban environment, local recreation areas, demanding and wide range of cultural offerings, etc.) is also adding to the increasing complexity of urban components in cities.

Hence new urban solutions and technological innovations need to be implemented into current and future urban design developments in order to satisfy and meet the demands and challenges of the constantly transforming cities. The temporal dimension of urban development considering both on one hand the necessary time for urban projects in order to be allowed to develop in a sustainable way and the contingency and limitations of adaptability of urban inhabitants especially in fast urban developing countries like China - Shenzhen - where the urban environment is changing its substantiality within one generation.

The latter mentioned challenges of today's and future cities is not only a task possible to be accomplished by the design of urban planners and architects alone but rather achievable by linking experts of the above mentioned areas, in order to meet the requirements of the diverse urban layers.

The already existing approach of project based diverse working collaborations, formed with experts from important disciplines involved in creating the urban environment, has the aim to lead to sustainable urban solutions. According to the needs and requirements of the project, expert groups are being composed and vary in their composition. Involved stakeholders of these joint ventures could be project developers, landscape architects, civil- and traffic engineers, waste and resource managers, political scientists, sociologists, mathematicians, architects and urban planners as well as representatives of the public, or the industries, etc., but the composition of these collaborations vary according to the project type and its individual requirements (Fig. 2: 'Urban Factors of Influence II').

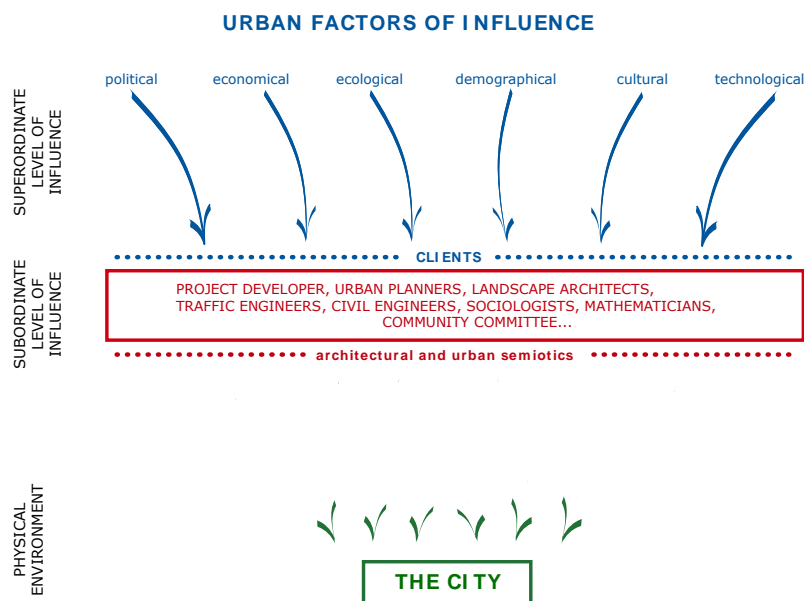


Fig. 2: 'Urban Factors of Influence II'

The ideal approach of these diverse project teams is sharing one's individual expertise and know-how with the other stakeholders in order to create urban projects, which meet

the complex extensive requirements of a sustainable urban environment. Knowledge transfer and knowledge transformation within the mentioned collaborations is thought to create the base in order to let the stakeholders benefit from each other's expert knowledge. In order to achieve this it is important to generate the ideal possible work environment to support the transfer of knowledge between the above-mentioned experts.

The latter mentioned transformation of urban planning both in the research area as well as in practice is developing towards diverse transdisciplinary, Mode 2, project teams. Further detailed explanation about urban transdisciplinarity project based teamwork and its ideal work environment is given in the following.

3 Tools and Methods in urban planning research and practice

The following chapter gives an introduction and an overview of methods and tools used in urban planning research and practice. The applicability of tools and methods for urban planning such as Mode 1 and Mode 2, transdisciplinarity, knowledge architecture tools, scenario development and Transdisciplinary Integrated Planning and Synthesis (TIPS) are going to be analysed from a critical perspective.

3.1. Mode 1 and Mode 2 research methodology

The collaboration of disciplines in order to enrich the research environment and to be equipped to give justice to the complexity of reality as needed in urban planning is discussed and named as 'Mode 2' knowledge production. The established Mode 1 research is described as theoretical and experimental science, mainly a disciplinary approach used by autonomous scientists and research institutions, whereas Mode 2 is characterized as application-oriented and broader distributed. The most important criteria for Mode 2 approaches is transdisciplinarity, as a description for a cooperation of multiple disciplines with shared accountability and responsibility to handle highly complex practical problems.

The "Mode 2" approach is hereby not seen as an alternative for Mode 1, but an extension of Mode 1 and will always need the disciplinary research as a base. (Nowotny, Scott, & Gibbons, 2003, p. 179)

To visualize the different dimensions of Mode 1 and Mode 2 approaches, Dunin-Woyseth and Nilsson created figure 3, which is not only adaptable for his field of study, architectural research, but can broaden the perspective for research approaches in general.

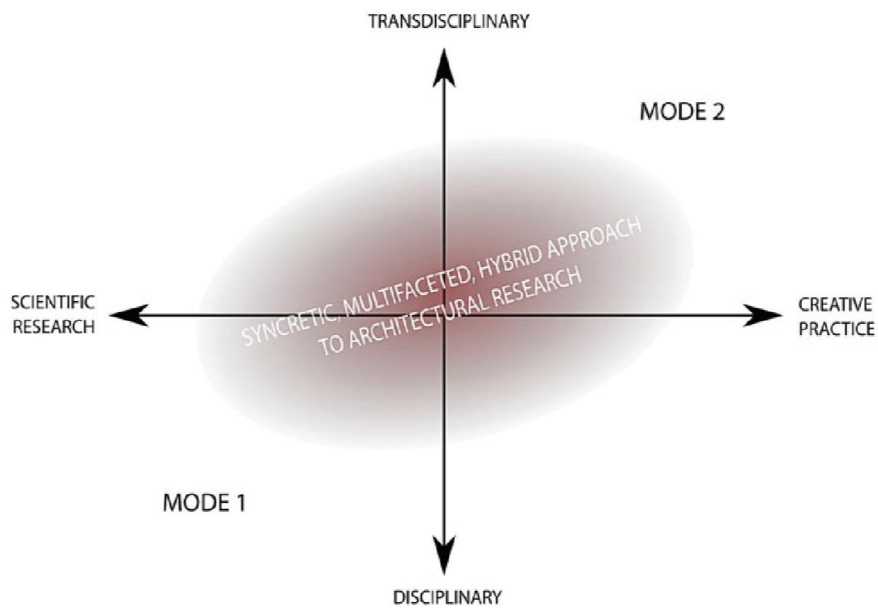


Fig. 3: *‘Expanding architectural research with syncretic, multifaceted, hybrid approaches within the field of dialogues between Mode 1 and Mode 2 of knowledge production’ (Dunin-Woyseth & Nilsson, 2011, p. 93)*

Transdisciplinarity as a new approach within urban planning needs to be well defined and differentiated from related terms such as Multidisciplinary and Interdisciplinary. Both approaches do not have the goal of a combined cooperation of several disciplines in order to understand and solve complex practical problems. In the ‘Manifesto of transdisciplinarity’ Basarab Nicolescu describes transdisciplinarity as follows: *“Transdisciplinarity is [...] distinct from multidisciplinary and interdisciplinarity because of its goal, the understanding of the present world, which cannot be accomplished in the framework of disciplinary research.”* (Nicolescu, 2002, p. 2)

In general, transdisciplinarity is focused on solving complex problems from practice with the collaboration of research and theoretical methods and tools and, especially used for complex problem with a high importance and reach. Bridging the missing knowledge with transdisciplinary approaches is a result of a mismatch between knowledge production in academia, on the one hand, and knowledge requests for solving societal and

practical problems, on the other (Pohl et al., 2007, p. 124; Hirsch Hadorn et al., 2008). Transdisciplinary Mode 2 approaches in urban planning aims at identifying, structuring, analysing and handling issues in problem fields with the aspiration to grasp the relevant complexity of a problem, to take into account the diversity of life-world and scientific perceptions of problems, to link abstract and case-specific knowledge, and to develop knowledge and practices (Pohl & Hirsch Hadorn, 2007, p. 124).

The above described theoretical transdisciplinary collaborations seem not only to meet the complex requirements of urban planning approaches but also seem to be consistent with some of the approaches implemented in today's practice of developing sustainable urban projects. At a closer look various challenges and difficulties appear, especially regarding the necessary and important expert- layman communication, so called expert knowledge transfer.

3.2.1 Knowledge Architecture

Knowledge Architecture is a tool offering structural conditions for an optimized knowledge management environment. It aims to support effective communication and collaboration within diverse teams in order to strengthen the transformation of implicit and explicit knowledge. Spatial, temporal and financial flexibility can increase the usability of creativity and innovation in diverse working groups. Knowledge Architecture as a prerequisite can create a supportive environment and a base to execute transdisciplinary research approaches not only in urban planning. (Noennig & Hentschel, 2011)

This can after all only be a starting point to meet all the challenges and needs of a transdisciplinary research and working situation. For the actual transdisciplinary research approach there are other tools, like scenario planning or TIPS, needed and necessary to be brought into practice.

3.2.2 Scenario Planning

Scenario Planning in the form of multiple disciplinary concept developments is a common and well-known tool in architecture and urban planning. Scenario planning used in multidisciplinary environments is a well-established tool and supporting collaborations. Therefore it should be more intensively used for transdisciplinary approaches in order to

be better equipped to meet the requirements of sustainable urban planning (Zegras & Rayle, 2012, p. 304).

Scenario planning is a quite established method in the practice of certain urban planning projects, but the combination of this method in a Mode 2 approach, along with a higher complexity, because of simultaneous involvements of several disciplines is not fully reviewed in research and not transformed into practical adaptability.

3.2.3 *Transdisciplinary Integrated Planning and Synthesis (TIPS)*

The most complex and fitting support tool as well as research method for dealing with several disciplines to solve complex reality problems is Transdisciplinary Integrated Planning and Synthesis (TIPS) described in the Handbook of Transdisciplinary Research.

„TIPS is an approach to embed a formal, scientifically based, integrated planning approach into a real world setting, allowing for mutual learning among scientists and practitioners.“ (Walter, Wiek, & Scholz, 2008, p. 223)

Within the scope of this definition, the following properties of TIPS are further described:

1. Transdisciplinary approaches are case based and goal oriented.
2. The active involvement of all respective stakeholders as co-leaders with problem ownership through expertise, resources and responsibility is necessary.
3. A high level of interaction between all participants under a common shared problem view is mandatory.
4. The differentiation of involved scientists into disciplinary experts, who are responsible for contributing their disciplinary knowledge and methodology, and transdisciplinary scientists, whose expertise lies in methods of knowledge integration is needed to define clear responsibilities. (Walter, Wiek, & Scholz, 2008, p. 223)

TIPS as a research and practical approach in urban planning is a recommended tool to meet several of the complex requirements faced by the involved stakeholders of interdisciplinary collaborations. However it cannot be identified as a general tool and method to solve all the above-described challenges.

Since TIPS is explained only for a single example in Switzerland, the flexibility of the method and its adaptability still need to be proven.

4 Conclusion and Outlook and Impulses

Which tools and methods of urban planning are applicable and therefore helping to solve the described issues of urban sustainable growth? Is an ideal tool or method existing?

In order to achieve a sustainable urban development, from the perspective of the urban designers as well as from the perspective of urban design research, transdisciplinary collaborations need to be strengthened and the connectivity of theoretical approaches to be expanded towards practical adaptability. Transdisciplinarity is an indispensable approach but needs further development in order to solve the existing difficulties in the expert- layman communication (for laymen of certain expert fields inaccessible resources and knowledge due to technical terminology) in order to benefit from the research results of the other involved fields of expertise.

For further research approaches one of the main questions necessary to be raised at this point is: *How can we provide urban planning Mode 2 research environments with the needed and suitable knowledge management infrastructure?*

Followed by the important resulting hypotheses and questions: *Most of the urban planners and related professions do not know about existing tools of knowledge transfer and knowledge management. How can the outreach of knowledge management and knowledge transfer tools be widened and the impact of these tools increased?*

Existing transdisciplinary approaches like TIPS give important impulses to lead urban planning approaches to more sustainable results on several levels, but it does not do justice to projects which deal with the additional levels of tremendous fast urbanization and cultural differences. Such urban projects happening in China designed by western architects and urban planners face cultural differences which can't be solved alone by approaches like TIPS.

The aim has to be to match the appropriate palette of tools and methods with the fitting complex urban projects, handled by the individual transdisciplinary working collaborations. In order to achieve this, the knowledge about the possible methods and tools helping to create sustainable urban growth needs to be brought to the respected transdisciplinary project based collaborations.

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From Idea to Innovation – The Role of Creativity in Knowledge Management

Anja Jannack

Department of Architecture
TU Dresden (Dresden University of Technology)
Germany

Structured Abstract

Purpose – The paper reports on a doctoral thesis at the professorship of Knowledge Architecture, an emerging scientific field at TU Dresden (Dresden University of Technology). This paper is going to focus on the meaning of creativity and its use in knowledge management.

Problem description / Background – Today’s society and work transforms into “knowledge society” and “knowledge work”. Inventive developers and managers are required in each field in order to answer ever more complex tasks and to create innovation. Yet, there is not much knowledge application of scientific results on the relationship of the innovation process and the term *creativity* into manager’s daily life.

Experiment / Approach There is a vast body of literature dealing with the term creativity. Though a clear definition of creativity and its application in terms of knowledge- and innovation-management is still absent. This paper is focusing on the main aspects of creativity defined in the literature and is introducing an architectural perspective into the discussion. The found literature is contrasted with first-hand experiences from technology and science clusters, industry-university cooperation, and other work experiences. Investigations, experiences and experiments by researchers of Knowledge Architecture form the basis for hypotheses about creative processes.

Findings / Practical implications - The process of generating ideas and innovation is complex and escapes simple description. Creativity is one of the most important variables in the innovation process, not only in its early stages. Creativity seems to be a significant success factor. Hence, future knowledge work has to be supported in two directions. Firstly: towards a theoretical discourse on the role of creativity due to knowledge- and idea-generation. Secondly: towards practical applications and translation of ideas, e.g. from architecture and design sciences towards management.

Keywords – Creativity, Knowledge, Ideas, Management, Idea-generation, Criteria

Paper type – Doctoral Thesis

1 Introduction

The paper is going to report on one component of an ongoing doctoral thesis at the professorship of Knowledge Architecture, TU Dresden (Dresden University of Technology). The aim of the thesis is to investigate in the Innovation processes and the transferability of architectural methods to this process in terms of Innovation- and Knowledge Management especially within cross-disciplinary teams.

2 The Value of Creativity

Today's society and work transforms into "knowledge society" and "knowledge work". In the developed world, innovation is the engine of economic and social welfare (Drucker, 2001). Organizations must develop the capacity to initiate or quickly adopt innovations, according to research literature as well as to popular media, since those who do not increase their rate of ex-change will lose their ability to survive (e.g. Csikszentmihaly, 1999; Janszen, 2000). Regarding the level of organization, creativity is an essential factor for innovation and consequent organizational success. In this sense Prabhu, Sutton and Sauser stated that: *"In today's competitive world, the only thing that is constant is change. A Product that may be a huge success today could be extinct tomorrow. In the backdrop of such fierce competition, new ideas and new products have become a necessity, rather than a luxury. To be competitive in the global market, organizations must develop creativity and high quality products and services."* (2008).

In order to gain innovation a wide range of innovative ideas are needed. Yet, there is not much knowledge about the early steps of the innovation process – the idea-generation-phase. From observation so far *creativity* is obvious closely related to this. However, with increasing dynamics in industries, sciences and society and the demand of cross-disciplinary teamwork in order to solve the related tasks and with adding phenomena like shifting targets, I hold that creativity is needed in all phases of the innovation process. Inventive developers and creative managers are required in each field of sciences as well as in economy in order to answer ever more complex tasks with innovative and problem-oriented ideas, products and services. In terms of managing creativity investigation so far figured out that future knowledge work has to be supported

twice: 1) towards a theoretical discourse on the role of creativity, and 2) towards its practical applications.

3 Theoretical Background and Aim of the paper

There is a vast body of literature dealing with creativity almost impossible to be completely overviewed or summarized. In the scope of this paper I am going to focus on some main aspects and definition criteria of the found literature.

3.1 How Literature defines Creativity

An intuitive conception of creativity holds that the production of new Ideas is involved (Guilford, 1950). However, creativity is not simply a matter of idea-production. It is rather defined as the production of high quality, original, and elegant solutions to problems (Besemer & O'Quin, 1999; Christaans, 2002; Mumford & Gustafson, 1988).

The problem of managing creativity and innovation is three folded: 1) the known complexity of this phenomena (Sternberg, 1999); 2) its multi-levelness, influenced by variable operating on individual, group, organizational, or environmental levels (Mumford & Hunter, 2005), and 3) the not well aligned-ness of these variables. Several organizational scientists noted that the study of team-level creativity is still an under-researched area (Kurtzberg & Amabile, 2001; West, 2002).

Csikszentmihaly, the founder of the Flow theory (1997), stated that: *“Creativity is not an attribute of individuals, but of a social system making adjustments about individuals... The social and cultural conditions, interacting with individual potentialities, brought about the objects and behaviours we call creativity.”* (1994). And Sawyer explained that: *“Creativity is a novel product that attains some level of recognition.”* (Sawyer, 2006).

And Teresa Amabile, Chemist, Psychologist and Edsel-Bryant-Professor of Business Administration and director of research at Harvard Business School, defined: *“Creativity is a process resulting in a product; it is the production of a novel and appropriate response, product or solution to an open-ended task. The response must be new, but it must also be appropriate to the task to be completed or the problem to be solved. In addition the task must be open-ended, rather having a single, obvious solution.”* (Amabile, Müller, 2008)

Surprisingly, practitioners' approaches to organizational creativity appear to better reflect the scientific literature than the scientific literature reflects applied interests and

application. The increasing attention on creativity by organizational scientists indicates, though that practical interests of work creativity is slowly influencing science (James, 2012).

3.2 How I define Creativity

“To make the most out of almost nothing.” might be the shortest answer to this question. In my definition creativity is the ability of human beings to solve problems under (time) pressure and in uncomfortable circumstance with few resources like material, tools, money, and to gain the best possible (problem-solving) solution out of these. Therefore (creative) people do not think about standardization too much. A wide range of creativity is found in the process of problem-solving e.g. in the world of sciences, engineers or production. Where one has to deliver new solutions to acute and dynamic problems with limited resources may this be tools, materials or time being available.

4 The Creativity of Architectural Processes

From observation so far, creative people often act unconventional. E.g. they use tools against their designated purpose or combine materials and processes in an unusual way. Understanding creativity is not only about the unique product moreover it is about the creative process itself. Though the result may appear as the “right” solution to answer the task in the end the way to get there is not clearly (scientifically) describable yet. Within the creative path, hard work and moments of frustrations are often included. To overcome this “uncanny valley” seems to be the creative moment on the way towards problem solving. Hence, peoples experiences, skills and their internal knowledge as well as the phenomena of peoples trust in the ability of finding a proper solution seem to be important influences on a successful creation process.

Anyway, creativity has to be taught, trained and practiced. This is not an easy task beneath daily routines and considering the diverse structures existing in our modern world. Creative workers as artists, designers, or architects appear to be useful “professional”-partners for this complex task of training and support.

Modes of (architecting) Creativity

Since 2011, researchers of Knowledge Architecture were asked to conceive and conduct creativity and innovation workshops for different stakeholders, such as scientists, teachers, administrators or innovation- and knowledge-managers. As most of the members of Knowledge Architecture are trained architects Knowledge architecture utilizes architectural processes and tools in order to develop conceptions of non-architectural items, as organizational design, product development, innovation- or knowledge management. Whereas groups and teams of divergent scientific fields and professions are focused.

By these workshop activities, a variety of creative techniques were developed, which are mostly based on modeling techniques and visualization tools, on design thinking and spatial representation. In the analysis of the workshop participant's behavior and workshop results indicated that methods of Knowledge Architecture may increase the probability of Innovation. In order to deliver a more scientific approach we developed a conceptual framework on the used modes of creativity:

- IDEATION – Idea Creation, Artificing
- PROGRAMMING – Contest and Demand analysing, describing and defining
- SELECTION- Criteria defining, Assessment and Evaluation

For each mode we collected and developed a set of tools and methods within main three categories 1) Visualization, 2) Modelling, and 3) Interaction. (For further details: "Programming Creativity: methods for Empowering Innovation in Interdisciplinary Teams" - IFKAD Proceeding 2013).

Architectural Process – an Example of a design project

To illustrate the aspects of architectural processes I shortly want to introduce my diploma project. The task was to design a multifunctional High-rise Building in Shenzhen, China. The following figures depict some of the media and modes of used in the architectural processes.



Figure 1: PROGRAMMING - Task-, Content and Demand-Analysis

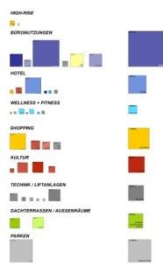


Figure 2: PROGRAMMING Demand Chart –Details
Visualisation of function
and square meter in scale.

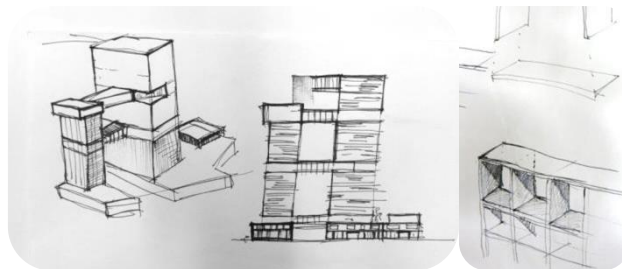


Figure 3: IDEATION Sketches: Facades, Bridges, and

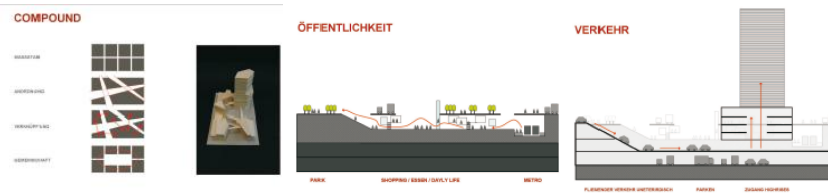


Figure 3: PROGRAMMING Analytical Sketches (compound, public flow, traffic organization)

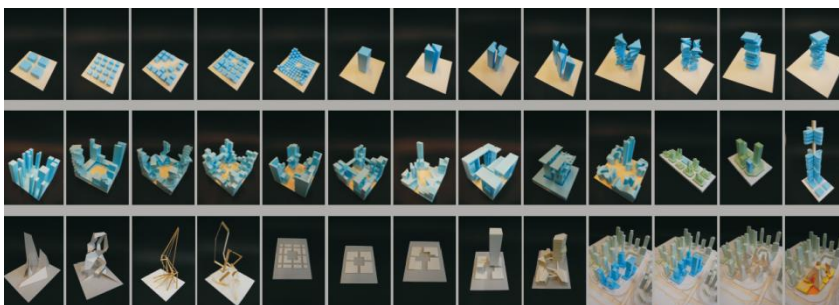


Figure 4: IDEATION working models – different variants of one Volume

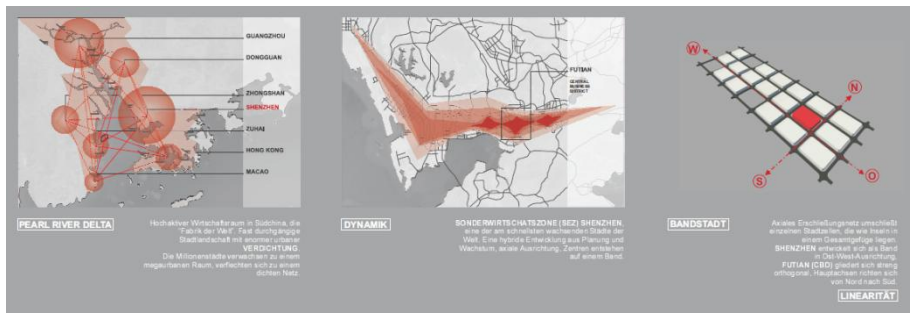


Figure 5: final Analytic Diagram (Pearl River Delta, Shenzhen-City, Grid-System)

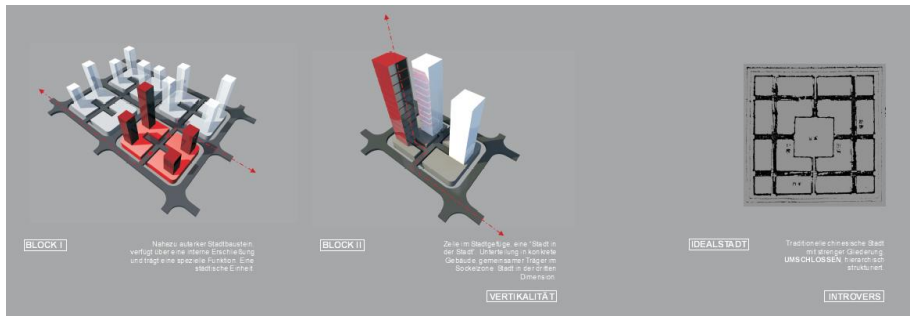


Figure 6: final Analytic Diagram (Building Block, Verticality, Ideal Chinese City)



Figure 7: Master plan, orig. Scale 1:500



Figure 8: Floor plan, orig. Scale 1:200



Figure 9: 3D Visualizations (location of different functions)

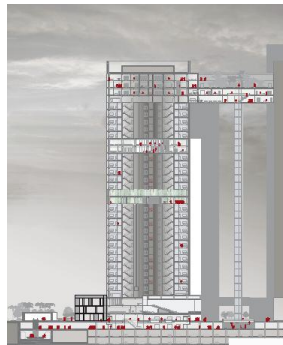


Figure 10: Vertical Section I
orig. Scale 1:200



Figure 11: Elevation
orig. Scale 1:200

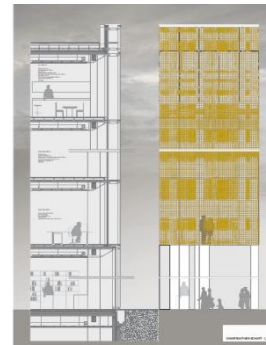


Figure 12: Section of Facade
orig. Scale 1:25



Figure 13: Final Rendering - Master plan

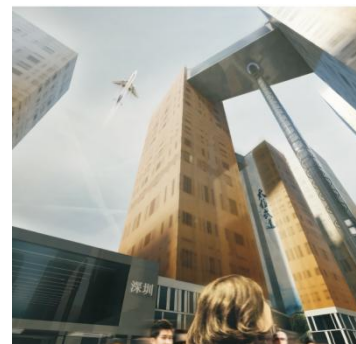


Figure 14: Final Rendering - Compound

First Description of elements of the Architectural Process

During the history of this discipline architects get to make use of different modes of creativity to overcome problems of managing complex tasks and conditions. Yet, there are only few scientific investigations on understanding and exploring of this process (Alexander, 1964). Though there is limited scientific research there are is a common approach and useful methodology within the internal knowledge of the architectural discipline developed over a long time period of practice.

When it comes to creativity, I state that architecting creativity is based on knowledge, experience and trained skills. Because they have to act as generalists they have to have a common understanding and the ability to communicate with very different fields of terminology. They have a broad – but not in depth – knowledge on different contextual field as Building Technologies, Physics, Civil Engineering, Organization Structures, Laws, Societal Responsibilities, or Psychology in order to produce customer-oriented

results. Most of the architectural tasks are rather complex and often no real references are existing at the beginning of a project. Architects are working often in groups and dealing with different details of the task simultaneously. They have to loop in between different scales and to change media several times during the design process - as sketching, computing, modelling, discussing and presenting. Architectural tasks are of a never-ending nature until the project is finished or the building is built finally.

In most sample cases architects produce unique results. In this manner they are comparable to artists somehow. However, artists are using modes of “real creativity” of a more escalating character in order to find their answers. Compared to that, the architectural processes are containing a programmed creativity in order to fulfil its tasks. Though, it often includes real-creativity moments in the different steps, it is somewhere in-between real creativity and product-oriented engineering. Creativity of architecture is knowledge driven, problem- and customer-oriented.

5 The Architecture of Creativity

Yet, the main investigators I found in fields of psychology and economics. They deliver valuable insights on the architecture of creativity. But the transferability of each disciplines’ result is still an unanswered question. There is a large amount of existing knowledge on creativity, partially very deep and specific, but there are limited findings in a general moreover theoretical and area-combining explanation on the nature of creativity. From Observation so far, people’s behaviour – for instance the behaviour of the workshop participants – are indicators of creativity. If they are moving around and produce certain level of noise, or if they are silently scrabbling seems to be connected to the different modes of creativity.

So the question is still how to get creativity to work within daily live routines? There are multi starting points to be found in the recent research which has to be still transferred and made adaptable.

6 Summary

Hence the nature of Creativity is still a mystery. The process of generating creative ideas is complex and escapes simple description. Though a complete definition of creativity and its application in terms of knowledge- and innovation-management is still absent future knowledge work has to be supported twice: 1) towards a theoretical

discourse on the role of creativity, and 2) towards its practical applications. So far I assume that architectural creativity and methods are valuable for other fields in science as well and in economic especially in terms of managing knowledge work within cross-disciplinary group work

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Managing reputation as part of intellectual capital management

Marjukka Nyberg

Department of Management and International Business
Lappeenranta University of Technology
Skinnarilankatu 34, 53850 Lappeenranta, Finland

Structured Abstract

Purpose - Reputational capital is part of a company's intellectual capital. Communications has been defined as main vehicle for managing reputational capital. The term communications can mean part of managerial work, referring to the communicational capacity an organization has as a whole, whereas communications conducted by a professional function forms a set of clearly distinguishable practices which can be studied.

The purpose of the research is to

- 1) look into the communications processes and practices through which the best performing publicly listed companies strive to manage their reputational capital and
- 2) test whether this correlates with better reputation, performance and better financial result

The link between performance and financial result has been proven many times, and so has the link between reputation and financial result. The impact of communication practices on reputation or performance has been harder to prove and is therefore the focus of this work.

Design/Methodology/Approach - The project will start with a quantitative analysis of appr. 100 public Finnish companies, comparing their long-time (10 years or less) data on financial performance with semantic analysis on the content of the publicity they have gained during the same period. In measuring organizational performance one or several of these measures will be used: market value vs. book-keeping value, revenue growth, share price, ROA. Some 10-15 firms that show the best positive correlation are identified and approached with a survey exploring in their corporate communications processes and practices. The survey is complemented with individual interviews and collection of communication documents from the companies. Performance measures for the companies are set by external and internal standards.

Originality/Value - Present IC research is strongly rooted in either management consultancy or accounting. The issue of reputation or brand management in a dynamic sense seldom appears in IC literature. Communications and marketing research again has focused on the correlation of brand image on consumer behavior or corporate value. There is strong evidence on these correlations, but what is missing is a genuine integration of IC management and communications research. However, now that we have moved into the knowledge-intensive business era of ours and gone through the explosive development of the internet, the concept of external reputation has gained a relevance

never seen before, and reputational capital has to be taken seriously due to its huge impact on corporate performance and monetary outcomes, such as share price and market value.

Practical implications - The aim is to produce a work that combines academic intellectual capital research and communications research, and at the same time offers new tools for business executives and for the communications industry to manage reputation and be able to measure its monetary impact. The study should produce knowledge that allows practitioners to make better decisions and improve the effectiveness of their work. The aim is to hold a *dynamic* perspective, approaching the issue from a *reputational capital management* perspective. The author will try to seek best practices and solutions to business executives' everyday problems – namely how to *manage* your reputation as far as it is possible.

Keywords – reputation, reputational capital, communications, intellectual capital.

Paper type – Academic Research Paper

1 Introduction

The importance of intellectual capital has never been as striking as today. Most of the discussion around future prospects of today's business deals with the companies' ability to manage their immaterial assets. In the present knowledge-intensive business environment this ability is the main source of success for whatever type of company, may it be in the manufacturing business or in service industry. Several studies show that intellectual capital plays a far more dominating role in building companies' market value than the tangible assets do.

The tradition of IC research has its roots in the 90s when a group of scholars started to look more closely at the intangible assets of corporations. The background of these academics was strongly rooted in either management consultancy or accounting, which obviously affected the view they had on the subject. The issue of reputation or brand management in a dynamic sense seldom appears in IC literature.

Now that we have moved into the knowledge-intensive business era of ours and gone through the explosive development of the internet, the concept of external reputation has gained a relevance never seen before. Relationships to the external world – customers, consumers, suppliers, decision makers, NGOs – cannot be handled in the traditional way that was meant when creating the concept of relationship or customer capital. The issue of trust or brand appeal has reached another level, where a lot of what is said about a company simply happens without the company being able to manage it in any way. At the

same time global internet communications have instant and far-reaching impact on companies' reputations and their performance. General understanding is that brand value and reputational value are essential parts of a company's market value, thus building financial success. Therefore reputation management cannot be ignored, but should be explored in more detail to deepen our insight in the subject.

In spite of that the importance of reputation has been largely recognized, not only in the communication research circles, its role within IC research has been close to non-existent. Going through a body of relevant IC literature from the last two decades you will find only few mentions about reputational value. On the other hand present mainstream of communications or marketing research focuses on the correlation of good or poor brand image on consumer behavior or corporate value. There is strong evidence on these correlations, but what is missing is a genuine integration of IC management and communications research.

The author also has another, personal reason for being interested in the chosen subject. Having been engaged in public relations and communications consultancy throughout one's professional career (apart from the last 15 years of running a business intelligence service firm) meant facing clients' frequent requests for evidence concerning the concrete benefits of reputation management. Communication research concentrates either in the effects of a good or bad reputation defined as an overall opinion of the relevant target groups, or in operational/tactical measurement of communications activities, such as media coverage or individual campaigns. Reputations are measured as end results of something, in terms of audience or consumer response or brand appeal. Very little has been done on the impact of activities leading to a particular kind of a reputation, and even less on the potential correlation of these activities and financial performance. The aim of the author is to hold a *dynamic* perspective and approach the issue from a *reputational capital management* perspective. The research aims at seeking best practices and solutions to business executives' everyday problems – namely how to *manage* your reputation as far as it is possible, and being able to *demonstrate evidence on its financial benefits*.

2 Literature review

2.1 About intellectual capital research and literature

In the last 15-20 years the rise of the 'new economy', principally driven by information and knowledge, has caused an increased amount of intellectual capital (IC) research and business literature. Intellectual capital is implicated in recent economic, managerial, technological and sociological developments in a manner previously unknown. There is much to support the theory that IC is instrumental in determining corporate value (Petty and Guthrie, 2000).

Brennan and Connell (2000) have composed an extensive list and classification of intellectual capital frameworks and indicators. They describe three different accounting standards' way of dealing with the definition and recognition of intangible assets. Main part of the paper consists of a list of empirical research and various frameworks developed in classical IC literature. They discuss both classification and management of intellectual capital within the listed frameworks. Measurement tools and indicators are discussed. Thus the work provides a solid and systematic overview of work that has been done so far. The authors particularly stress the importance of a dynamic approach, including acquiring, producing and increasing intangible resources, and measuring and managing intellectual capital. From the accounting point of view, both producing and managing/measurement are investments, and the benefits can be calculated in a grid where the investments and their costs are compared with financial or non-financial outcomes.

According to Edvinsson and Malone (1997), IC is about knowledge, applied experience, organizational technology, customer relationships and professional skills, which make a firm competitive in the marketplace. The importance of IC from the value perspective comes from the gap between an organization's market value and book value. They separate IC into three categories, which include Human, Structural and Customer Capital. Human Capital covers the knowledge, education, skills and characteristics of the members of the organization. Structural Capital falls into two categories: outcomes of knowledge conversion, and the intellectual properties of the firm. Customer or Relational Capital refers to the ability of an organization to interact in a positive manner with the external stakeholders and thereby actualize the wealth-creation potential of Human and Structural Capital. The authors also discuss the so-called SKANDIA model that separates

one more type of intellectual capital, namely Renewal and Development. They suggest specific measures for each kind of capital and recognize the problem of having qualitative, monetary and percentage-based measures, which are hard to co-ordinate in one single index. Edvinsson's and Malone's solution to the problem is the coefficient of IC Efficiency iC , where i is calculated on the basis of an average value of a percentage-based measure and C is money.

Sveiby (1997) as one of the leading long-time theorists on IC divide intangible assets in three parts, external structure, internal structure and individual competence – which could be seen as equivalents to customer & relational capital, process capital and human capital. He focuses on companies operating in the knowledge era, points out the difference between being a knowledge based or information based business, defines knowledge as a capacity to act and in a business context equivalent to competence, and discusses ways professional knowledge and competence is transferred in an organization. Managing external structures is a vital part of managing intangible assets, and in this context he also recognizes customers being particularly important in generating intangible revenues and contributing with their image – thus image or reputation is part of intangibles.

Roos, Roos, Dragonetti and Edvinsson (1998) present an IC Index model, aimed at helping business decision makers to manage their company based on facts and measurements. Their recommendation is to start from a business idea and based on it define the company's Key Success Factors (KSF). Using these as a starting point and selecting the preferred model for forms of intellectual capital one develops indices, set of measures for each KSF. As a result of capital-specific indices it is possible to calculate a certain general IC Index that can be used in predicting and enabling better decision making. The authors' approach is dynamic and practice-oriented, and they call it the Process Model. Their definition for Intellectual Capital also underlines this: *Intellectual capital as a language for thinking, talking and doing something about the drivers of companies' future earnings.*

Brooking (1996) has produced a very straightforward, practical guide to understanding, measuring and developing intangible assets. She uses the breakdown of IC which covers market, human-centered, intellectual property and infrastructure assets. She guides the reader through an IC audit process that helps executives to analyze the

intangible capital in their organization, however like many others, without mentioning image or reputation.

In their overview Petty and Guthrie seek to review some of the most significant literature on IC and categorize it in a way that provides an understanding of how and why the IC movement has developed as it has. They then use the review as a platform to identify and establish paths for future research. They particularly focus on IC measurement and reporting, although they acknowledge the importance of IC management as well. They agree on the definition of IC as ‘the economic value of two categories of intangible assets of a company: 1) organizational (structural) capital and 2) human capital (offered by OECD in 1999). This definition locates IC as a subset of, rather than the same as, the overall intangible asset base of a business. Interestingly, Petty and Guthrie mention reputation as being an item that does not form part of a company’s intellectual capital, but as a by-product of the use of a firm’s intellectual capital.

The authors run through the history of IC literature and discuss issues such as distinctions between intangible assets and intellectual capital, delineation between knowledge management and intellectual capital, and problems with the inability of the present accounting practice to measure ‘new’ intangibles. The review then classifies all major contributions to the IC development and compares the various classification schemes, as well as different reporting and measurement systems for both financial and non-financial measures.

Andriessen (2004b) states that the IC community has entered a phase of consolidation. He himself has focused on the methodology of IC research and in particular on the “why” and “how”. He points out that it is often unclear what the organizational problem is the methods intend to solve, and additionally there seems to be confusion about the distinction between valuation and measurement. According to Andriessen the motives or problems IC valuation or measurement is intent to solve can be grouped under three main headings: Improving internal management, Improving external reporting and Transactional and statutory motives. Each of these contain a number of more specific problem definitions; all in all the author counts 18 different problems addressed in recent research. He discusses each of them in detail and calls for less focus on solutions and more evidence for problems that can be solved with these solutions.

Another important issue he raises is the inconsistency of methods. A distinction can and should be made between financial valuation methods, value measurement methods,

value assessment methods and measurement methods. As part of the consolidation process more research is needed into the strengths and weaknesses of these approaches, related to the type of problems that need to be solved.

In his book (2004a) he systematically analyses 25 commonly used methods from the point of view of identifying which category of valuation or measurement method they belong to and whether they really deal with intangible resources or something else, whether they are capable of dealing with a wide array of intangible resources and whether they offer tools for looking forward and helping users to choose between different strategy options. Andriessen also designs a new model, Weightless Wealth Tool Kit, and tests it on a sample of companies. According to him IC methods should help in solving future orientation and strategy development and creating resource-based strategies. He also starts with a financial valuation of a company's core competencies and designs a value dashboard, which gives the management insight into the company's strengths. This way he believes that information is converted to action through a common language and management agenda that helps in building success and future earnings. His own toolkit seems to work best with knowledge-intensive, middle-sized companies.

A recent systematic review on empirical IC literature comes from Inkinen, who lists different categories of IC stocks and identifies how they are linked to organizations' value creation. He mentions that the phenomenon of IC has been developed in two phases, the first being the era of conceptualizations, whereas the current stream is more diversified and focuses on a large number of issues. According to Inkinen IC research has become a global issue and it covers various types of industries. Majority of the authors agree on three main types of IC stocks, namely Human, Structural/Organizational and Customer/Relational Capital. Some of these seem to be overlapping and depending of each other. Increasing attention has been paid to a fourth dimension of IC, Social Capital, which from the point of view of this research is particularly interesting, as it represents the quality of relationships among people and groups, i.e. stakeholders, and could be seen as equivalent to the concept of reputation. At the same time image and reputation can be part of Relational Capital. In fact in a large number of the papers reviewed by Inkinen describe reputational features in the context of Customer/Relational/Social Capital, but only a few directly mention the concept of image and reputation. 42 out of the 44 works he lists conclude that the effect of IC stocks on corporate performance is positive and significant.

Kianto, Andreeva and Pavlov (2013) have focused on the dynamic dimension of intangibles. They claim that only a handful of studies have empirically examined how the strategic management of intangibles impacts value creation. Most of the existing studies have assessed the value or level of existing intangible assets and then correlated this with performance outcomes. There are far less studies examining to what extent these intangible assets are consciously managed in firms and how their management impacts the success of organizations. The authors define IC management as strategic planning and implementation related to the knowledge-based assets in the firm, and propose a process for the IC management, which includes defining key knowledge assets, identifying processes, planning activities and implementing and monitoring actions. They also conduct a survey testing the connections between IC management, competitiveness and financial performance. They come to the conclusion that the correlation between IC management and competitiveness does exist, but no direct correlation between IC management and financial performance. The impact of IC management is mediated by competitiveness. Time factor is identified as crucial: the results would demonstrate a stronger and direct impact of management on financial performance, had performance data been acquired at a later point in time. It would also have been preferable to obtain financial information from external instead of only internal sources.

In Kianto's earlier paper (2007) a dynamic aspect of Intellectual Capital is discussed from three different perspectives: as value creation processes, activities and change capabilities. Instead of existing statistical data on individuals, structures and outcomes the dynamic research focuses on social processes and organizational characteristics. The research has clearly shown that the main value creation factor is how resources are exploited and explored, rather than what they are as such. The author calls for more research focus on particular activities through which intangible resources are leveraged, developed and evaluated in organizations.

2.2 About reputation management research and literature

Cornelissen (2011) offers a compact set of definitions for concepts that deal with what in the IC literature is covered by 'relationship capital':

Corporate image is the way a company is perceived, based on a certain message and at a certain point in time, the immediate set of meanings inferred by an individual in

confrontation or response to one or more signals from or about a particular organization at a single point of time.

Corporate reputation is defined as an individual's collective representation of past images of an organization (induced through either communication or past experiences) established over time.

Corporate personality or *culture* equal the core values of an organization, as shared by its members.

Corporate identity is defined as the profile and values communicated by an organization, the character a company seeks to establish for itself in the mind of its stakeholders, reinforced by consistent use of logos, colors, typefaces etc.

One of the primary ways in which organizations manage relationships with stakeholders is by building and maintaining their corporate reputations. Reputations are established when organizations consistently communicate an authentic, unique and distinctive corporate identity towards stakeholders. (Cornelissen 2011).

He claims that corporate reputation has a strategic value for the organization that possesses it. It ensures acceptance and legitimacy from stakeholder groups, generates returns, and may offer a competitive advantage as it forms an asset that is difficult to imitate. A general principle for corporate communication practitioners is that they need to link the corporate identity – the picture of the organization that is presented to external stakeholders – to the core values that members of the organization themselves associate with the organization (culture) and define the organization's mission and vision (organizational identity). A good corporate reputation, or rather the corporate identity upon which it is based, is an intangible asset of the organization because of its potential for value creation, but also because its intangible character makes replication by competing firms more difficult.

Aula and Mantere (2008) have recently offered an interesting and different view on the creation of corporate reputations. Instead of considering reputation as capital they analyze it as an interpretation that develops in an arena of meanings and opinions. Interestingly this theory claims that reputation management is partly outside the control of the subject itself; reputation lies to a great extent elsewhere than in its actual subject, i.e. among the company's audience, stakeholders, interest groups and others, in the interpretations of those assessing the subject.

The authors recognize reputation as having real value to organizations, and reputation-building being a competitive activity. Reputation is seen as a negotiation of meaning, taking place between an organization and a number of stakeholders. Strategic management tools are often based on this synthesis of external demands and internal conditions, but in strategic management the market or economic environment is considered to be the most significant for a company. Instead Aula and Mantere think that the strategic management of reputation requires a quite different view of what constitutes an organization's environment. It should be seen above all as an environment of meaning, where the organization and its publics encounter each other and create representations and interpretations.

In their arena model the authors differentiate between the company's own notions about itself ("what we are"), the way the organization perceives how others see it ("how they see 'what we are'") and how the public perceives the organization ("what it is") – "between being" (factual reality) and "seeming" (expressions about reality). Accordingly, reputation is formed through targeted communication and actions that the company takes, as well as through people's perceptions and understanding of the 'true' nature of the company.

Fombrun and Van Riel discuss six different approaches to reputation and encourage further research in each of them, with the aim of building integrated models of reputation research. They list the economic view, consisting of the game theorist framework and signaling theorists' framework, then the strategic view, the marketing view, the organizational view, the sociological view and the accounting view. Each of these schools tries to approach the reputation concept for different reasons. The authors call for better integration and propose the following definition of corporate reputation: *A collective representation of a firm's past actions and results that describes the firm's ability to deliver valued outcomes to multiple stakeholders. It gauges a firm's relative standing both internally with employees and externally with its stakeholders, in both its competitive and institutional environments.*

Majority of reputation research deals with stakeholder perceptions, and they are mainly conducted by practitioners, who themselves largely acknowledge the limitations of the methods. Fombrun, Gardberg and Sever (1999) examine some of the most used indices and document their shortcomings. They then present a new instrument – the reputation quotient RQ – to measure corporate reputations and improve the validity and

reliability of such measurements. According to authors the methods most commonly in use are based on psychometric ratings, and they suffer from two key biases: they lack content validity by focusing on the perceptions of a limited respondent pool of corporate leaders and financial analysts, and survey items do not capture the perceptions of multiple stakeholder groups that are necessary for a valid measure of corporate reputation. The method undergoes a series of large tests by varying stakeholder groups and sample sizes. The proposed method RQ is a construct that combines the measurements of two factors: Emotional Appeal and Rational Appeal. It strives to capture the perceptions of multiple stakeholder groups and establish the multi-dimensionality of the construct. This work is one example of the methods used in reputation research, and it illustrates the type of challenges current reputational measurement deals with.

Recently a strong focus has been put on trying to evaluate the impact of a good reputation on corporate financial performance. This links together the concept of reputation as capital – equivalent to the concept of intellectual capital – and financial performance. However, research does not deal with the dynamic concept of reputation management, the underlying processes and actions companies undertake to manage their reputation. These research projects compare strengths of brands with the market values of the companies and state that there is a strong correlation between brand image and market value or other financial indicators.

Fombrun and Van Riel (2003) have continued their work in this direction and list a number of research projects stating the correlation of a strong brand and financial performance. They claim that a good reputation impacts the operational result of a company and therefore future earnings, because it reinforces stakeholders' belief in the competitiveness of the company. Corporate reputation – being part of the intangibles of a company – improves the market value of the company, whereas this works the other way around as well. There are many other ways the reputation impacts the financial result: employees tend to work harder and produce more when they are emotionally engaged in a brand, a strong reputation succeeds in employing best talents, and it is easier for the company to negotiate low production costs with suppliers, due to the attractiveness and brand value they bring to partners.

Fombrun and Van Riel also illustrate their theory on the role of communication capital: according to them reputation together with intellectual capital form what they call immaterial capital. As good reputation management requires effective gathering of

information from the business environment, reputation management overlaps with other types of intangibles – what you do for the reputation, also improves your overall business performance due to better decisions concerning other functions than communication.

The authors have based their Reputation Quotient (RQ) on a large number of surveys done on well-known consumer brands, but they point out that the stakeholder groups that have been researched usually cover only a limited group of people, who see the company from their specific point of view. Generally consumers tend to value emotional image factors (social responsibility, favorable working atmosphere, good products etc.), whereas the financial community values factors connected with the business performance of the company. Correlations have been found between the Reputation Quotient of a company and the behavior of stakeholders that affect the corporate financial performance, as well as between the RQ and the company's financial result, its sales and revenue growth, and market value. A particular connection exists between the change of RQ and change of market value. The correlation is however not simple. The best RQ companies differ largely in terms of financial performance, and the market situation plays a substantial role. In an upward developing market companies with high RQ generate better share earnings than industry average, and companies with low RQ clearly smaller earnings. In a downward trend high RQ companies create a bigger risk, as their share earnings follow industry average more than companies with low RQ.

One interesting issue is whether companies with good reputations are better to sustain superior profit outcomes over time. Roberts and Dowling (2002) matched data from Fortune's Most Admired Companies with financial data from the corresponding years, combining different reputational measures and financial measures (ROA, market value and turnover) and compared the results with industry averages. As a fundamental mechanism they mention that a firm's financial performance always affects its reputation. Accordingly the connection is complex, and therefore they decomposed overall reputation into a component that is predicted by previous financial performance, and that which is 'left over', and found that each element supports the persistence of above-average profits over time. All firms experience a variety of different financial periods, whereas firms with relatively good reputations are significantly more likely to exit a below-average performance position at any point of time. Good reputations also help poor performing firms in their efforts to return to profitability. The findings complement existing studies of the relationship between reputation and financial performance by articulating the dynamic

implications of good reputations. They are also consistent with the growing body of strategy research that links high-quality intangible assets with sustained superior performance. A firm's financial reputation has a strong impact on profit persistence, suggesting an important self-reinforcing dynamic. Some of the things that firms do to improve profitability also enhance their reputation, and this enhancement, in turn, makes it easier for firms to sustain superior performance outcomes over time. The results also suggest that reputation works in different ways, depending on the initial performance position of the firm.

Communication is often defined as a major vehicle for managing reputation. It can be seen as a set of activities based on corporate strategies and run by a professional, specialized corporate function. It can also be seen as something that cuts through and involves the whole organization, as comprising both internal communications and communications with stakeholders and other groups outside the organization. In other words, communications is a means for engaging personnel and other stakeholders, building trust and motivation.

Malmelin (2007) sees communication as an integral part of management and as a function that impacts the organization's performance and success in increasing its intangible assets. In his model he identifies communication as a function that fulfills a role in building and increasing the company's intangible assets.

Malmelin advocates an understanding of communications as an intangible organizational asset – as communication capital. His model for communication capital covers four types of capital, which can be seen as supporting functions for the corresponding types of intellectual capital. *Juridical* capital is about patents and copyrights, the company's immaterial property, information masses, databases and documented information that the company owns. Also documentation on earlier projects and activities, as well as surveys and assessments and corporate identity manuals etc. belongs to this category. *Organizational* capital means communications practices and systems, styles of corporate management, effectiveness of internal communications, trust of employees on the organization and other elements of internal cohesion and engagement. *Human* capital from a communications point of view is about personal communication competence residing in people, brand management and interactive corporate communications, and it underlines the importance of all employees being responsible for furthering the achievement of the company's objectives. *Relational*

capital has to do with the company's interaction with its customers and other stakeholders, about building brand equity and understanding the consumer or the client.

Malmelin's model of communication capital can be used in charting, analyzing and measuring an organization's communications resources and processes.

A substantial number of works have been written by scholars focused on the excellence and quality of the methods companies use when conducting communications. These books and research projects aim at assessing communications methods in order to build best practices and set normative standards.

The best known of these is produced and edited by Grunig's working group (Grunig et al. 1992) and builds a sort of a foundation for what has been considered to be excellent public relations. The editors do not engage themselves in evaluating the financial implications of 'good PR' for a company. Their philosophy goes even further, as they do not see reputation management as anything that should benefit the company alone but mutually both the company and the society around it. They are mainly interested in stating requirements for good communications and presenting ways to measure whether communications actions of individual companies meets the predetermined goals. They present a comprehensive model for the implementation levels and impact levels for communications and public relations, with the ultimate aim of changing interest group attitudes and behavior. This is a very typical set-up for communications measurement techniques, as it concentrates in measuring only tactical and operational performance within the communications function. The correlations between activities and corporate strategic outcomes are not measured.

Interesting is though that the group considers PR being excellent when it is an integral part of an organization's strategic management process – meaning that everything that is done is being done because of corporate strategic goals, which in turn aim at financial success.

When defining criteria for excellent communications the book searches in the literature dealing with excellence of overall management of organizations. They also claim that excellence in communication is a characteristic of excellent organizations, but that excellent communication can help to make organizations excellent. This conforms easily with the view that reputation management is part of an integrated system of building intellectual capital and financial benefits. The book identifies 12 characteristics that appear repeatedly in the literature and derive implications for public relations from

each of the attributes. These attributes may be useful in considering ways to measure reputation management processes in my own study. They include such as human resources, organic structure, intrapreneurship, symmetrical communication systems, leadership, strong participative cultures, strategic planning, social responsibility, support for women and minorities, quality as priority, effective operational systems and a collaborative societal structure.

Cornelissen (2011) describes in detail the processes and contents of conducting corporate communications, starting from the development of an overall communication strategy across communication disciplines and stakeholders and in line with the overall corporate strategy of an organization. He then discusses the processes of planning and managing strategic communication programs and campaigns as parts of an overall communication strategy. Furthermore, he lists common corporate communication measurement methods. Research helps in establishing the effects of communication campaigns and activities, as well as in documenting the organization's reputation and identity in the eyes of its stakeholders. The book also goes deeper into the various disciplines of communications with practical advice in what works and what does not.

These normative suggestions for corporate communication practices by Grunig et al. and Cornelissen can be used as a basis for designing the research set-up for reputation management processes in the companies that will be studied.

Another view on the quality of communications is offered by Coombs and Holladay (2007), who use the term *public relations* – as substitute for maintaining reputation – throughout their book. They want to develop a more complex and complete understanding of the practice of corporate public relations, claiming that the term is widely misunderstood and misapplied. They define public relations as *the management of mutually influential relationships within a web of stakeholder and organizational relationships*. When this is done with success, it creates a dialogue, a two-way exchange of messages and influence between organizations and stakeholders, which is an effective and ethical way of cultivating and managing these relationships. At the end both the company, its stakeholders and the society, are beneficiaries, as it offers a mechanism for people to be involved and get their messages through, at the same time as the company is pursuing their interests.

In the planned study a two-way mutual communication approach will be applied as one of the criteria for excellent reputation management in the set-up, when analyzing the

communication quality and processes of the object companies. A decade ago it would not have been possible for a firm to engage in a dialogue with its environment to the extent it is possible now. In fact, organizations are forced to listen to their customers, consumers, influencers and decision makers in the society on a constant basis, with the ever-existing global web and social media. This creates both opportunities and threats and puts high pressure on communication practitioners. What Grunig called symmetrical communication systems and two-way communication, has become everyday reality for all organizations. Companies increasingly need to put in place procedures and practices in order to manage their reputation and the risks involved as they set out to engage with the wider community in the social web. Reputation management process now consists of a constant flow of three stages: participating, measuring and monitoring. However, little is known about the practices on strategic level.

3 Preliminary research plan

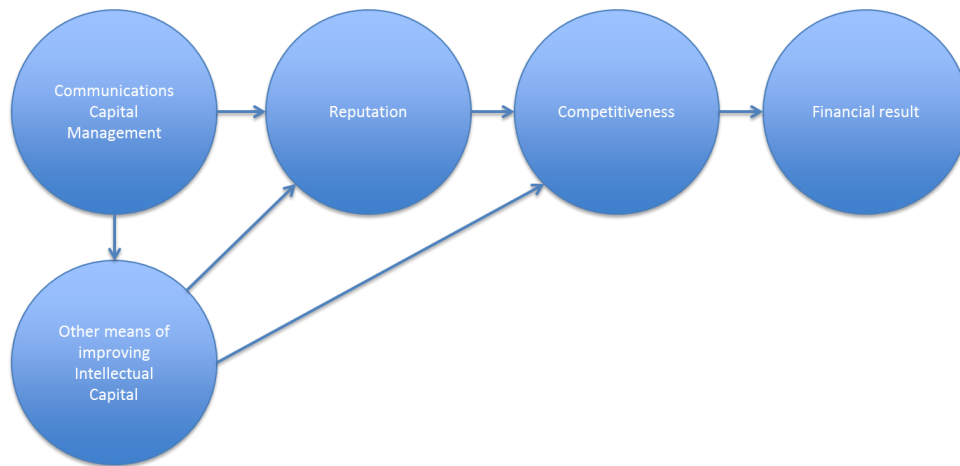
3.1 Scope and focus

The research issue will be approached from a *reputational capital management* perspective. On one hand reputation is something that a company possesses, a part of its intangible assets, and it can be measured in terms of stakeholder or public opinions. There are a large number of research projects exploring the connection of an existing reputation and the financial performance of a company. This alone does not build a new perspective on the reputation issue and is therefore not in the focus of this work. As opposed to a static view on reputational/IC capital, there is a more dynamic aspect to be considered, namely the way an organization manages its intangible assets, i.e. defines, identifies, plans, implements and monitors them – in this case its reputational assets.

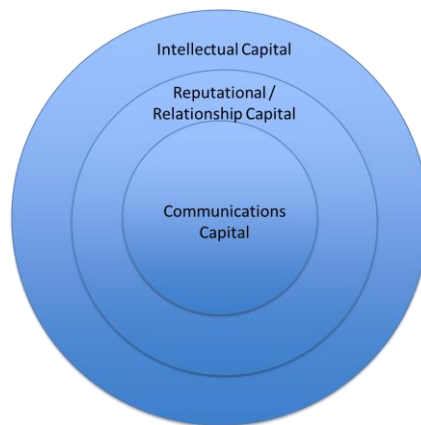
There is a further distinction to be made. Communications as part of managerial work refers to the entire communicational capacity an organization possesses, and the methods and processes it uses for driving its external and internal reputation, thus influencing its intangible assets in general. However, communications conducted by a professional corporate function forms a set of clearly distinguishable practices which can be studied. Studying the entire scope of activities affecting a company's reputation, including day-to-day business decisions, which influence people's real life experiences of the company and thus contribute to building intellectual capital, will fall outside the research focus.

The purpose of the study will be

- 1) looking into the communications processes and practices through which the best performing case companies strive to manage their reputational capital and
- 2) testing whether this correlates with better reputation, performance and better financial result



Another way of describing the relationship between communication capital, reputational capital and intellectual capital is the following:



The aim is to examine to what extent this asset of reputational capital is managed, and whether reputation/communications management has an impact on the performance and the financial results of a company

Preliminary research hypotheses:

H1: The more intensively an organization applies reputation management practices, the better reputation it will gain.

H2: The more intensively an organization applies reputation management practices, the better it is likely to perform.

H2: The more intensively an organization applies reputation management practices, the better financial performance it will reach.

H3: The better reputation, the better performance, and the better financial performance.

3.2 Design/methodology

The project will start with a quantitative analysis of approximately 100 public Finnish companies, comparing their long-time (10 years or less) data on financial performance with semantic analysis on the content of the publicity they have gained during the same period. In measuring the financial performance of the companies one or several of these measures will be used: market value vs. book-keeping value, revenue growth, share price, ROA. Measuring the amount and quality of media publicity following criteria are used:

- the volume of media publicity
- the type of media (editorial or social)
- the favorability and content of the publicity, defined as messages that contribute to a positive reputation

10-15 firms that show the best positive correlation between chosen financial measures and chosen media publicity criteria are identified and approached with a qualitative survey, which explores in their communications practices. The survey is complemented with individual interviews and collection of communication documents from the companies.

In designing the elements of the survey and the structured interviews, the framework of four categories of communication capital created by Malmelin will be used. Research questions are modelled to monitor the level of sophistication and accuracy in each of the categories. Although the concept of communication capital is not used in the study, this structure captures well the various practices and assets a company needs to manage in order to influence its reputation. The research aims at assessing whether the communications strategy, and tactical and operational activities employed contribute to building intellectual capital, as defined in the corporate strategy.

Research questions cover:

Juridical reputation assets: communicational immaterial property rights, information masses, databases and documented information that the company has the right to use. Examples: Graphic guidelines, typographic manuals, plans and strategies for different communications functions, as well as documentation on earlier projects, activities, surveys and research.

Organizational reputation assets refer to the organization's communications practices and procedures that are not dependent on individual people: systems and styles of management communications, the organization and management of the communications function, the role and importance that is given to the communications function, its representation in the corporate management and on board level. Standardized practices and the organization of various types of communications activities, such as media relations, brand management, social media engagement, market intelligence etc. belong to this category.

Human reputational assets: the skills and competencies of the people conducting professional communications in the company, which refer to a broad range of personal attributes, including the individuals' knowledge, skills, experiences, characteristics, abilities, and qualifications. It also covers the competencies of outsourced resources and the quality control maintained when managing them.

Relational reputation assets refer to the level and quality of diverse relations between the company and its stakeholders, which can be divided into business partners and external stakeholder groups. As manifestation and documentation of these assets various types of opinion and media (and social media) research will be used. The extent to which stakeholder opinions and corporate publicity contain messages that are favorable to the company and enhance aspects of the type of intellectual capital the company wants to be known for, is measured.

Performance measures for the companies are set by external and internal standards. Because the object companies are publicly listed, external financial information is easily available. Other potential performance measures, such as different comparisons to industry average – successful product launches, time-to-market, effectiveness of product development, leadership position within the industry – can be based on internal or peer assessments, as well as industry statistics.

3.3 Research structure and presentation of results

A preliminary plan for the presentation of the results consists of 3-4 articles, namely

Article 1: *The Correlation Between Media Publicity and Financial Success of Listed Finnish Companies* – based on the quantitative research

Articles 2-4: deeper exploration in the communicational practices and assets that make it possible to distinguish the best performing companies both in terms of reputation and financial success. These articles could potentially include

- Presentation of the role and importance of communication strategies as part of corporate strategies in the best performing companies
- Analysis on the impact of effective social media communications in the best performing companies
- Analysis of a successful integration of communications and business intelligence, which makes it possible for the best performing companies to run successful two-way communications

4 Final remarks

The aim of the research project is to open a new path within the present intellectual capital research, leading to further inspiration among both academics and communication practitioners. As stated by a number of authors, there is a clear lack of research here, calling for deeper insight and further research in this particular field. Hopefully this work will generate new insights and valuable information guiding to better everyday business decisions as well.

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Economic effectiveness and intangible investment in Lithuania

Ilona Bartuseviciene

Faculty of Economics and Finance Management
Mykolas Romeris University
Ateities st. 20, LT-08303 Vilnius, Lithuania

Structured Abstract

Previous research regarding intangible assets and their possible influence over the effectiveness encourages governments to change their perspectives towards the assessment of economic effectiveness. Tangible assets such as equipment, plant, office buildings are no longer considered as competitive recourses contributing towards long lasting competitive sustainability (Benevene and Cortini, 2010; FADUR, 2013). Thereafter intangible assets are becoming the drivers of a long lasting competitive advantage in economy (Suriñach and Moreno, 2012; Mackevičius and Jarmalaite, 2011; Fadur etc., 2013; Goodridge etc., 2013). Countries, such as United Kingdom, Japan and the United States, have already exceeded the investments in the intangible assets as a share of Gross Domestic Product (GDP) compared to the investments in tangibles (Corado *et al*, 2013; Goodridge, 2013). In July 31, 2013 the United States Bureau of Economic Analysis adopted a policy where Research and Development (R&D) were categorized as an investment on the government's books rather than an expense (BEA, 2013). Corado *et al* (2012) argues that capitalizing intangible assets changes the perspective of the indicators that account for economic effectiveness. Chua and Goh (2009) pointed out, that gaining and sustaining the competitive advantage for an economy, one has to identify main components of the intangibles, invest accordingly and capture the return from these investments. Many studies have concluded that investments in intangible assets increase future output and consumption for the entire economy (COINVEST, 2013; INNODRIVE, 2013, INTAN Invest, 2011). According to Corado *et al* (2012) the key point again is whether an increase in intangibles yields returns at some point in the future in the form of higher production efficiency and improved product quality. Webster and Jensen (2006) argues, that certain intangible assets do not meet the characteristics associated with the investment. They are not identifiable, non-rival, sometimes they are not even assessable, therefore quantitative assessment on the returns of the investments of the intangible assets might be challenging. Intangible asset policy in Lithuania follows traditional accounting principles, where most of the intangibles are excluded from the government books. Statistics department provides certain macro level data such as investments into R&D. Konstatinos *et al* (2013) defended, that the size of the investment in R&D is not enough to get a grasp of the intangible asset essence and impact in the economy. According to the study carried out in France, the investment into R&D starting 1995 up to 2010 has increased by 1,9 percent, although the investments into other intangible assets such as human capital, knowledge, networks etc. has followed the increase from 7,4 percent up to 10,6 (OECD, 2013). Such data implies that intangible assets other than R&D are more substantial to our economies, therefore, it is important to identify those assets, assess the

investment accordingly and measure the impact of these investments on the economic effectiveness.

Purpose –The objective of this paper is to investigate intangible investments in Lithuania and assess their impact on the economic effectiveness.

Design/methodology/approach – Analysis and review of scientific literature, and data statistical analysis.

Originality/value – The present study represents a step forward in the understanding of the impacts of intangible assets on economy effectiveness in Lithuania, which still follows traditional accounting practice. The study was performed at the macro level using adaptive model proposed by Corado (2012), where intangible assets are categorized as computerized information, economic competencies and innovative property. The model was adjusted to the available data. The results show the investment level of the intangibles as well as the association with the economic effectiveness of the state.

Practical implications –Knowledge based economy requires innovative methods to assess its effectiveness. Lithuania’s policies regarding intangible assets follows traditional theories, therefore it is very important to identify the level of intangible investments, not recorded in the accounting books and define it’s impact on the economical effectiveness and this will add value to the current status and contribute to a better assessment. Such study provides a benchmark possibility, which would be useful for Lithuania’s potential.

Keywords – Intangible assets, economic effectiveness, intangible asset assessment, intangible investment.

Paper type – Empirical study

1 Introduction

Within the last two decades economists and policy makers has been putting much effort to explore whether intangible assets influence the effectiveness of the economy. Fudur et all (2011) states that economies of developed countries has dematerialized. Economic systems tend to become the systems of technological ideas and innovation (op. cit. Bianchini, 2004, p. 58) Tangible assets such as equipment, plant, office buildings are no longer playing an important role in today’s advanced economy. Increased knowledge and competencies allow modern economies to improve their effectiveness, create more value and consequently become more competitive (Konstantinos et al, 2013). Based on world bank report growth requires improvements in ‘hard’ (tangible) and ‘soft’ (intangible) infrastructure at each stage (op.cit. *Justin Yifu Lin, 2011*). According to the reports from Organization for Economic Co-operation and Development (OECD), countries, such as United Kingdom, Japan and the United states, have already exceeded the investments in the intangible assets as a share of GDP compared to the investments in tangibles (OECD, METAI). If intangibles are playing such an important role in today’s

economy, it is natural to raise questions, whether these investments are worthwhile, and how much should the economies invest to increase their effectiveness.

2 Economic effectiveness and the intangibles

Economic assessment has always been a priority for every government. Limited resources; increased consumption requires innovative economic models to maintain the sustainable growth of each country. Mouzas (2006) emphasized two indicators to assess the performance: the *efficiency* and the *effectiveness*. For economists, policy makers and investors these two terms might be synonymous, yet, each of these terms have their own distinct meaning.

Effectiveness ('doing the right things') oriented governments are concerned with output, sales, quality, creation of value added, innovation, and cost reduction. It measures the degree to which a goal is achieved or the way outputs interact with the economic and social environment. Usually effectiveness determines the policy objectives or the degree to which an economy realizes its own goals (Zheng, 2010). According to Heilman and Kennedy – Philips (2011) economic effectiveness helps to assess the progress towards mission fulfillment and goal achievement.

Efficiency ('doing things the right way') measures relationship between inputs and outputs or how successfully the inputs have been transformed into outputs (Low, 2000). Effectiveness and efficiency are exclusive, yet, at the same time, they influence each other; therefore, it is important for policy makers and economists to assure the success in both areas.

The main problem with the knowledge economy, and intangible investment, in general, is not that the expenditure is hidden, but rather that it is loosely connected to output. Investment in assets such as software, databases, innovative property, and market research, and reputation, human and organizational capital is the main way through which the available stocks of knowledge and information are augmented. Intangibles are regarded as the cornerstone of the 'new' or 'knowledge' economy that emerged with the advent of the information technology revolution, although for economists such as Paul Romer, the role of intangibles in economic growth was established much earlier. According to his argument, what makes people of this era wealthier than their ancestors 100000 years ago is not the quantity of available raw materials, which has not changed

over time, but the ability to rearrange raw materials in ways that make them more valuable (op.cit. Konstantinos et al, 2013; Kaufmann et all, 2009).

The reality is that until now policy makers treat intangible assets as intermediate expenditure, which does not appear in either investment or Gross Domestic Product data. Marrano et al. (2009) states that once intangibles are treated as investment and not as intermediate consumption market sector Gross Value Added (GVA) in the UK rises significantly (13% in 2004). Similar path was demonstrated in Europe According to the OECD (1998, p. 37) in 1992, the share of intangibles in GDP was 11% in Sweden, 10.8% in the Netherlands, 9.4% in Denmark and Belgium, 9.2% in France, 8.5% in Austria and 8.2% in Germany.

Another problem arise when intangibles are being treated only as the production input (e.g. educational human capital, employment in R&D and IT, applied patents by inventor, etc.). This model highlights the importance of intangibles in the production process, although it fails to recognize their impact on the output side. As a result, the question remains unanswered – what is the impact of intangibles, what kind of the results they produce, what is the rate of return the investors should be expecting. In other words, it is not the size of investment that is hidden, but the connection between the input and the output (Konstantinos et al, 2013).

Within the conventional System of National Accounts, expenditure on intangible assets, such as research and development or human and organizational capital, is not considered either as part of Gross Value Added (GVA) or as investment. Although Marrano et al. (2009) argues that these assets should be included into national accounts, the study he had performed in the UK demonstrated, that after these assets have been accounted market sector GVA has increased macro figures by as much as 13% in 2004 (Konstantinos et al, 2013). This study was performed using Corrado et all (2005) methodology, which investigates the potential of intangible assets and economic growth. Here intangible assets are classified into three major blocks:

- **Computerized information:** software and databases.
- **Innovative property:** R&D; design; product development in financial services; mineral exploration and spending on the production of artistic originals.
- **Economic competencies:** market research; advertising; training; organizational capital (own account and purchased).

The analysis of Ferreira and Hamilton (2010) suggests that countries wealth and growth potential relies on two areas: 1) Human capital; 2) Institutional capital.

Investments in human capital today will assure benefits in the future. Institutional capital measures the extent to which policies and rules are applicable. In their Worldwide Governance Indicators (WGI) research project, Kaufmann, Kraay and Mastruzzi, provide data on five additional dimensions of governance: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality and control of corruption. These indicators are highly correlated -the lowest pair-wise correlation coefficient in our sample is 0.76 between political stability and regulatory quality (op. cit. Ferreira and Hamilton, 2010).

There has been quite a discussion whether intangible assets could be approached as the investment. Broadly accepted concept of intangible assets states, that intangible assets claims to future benefits that do not have a financial or physical embodiment (Bianchi & Labory, 2004; MORE AUTHORS). According to Diefenbach (2006) intangible concept has no materiality, it is not a paper with the idea written on it, but the idea itself, in addition intangible assets are renewable which is not the case with certain tangibles such as ecosystems. Another important aspect of the intangibles is ability to change while being used. In the consumption process tangible assets are being reduced, which is the same for intangibles, although in the consumption, process, intangible asset could be increased, regarding on the nature of the asset, for instance – shared knowledge. Based on these criteria Diefenbach (2006) emphasizes the main difference between tangibles and intangibles – is that intangible asset can growth while being used, which is not the case with tangibility.

According to Konstantinos et al (2013) intangibles should be approached as investment given that they represent a sacrifice of the present level of consumption in order to produce more output in the future. In addition, if these investments produce returns at some point in the future, they should not be only treated as an investment but also included in the gross value added (GVA) calculations, given as much quantitative importance as inputs of tangible nature (op.cit. Konstantinos et al, 2013). According to Goerzig and Gorning (2012) observed return rates on capital have an upward bias if economies are producing with unobserved intangible capital in addition making unobservable intangible capital observable. According to this statement, unobserved intangible capital contributes towards higher returns of observed capital, which also

redounds to the investment in intangibles acknowledgement. Webster and Jensen (2006) claims that intangible assets can not be treated as an investment due to these reasons:

1. They are not identifiable, as many intangibles are produced within the firm that uses them. In this respect, it is not easy to separate them from the business that owns them, or sells them as independent assets. In addition, several intangibles are non-rival.

2. The owner cannot always control access and use of them. Furthermore, in some cases intangibles might not be beneficial. It is not certain that the benefits embodied in assets such as R&D and marketing for instance will materialize eventually. The marginal product of some intangibles may well be zero (op. cit. Webster and Jensen, 2006).

Corrado *et al.* (2009) argues that these concerns could be applied towards tangible capital as well, in addition these statements has no point at macroeconomic level, since the owner of the asset is not important. What matters here, is whether the investment in intangibles increase the output and consumption of the entire economy. According to Hulten (2001) it is irrelevant whether the marginal product of some intangibles is zero. The key point again is whether an increase in intangibles yields returns at some point in the future in the form of higher production efficiency and improved product quality (op. cit. Hulten et al., 2001).

International investment law states (OECD, 2008), that investment concept should meet these criteria:

- The project should have a certain duration.
- There should be a certain regularity of profit and return.
- There is typically an element of risk for both sides.
- The commitment involved would have to be substantial.
- The operation should be significant for the host state's development.

Marrano et al (2009) has proposed to revise the upcoming Systems of National Accounts in Great Britain and include capitalization of R&D. According to their research, the ratio of nominal investment to nominal GDP has stayed more or less, where it was since the 1950s, which raises doubts what happens to the inputs in intangibles. According to Marrano et al (2009) GDP trends would look differently if intangibles have been included in the calculation process, but the process follow traditional accounting path due

to two reasons: 1) investments in intangibles is not popular among policy makers; 2) intangible assets are still encountering measurement problems.

The development of new products, services and business sectors along with the technological progress requires updated financial recording. Financial-accounting reports provide inaccurate information, irrelevant for making forecasts and for determining risks. In addition only a small portion of intangible assets are being recognized and used.

United States Bureau of Economic Analysis after proposed recommendations from certain studies (Corrado et al 2005, Corrado et al 2006) in July 31, 2013 has adopted a policy, where R&D was categorized as an investment on the government's books rather than an expense (BEA, 2013). After the adoption of this policy the GDP of the United States should increase by 3 percent, in addition revised GDP calculation methodology will be applied to re-calculate economic indicators starting 1929 m. (BEA, 2013). OECD (2013) reported that investments in R&D has showed little or no change in France for the period 1995- 2010. Within five years investment in R&D amounted for 1,9 percent of GDP, on the other hand, the investments in knowledge capital, organizational capital and other intangibles, which are not included into R&D has accumulated 7,4 up to 10,6 percent of GDP. These results supports Marrano et al (2009) idea, that R&D is only one of many intangible asset, which impact the effectiveness of our economies.

Up to date policies, capable of supporting nowadays resource allocation trends are essential in rapidly changing economies, better quality investments would expand opportunities to reap scale economies and by facilitate integration into global supply chains, boost productivity and rates of return on investment (OECD, 2013).

3 Intangible investment in Lithuania

Policies, supporting investment opportunities in Lithuania, comply with Europe Union regulations, in addition Lithuania, along with 34 OECD and ii non OECD countries has subscribed to the Declaration and committed to adhere governments to provide an open and transparent environment for international investment and to encourage the positive contribution multinational enterprises can make to economic and social progress (OECD, 2011).

Republic of Lithuania Law of investment states that:

- **“Investments”** means funds and tangible, intangible and financial assets assessed in the manner prescribed by laws and other legal acts, invested in

order to obtain from the object of investment profit (income), social result (in education, culture, science, health and social security as well as other similar spheres) or to ensure the implementation of state functions.

- **Investment**” means the act of investing performed by an investor in the manner prescribed by this Law whereby the investor acquires the right of ownership or the right of creditor’s claim against the object of investment, or the right to manage and use the object.

Investors may invest in the Republic of Lithuania according to the procedure established by law by using any of the following methods:

- By setting up an economic entity, acquiring the capital of an economic entity registered in the Republic of Lithuania or a share therein.
- By acquiring securities of all types.
- By creating, acquiring long-term assets or increasing the value thereof.
- By lending funds or other assets to economic entities, in which the investor owns a share in the capital enabling it to control the economic entity or to exert a considerable influence over the economic entity.
- By implementing concession contracts and contracts of financial lease (leasing).

Table 1: Types of investments according to Republic of Lithuania Law on investments

Types of investments according to Republic of Lithuania Law on investments		
Investor’s influence over an economic entity	direct	the investments aimed at establishing an economic entity and acquiring the capital of a registered economic entity or a share therein, also reinvestments, loans to economic entities the capital whereof is owned by the investor or in which the investor has a share in the capital, the subordinated loans where the objective of investment is to establish or to maintain long-term direct links between the investor and the economic entity into which investment is made, and the share in the capital acquired through investment grants the investor the right to either control the economic entity or to exert a considerable influence over it
	indirect	the investments where the share in the capital acquired through investment does not allow the investor to exert a considerable influence over the economic entity
Investor’s registered office	domestic	the investments in the Republic of Lithuania made by the State of Lithuania, natural and legal persons of the Republic of Lithuania
	foreign	the investments in the Republic of Lithuania made by foreign states, international organisations, foreign natural

		and legal persons
Status of the investor	state	the investments for meeting the needs of the State made using the national budget resources, state (municipal) fund resources, the loans obtained on behalf of the State of Lithuania (municipalities), funds of state-owned (municipal) enterprises and other state-owned (municipal) assets as well as the loan guarantees extended by the State (municipalities);
	private	the investments made by the subjects of private property law of the Republic of Lithuania and foreign states
	the investments made by foreign states and international organisations	
Object of investment	capital	investments in the creation, acquisition or increase of value of tangible and intangible fixed assets
	financial	all investments other than those specified in subparagraph 1 of this paragraph

Source: Republic of Lithuania law of investments

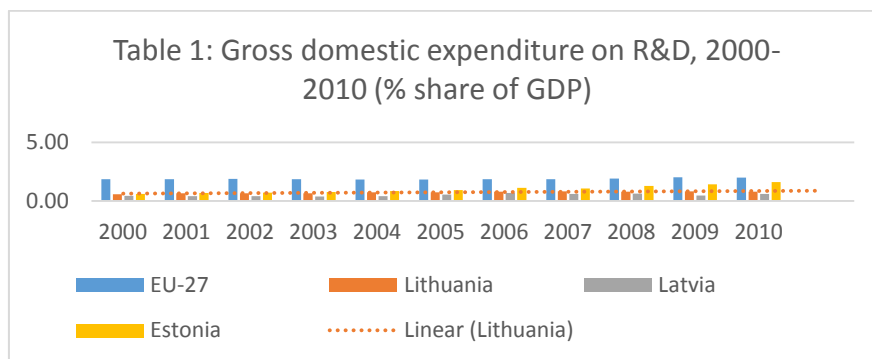
Intangible asset perspective within regional potential has been developed in many regions, such as: OECD countries (2013), United Kingdom (Konstantinos et al, 2013), Japan (Fukao, 2009), Brazil (Dutz, 2012) etc. Baltic States: Lithuania, Latvia and Estonia shares little attention regarding intangible asset recognition, assessment and investment insights, although Intan Invest project (Corrado et al, 2011) has developed a macroeconomic estimates of intangible investment for all 27 European countries, including Baltic States. Statistics for investing in intangible assets in Lithuania, Estonia and Latvia has been recorded for period 1995-2005, data for 2006-2010 is missing, which does not allow to benchmark the statistics.

Data to explore intangible asset patterns in Lithuania in this study has been taken from the Statistics department of the Republic of Lithuania, Eurostat, Innovation Union Scoreboard. Since Lithuania is not an OECD country it has not been included into Supporting Investment in Knowledge Capital, Growth and Innovation study, which focused on the investment patterns in all OECD countries.

According to the Statistics department of Lithuania, investment in Research and Development (R&D) as a share of Gross Domestic Product (GDP) in Lithuania has increased starting 0,79 perc. in 2006 up to 0,9 perc. in 2012. The size of the investment in R&D as a percent of GDP in the Baltic States is much smaller compared to the EU(27) (See Figure 1). Lithuania and EU (27) performance follows consistent trend line in the investing practice compared to Estonia or the United States. Estonia also demonstrates

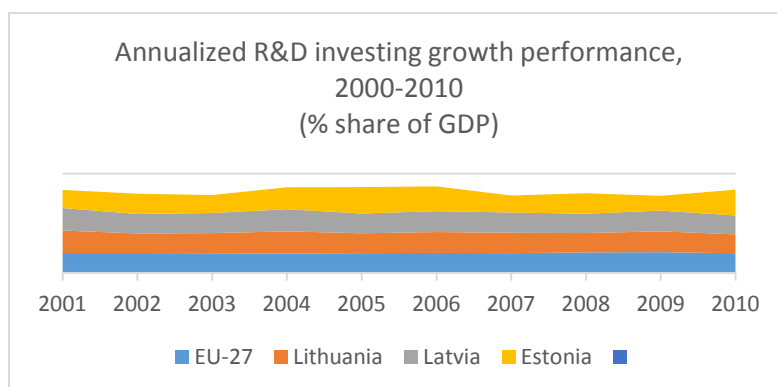
high growth rates compared to all regions (See Figure 3). For the year, 2004 – 2006 Estonia has increased its investment in R&D by 14 percent; starting 2009 investment trends are indicating the growth again (See Figure 2).

According to Eurostat data, GDP expenditure patterns on R&D by sector for the period 2005-2010 has been changing. Business enterprise sector has increased the investments in R&D in EU (27), all Baltic countries and the United States. Government investment in R&D within the same period in Lithuania has dropped slightly, yet investments in R&D in higher education sector in Lithuania has not showed any changes. Most of the funds to cover R&D expenditure in Latvia and Lithuania come from government institutions, although EU (27) and United States get most of R&D funding from business enterprise (Eurostat data). Looking at the trends of R&D expenditure source of funds Lithuania follows the same pater as EU (27) which is, ascending financial recourses from private sector and descending from the government.



Source: Eurostat

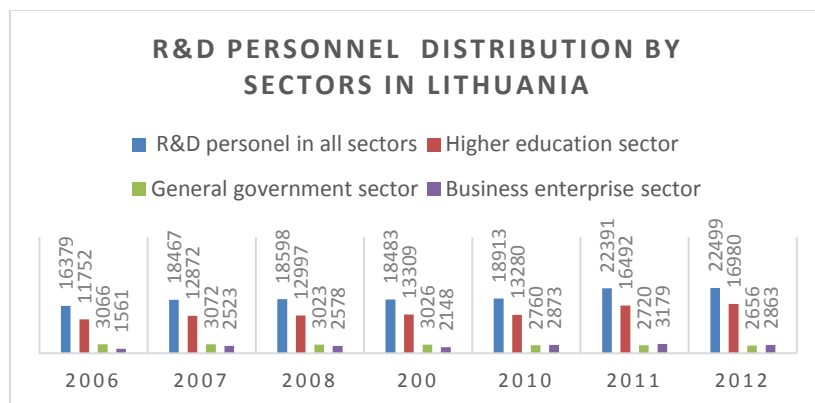
Figure 2. Gross domestic expenditure on R&D 200-2010



Source: Eurostat

Figure 3. Annualized growth performance

Most of the personnel working in the Research and Development field are allocated in higher education sector, there has been 45 perc. growth for the period 2006-2012, government sector on the other hand, has reduced personnel extent working in R&D (See Figure 4). The highest growth belongs to business enterprise sector, which has increase it personnel working in R&D by 83 percent. Shifting trend could be influenced Europe Union strategies followed by national policies and incentives. For instance, Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness. Horizon 2020 is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020) – in addition to the private investment that this money will attract. It promises more breakthroughs, discoveries and world-firsts by taking great ideas from the lab to the market. That is why major focus belongs to science and private sector collaboration and synergy creation, which leads to innovative outcomes. The main idea behind this strategy is to break down barriers to create a genuine single market for knowledge, research and innovation (Horizon 2020).



Source: Statistics department of the Republic of Lithuania

Figure 4: R&D personnel distribution by sectors in Lithuania 2006-2012

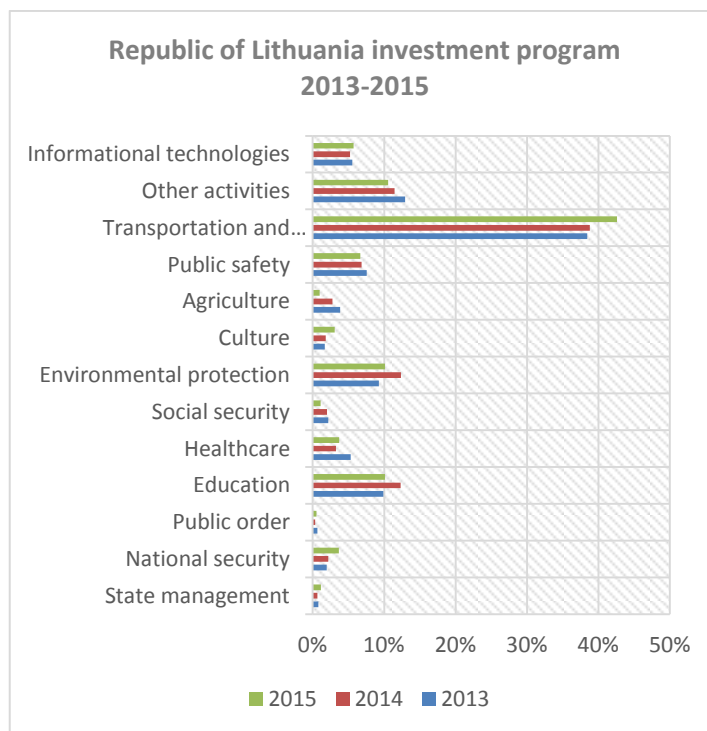
Even though investment patterns in R&D as a percentage share of GDP has been demonstrating ascending trends, which contributes to “Europe 2020” one of the targets - 3 perc. investment rate in Research and Development, it should not be the main focus indicator exploring intangible asset investment trends.

According to the Republic of Lithuania investment program for 2013-2015 almost half of the budget goes to transportation and communication, along with the 5 perc.

growth from 2013 till 2015. Further aims of this study is to explore what part in this distribution could belong to intangible assets (See Figure 5).

Investments in public order and state management areas are the lowest, yet according to Policy Framework for Investment (OECD, 2006) regulatory quality and public sector integrity are two dimensions of public governance that critically matter for the confidence and decisions of all investors and for reaping the development benefits of investment. Reduced R&D personnel in public sector, low government investment policy in these two sectors could negatively affect the extent of the investment.

Lithuania has improved its innovative performance between 2006 and 2013, yet almost all the indicators are below Europe Union average, except for Human resources, which one of the highest once in Europe (See Figure 6). High performance in this area is can be considered quite an achievement.



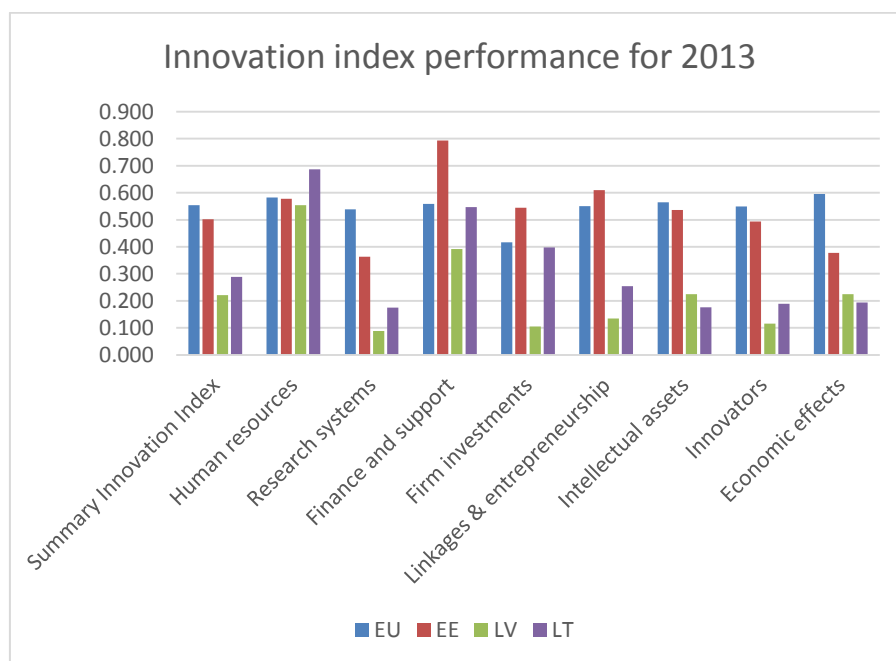
Source: The Ministry of Finance of the Republic of Lithuania

Figure 5: Republic of Lithuania investment program 2013-2015

Human resource development is a prerequisite needed to identify and to seize investment opportunities, yet many countries under-invest in human resource

development due in part to a range of market failures (OECD, 2006). Lithuania investments in tertiary education, exceeds EU average by 36 percent as well as youth with upper secondary level education. Human resource component – new doctorate graduates underperforms compared to EU average by 53 percent. Estonia and Latvia performs just about even with EU average in Human resource indicator. High growth is observed for Community trademarks, Most cited scientific publications and International scientific co-publications.

Despite of low business investment in R&D indicator there is consistent high annual growth in this area, same goes for intellectual capital. Growth trends are demonstrated in PCT patent applications, PCT patent applications in societal challenges, community trademarks has increased by 28.8 perc.



Source: Innovation Union scoreboard 2014.

Figure 6: Innovation index performance for 2013

Linking economic effectiveness and investment in intangibles aspect it is important to emphasize, that Lithuania puts most of the effort in investing in Human capital, which is the on the input side, although criteria for the output such as patent revenues from abroad, employment in knowledge intensive activities results are one of the lowest in Europe

Union. Lithuania invests in education, but does not get the use out of it. Same path follows scientific publication indicator, which is quite competitive compared to EU average, but what is the outcome of such investment.

Only a few intangible assets, such as good will etc. are included in financial reports, investing strategy focuses on tangible nature areas. Investing strategy in Lithuania follows similar trends since its independence. Rapid changes in global economy adds pressure for policy makers and economist to adopt innovative models to capture the most benefit possible.

3 Conclusions

1. Investments in knowledge capital, organizational capital and other intangibles, which are not under Research and Development (R&D) indicator has been demonstrating ascending trends, compared to the R&D.
2. One of “Europe 2020” strategy targets is 3 percent of each country’s GDP devoted to R&D. According to the Statistics department of Lithuania, investment in R&D as a share of GDP in Lithuania has increased starting 0,79 perc. in 2006 up to 0,9 perc. in 2012.
3. Human resource development is a prerequisite needed to identify and to seize investment opportunities, yet many countries under-invest in human resource development due in part to a range of market failures. According to Innovation dashboard data, Human recourse indicator is one of the highest in Europe. Lithuania investments in tertiary education, exceeds EU average by 36 percent as well as youth with upper secondary level education. Human resource component – new doctorate graduates underperforms compared to EU average by 53 percent.
4. Lithuanian private sector investments into R&D is still below EU average, but there has been a consistent annual growth trend. In addition, private sector has increased its personnel working in R&D by 83 percent from 2006-2012. Higher education has increased its personnel working in R&D, yet for the same period public sector demonstrated negative trends. Shifting trend could be influenced Europe Union strategies followed by national policies and incentives to promote science and private sector collaboration.

5. Investments in public order and state management areas are the lowest, yet according to Policy Framework for Investment (OECD, 2006) regulatory quality and public sector integrity are two dimensions of public governance that critically matter for the confidence and decisions of all investors and for reaping the development benefits of investment. Reduced R&D personnel in public sector, low government investment policy in these two sectors could negatively affect the extent of the investment overall.
6. Linking economic effectiveness and investment in intangibles aspect it is important to emphasize, that Lithuania puts most of the effort in investing in Human capital, which is the on the input side, although criteria for the output such as patent revenues from abroad, employment in knowledge intensive activities results are one of the lowest in Europe Union. Lithuania invests in education, but does not get the use out of it. Same path follows scientific publication indicator, which is quite competitive compared to EU average, but what is the outcome of such investment.

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Keeping Ambidexterity and Knowledge Dynamics Onboard. A Case Study of Norwegian Olympic Shipping

Johan Olaisen*

Department of Leadership and Organizational Behavior
BI Norwegian Business School
Nydalsveien 37, N-0442 Oslo, Norway

Øivind Revang

Department of Strategy and Logistics
BI Norwegian Business School
Nydalsveien 37, N-0442 Oslo, Norway

** Corresponding Author.*

Structured Abstract:

The **purpose** of this study is to describe, analyze and understand how a company keep ambidexterity and knowledge dynamics onboard during change and growth through defining, evolving and defending the vision of working smarter, greener and safer.

The research questions are:

Q1: How does ambidexterity manifest itself at the micro level?

Q2: What kinds of hurdles exist when the noticeable conditions for ambidexterity are elevated from an individual to an organizational knowledge level?

The answer to Q1 is that dividing the responsibilities for exploration and exploitation activities to separate managers are of importance, and that the individual power of these managers will impact the trajectory of the company. The answer to Q2 is that the main concern moving from an individual to an organizational knowledge level is how to organize and energize exploitation activities.

Methodology. This is a case study using the Norwegian Olympic Shipping as a case. We gave the management group of 22 an executive one third of a Master of Management program in 2013 and we got through this program access to all needed primary and secondary sources about the company itself and about their branch of business. All the participants worked with a project assignment analyzing different subjects for the practical realization of the company's strategy for the period 2014-2020. The project assignments included proposals for improvements and implementations and we will follow up this in august 2014. The case represents an action based methodological paradigm.

Practical implications. This is an exploration of how a company has kept the ambidexterity and knowledge dynamics in a long period growing from a small shipping company to a medium sized shipping company on its way to become a large global shipping company. The entrepreneurial spirit is kept in the shipping company through

empowerment, engagement, participation around the agreed upon vision to become greener, smarter and safer. The top-down control work in a dialectical relationship with bottom-up and the company can then take well care of their long term practice of working at the edge of their business.

Keywords - Knowledge Capabilities, Knowledge Dynamics, Exploitation, Exploration, Ambidexterity

Paper type - Academic Research Paper.

1 Introduction

This study is about understanding the knowledge assets for managing the paradoxical requirements between exploitation and exploration as companies grow. Firms have different attitudes and strategies towards innovation. In particular, firms have dissimilar motivations and capabilities to sense, search for, and seize new opportunities. They also have differentiated capacities to absorb new technologies developed externally. In this paper we explore how Olympic Shipping collaborate externally to complement their own resources and capabilities in their efforts to innovate. The theory of dynamic capabilities is combine knowledge, resources, entrepreneurship and complementarities based theories to explain how and why firms link with the market and the local knowledge cluster to leverage their own assets and resources. Dynamic capabilities enable firms to create new products, processes and business models. In addition to entrepreneurial capacities, dynamic capabilities involve combining and reconfiguring the firm's intangible and tangible assets to meet or shape market demand. These orchestration capabilities are hard to observe and replicate for competitors and may thus constitute sustainable competitive advantage for the focal firm. Designing and implementing collaborative mechanisms with a local knowledge cluster to search for and exploit and explore complementarities in innovation processes, may develop into hard-to-copy dynamic capabilities.

Knowledge is a critical asset and an important source of entrepreneurship and innovation (Du Chatenier et al., 2009; Grant, 1996; Nonaka, Toyama & Konno, 2000). Accordingly, knowledge is an important resource, however its effective use will to a great extent depend on its quality (Yu, 2007). Important criteria for knowledge quality are that the knowledge should be intrinsically right, relevant to the context and have practical value (Yoo, Vonderembse, & Ragu-Nathan, 2011). Thus the advantages to take into consideration the quality of work related knowledge shared are many, as a high level of knowledge quality will help employees and a team perform better, develop novel

products and services, increase sales and reduce costs, including reducing information overload.

We are exploring how firms collaborate externally to complement their own resources and capabilities in their efforts to create competitive advantages and innovative business systems. A central concern of a firm's overall strategy and the management of its own renewal is to maintain a dynamic fit between what the firm has to offer and what the environment expects (Miles and Snow, 1978). As such, a firm must possess the essential capabilities so as to constantly reconfigure, renew, and redeploy its resources and capabilities to better capture and exploit the changing opportunities (Teece, Pisano and Shuen, 1997). Dynamic capabilities enable firms to create new products, processes and business models. In addition to entrepreneurial capacities, dynamic capabilities involve combining and reconfiguring the firm's intangible and tangible assets to meet or shape market demand. These orchestration capabilities are hard to observe and replicate for competitors and may thus constitute sustainable competitive advantage for the focal firm. In a lack of a common accepted and well-received definition of dynamic capabilities several scholars have come together and define dynamic capabilities as the capacity of an organization to purposely create, extend, or modify its resource base (Helfat et al 2007). As also pointed out by Easterby-Smith et al. (2009) dynamic capabilities are determined in a variety of forms, involving a diversity of functions including product and process development combining the strategic choices with the delivery of the value chain. Dynamic capabilities are also associated with research on continuous change in organizations (Zollo and Winther 2002, Zahra et al., 2006) and might be looked upon as the theoretical foundation for agile project management (Augustine, 2005, Highsmith, 2004). Agile project management keeps the industrial scope; time and cost framework open much longer than traditional project management. This allows for adjustments of projects through all the phases. This has been identified as the competitive advantage of Norwegian oil service companies (Rosendahl, Olaisen and Revang, 2014).

More and more companies specialize in one area and technology to be efficient. Most innovations take place at the boundaries between specialized domains (Carlile, 2004), as knowledge production relies on the combination of knowledge from a variety of fields and disciplines (Newell et al., 2009; Shalley & Gilson, 2004). To be innovative organisations collaborate with each other. For the collaboration to be successful and generate innovative solutions, knowledge sharing in regional clusters becomes essential.

The case for this study is a fast growing offshore supply vessel company in Norway with the knowledge mission to be smarter, greener and safer than their competitors. Their strategy is to simultaneously explore and exploit their knowledge and technology environment. The challenge of balancing exploration and exploitation has been exhibited in distinctions made between refinement of an existing technology and the invention of a new one (Levinthal & March, 1981; March, 1991). In many ways the formulation “organizational ambidexterity” introduced by Duncan (1976) have been established as the concept that covers the “ability of a firm to simultaneously explore and exploit” (O’Reilly & Tushman, 2008, 2011). The purpose of this study is to describe, analyze and understand how a company keep ambidexterity and knowledge dynamics onboard during change and growth.

The research questions are:

Q1: How does ambidexterity manifest itself at the micro level?

Q2: What kinds of hurdles exist when the noticeable conditions for ambidexterity are elevated from an individual to an organizational knowledge level?

The answer to Q1 is that dividing the responsibilities for exploration and exploitation activities to separate managers are of importance, and that the individual power of these managers will impact the trajectory of the company. The answer to Q2 is that the main concern moving from an individual to an organizational knowledge level is how to organize and energize exploitation activities.

2 Methodology for the case study

In this paragraph we account for the empirical setting of the research project, how we collected data and interacted with key people in the case firm.

2.1 Research setting

This ethnographical case study was conducted in a supply shipping company located in the coastal center of Fosnavåg (population 4000) at the west coast of Norway. It is the most innovative maritime town in Norway, evidenced by housing of eight offshore shipping and four fishing companies and that owns more than 100 offshore vessels and 20 fishing vessels. Our case has approximately 55 people engaged at their headquarters and 900 globally. The company was founded in 1996 with 2 vessels. Today it has grown to 23 supply vessels with operations in the North Sea, the Gulf of Mexico

and Brazil. In the period 2005-2013 the company grew from seven to twenty-two vessels. The intention is to increase from 23 vessels to 50 vessels from 2014 to 2020. The island on the West Coast of Norway with three small towns and a population of 22000 represent a unique dynamic knowledge cluster for offshore oil activities where 27 companies are sharing and competing for the knowledge resources. This local cluster is a part of the maritime cluster at Møre. In 2011 this large cluster included 15 design companies, 14 shipbuilders, 160 equipment suppliers and 17 shipping companies. The export rate of the products and services extend 50% and Rolls Royce has chosen this site as their world center for marine shipping services. The cost level is the highest in the world, but the cluster prospers of increased activities even in a down turn for oil service companies (spring/summer 2014).

2.2 Data and information

The original agenda for our contact with the company was to design and run an executive Master of Management program for the top twenty managers in the company. Included were the two owners. Initially we interviewed the five top executives in two rounds to get an in depth picture of the company. Then we designed a module based, one-year program in six modules, consisting of lectures and group work. Through the program the participants had to analyze their own organization through different theoretical lenses. In parallel, groups of three had to write a project assignment on given topics where they analyzed their own firm and the realization of the firm's strategy 2014-2020. The project assignment should recommend improvements and a plan for implementation of the improvements. During the year we spent a total of twenty-four days each interacting with the top management group. The evidence we got from this case is extremely rich through documentation, interviews, interaction, and observations and through eight Master of Management assignments. We saw demonstrations of their management information systems and had a guided tour at a shipyard to observe the building of a vessel. In addition we collected much material about the industry and the company from secondary sources as newspaper, industry journals and magazines. We will in the fall of 2014 have a follow up of the implementations of the assignments where we also shall validate this paper through presentation and discussions with the top management group. Mansfield (1991, 1995 and 1998) has documented this way of interaction between the academic world and the practical world as the most successful way both to get

improvements/implementations in the practical world and to get valid and reliable research results in the academic world.

2.3 Originality and value

This methodology puts in evidence the possibility to propose an approach to analyze ambidexterity at a micro-level. In our analysis we have framed our observations in theoretical terms. A significant contribution to the literature on ambidextrous organizations is the identification of the close relation between individual competence and their corresponding responsibility for exploitation and exploration activities, and how their power in these positions will impact the paradoxical requirements of how exploration and exploitation are managed. This identifies a property of ambidextrous organizations that has been almost totally neglected in previous research. In investigating state of the art in organizational ambidexterity research Nosella et al. (2012) address future research this way: first it is important to remember that that ambidexterity is viewed as a capability to improve firm performance and that implies analyzing ambidexterity at a more micro level, through the organizational practices underlying the development of this capability (Kim & Rehee, 2009). "Adopting, for example, a 'practice-centered' approach in order to explore ambidexterity, 'to enter into how things get done in organizations' (Antonacopoulou & Pesqueux, 2010:11), would be a useful tool for investigating ambidexterity and providing a micro-foundation for this multifaceted phenomenon" Nosella et al. (2012:459). Our analysis is a micro oriented case study aimed at exploring the 'hows' of this phenomenon within a knowledge perspective.

3 Introducing the case of Olympic Shipping

At an abstract level the case company is based on mediating technology (Thompson, 1967:16-17), developing and linking supply-shipping capacity with clients or customers distributed in time and space. It differs from traditional examples of mediating technology as banks, telecom and insurance in being project based, of all excess both at the supply and demand side. They specify and order new builds from shipyards and they contract these vessels to customers in the offshore oil and gas business as drilling and oil companies. Usually it takes two years from they start detailing a new vessel until it is delivered from the shipyard, and the average contract period with customers are between three and four years. Each build is a unique constellation of technical equipment as

cranes, helideck, engine design, greener technology, new electronics devices and so on. Each customer contract represents a unique bundle of activities to be performed. Accordingly the projects embody stepwise developments, both in technological innovations and in customer requirements. These properties make it easier to spot and pinpoint changes, progress and development and their interrelated managerial decisions, actors and considerations; compared to cases where companies' mass-produce products continuously applying long-linked technology. The project-based context are the common value-creating logic in construction industries and becoming more and more usual both in traditional industries as well as in expanding industries like consulting, R & D, and in high tech firms where shorter product lifecycles enforce renewal processes. So our case firm does not only represent a beneficial context for studying development and processes, it typifies a setting that seems to be more and more common in business. Thompson (1967) labeled project-based organizations as temporary organizations and Olympic Shipping practice agile project management.

4 The theoretical foundation for organizational ambidexterity

In this section we first elaborate on the concept of dynamic capabilities DCs. We will then take into consideration four additional areas of theory: knowledge, resource, complementarities and corporate entrepreneurial-based theory. All of these five theoretical foundations even if they often are overlapping have contributed to our integrated expansion into the concept of organizational ambidexterity (OA).

4.1 Dynamic Capabilities

All organizations have a limited number of resources that must be allocated between conflicting goals. Firms that balance this tension resulting in superior rent over a long period of time is said to have DCs. DCs are defined as a firm's ability to integrate, build and reconfigure internal and external competences to address (respond and create) rapidly changing business environments (Teece et al., 1997:516) or "the capacity of an organization to purposefully create, extend, and modify its resource base" (Helfat et al., 2007:4). The concept of dynamic capabilities is linked to the resource based theory of strategy (Barney, 1991; Wernerfelt, 1984). Initially this theory assumed that resources and capabilities that grant enterprises competitive advantages are relatively fixed. Recently, however, scholars have put entrepreneurial skills to the forefront of dynamic

capabilities to develop the theory as a response to the strategic challenges posed by a fast moving and globalizing business ecosystem (Teece, 2007; Wang & Ahmed, 2007). Wang and Ahmed posit that three main components are at play: adaptive capability, absorptive capability, and innovative capability. Adaptive capability concerns the firm's ability to identify and capitalize on emerging market opportunities, balancing exploration and exploitation strategies (March, 1991). The dynamic capabilities are reflected through the capacity to integrate complementarities into a strategic fit between the firm's resources, organizational design and foresight. Activities include scanning the market, monitoring customers and competitors, and allocate resources to R&D and marketing efforts. Absorptive capability involves "the ability of a firm to recognize the value of new, external information, assimilate it and apply it to commercial ends.... and the ability to evaluate and utilize outside knowledge is largely a function of the level of prior knowledge"(Cohen & Levinthal, 1990). A study of the oil service industry indicates that firms possessing absorptive capacities learn from various partners, share information within multidisciplinary teams, develop and use complementary technologies and possess a high level of knowledge and skills in areas relevant to the applications of the new technology (Woiceshyn & Daellenbach, 2005). Innovative capability refers to a firm's ability to develop new products and services, processes, business models and markets.

4.2 The resource based theory and DC

The concept of dynamic capabilities is linked to the resource based theory of strategy (Barney, 1991; Wernerfelt, 1984). The resource-based theory is also the start of the theory of dynamic capabilities and the theory of agile project management is a part of the theory of dynamic capabilities (Augustine, 2005). Initially this theory assumed that resources and capabilities that grant enterprises competitive advantages are relatively fixed. Recently, however, scholars have put entrepreneurial skills to the forefront of dynamic capabilities to develop the theory as a response to the strategic challenges posed by a fast moving and globalizing business ecosystem (Teece, 2007; Wang & Ahmed, 2007). Wang and Ahmed posit that three main components are at play: adaptive capability, absorptive capability, and innovative capability. Adaptive capability concerns the firm's ability to identify and capitalize on emerging market opportunities, balancing exploration and exploitation strategies (March, 1991). Adaptive capability is defined as a firm's ability to identify and capitalize on emerging market opportunities (Chakrovarthy,

1982). Therefore, adaptive capabilities are essential in the context of commercialization. Adaptive capability focuses on effective search and balancing of exploration and exploitation strategies (Staber and Sydow, 2002). This type of balancing act is brought to a strategic level and linked to the coordination of resources. The development of an increased adaptive capability is linked to a development of new organizational forms like for instance agile project management.

The dynamic capabilities are reflected through the capacity to integrate complementarities into a strategic fit between the firm's resources, organizational design and foresight. Activities include scanning the market, monitoring customers and competitors, and allocate resources to R&D and marketing efforts. Cohen and Levinthal (1990) defined absorptive capability, as "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends the ability to evaluate and utilize outside knowledge is largely a function the level of prior knowledge". Firms ability to acquire external, new knowledge, assimilate it with existing internal knowledge and ability to create new knowledge is an important factor of dynamic capabilities. The absorptive processes are crucial for all learning processing.

A study of the oil industry indicates that firms possessing absorptive capacities learn from various partners, share information within multidisciplinary teams, develop and use complementary technologies and possess a high level of knowledge and skills in areas relevant to the applications of the new technology (Woiceshyn & Daellenbach, 2005). This study concludes that his absorptive capacity is especially important in emergent new markets and territories. Understanding the political, social and cultural values in these societies is an important part of the absorptive and thus competitive capacity. In our opinion the absorptive capacity of the firm in other political and cultural business systems are not well theoretical and empirical based and there is a missing understanding link between understanding how a system might adjust to use their stable components differently in different systems. We are arguing that the flexibility and agility must be found in the business system itself

Innovative business capability refers to a firm's ability to develop new products and services, processes, business models and markets. This encompasses several dimensions such as developing new product and services, developing new methods and production, identifying new markets, seeking unusual and novel solutions (Schumpeter, 1934).

An important part of this innovative capability is the capability to standardize these innovations into standard routines and procedures in such a way that the innovations might be reused in different projects in different political systems. The reuse of procedures and routines is the efficiency needed for delivery of cost, time and quality in any project. The effectiveness for this must however be found in the business system itself.

In his studies of innovation in disruptive circumstances, Christensen argues that existing decision rules and underlying reward and incentive systems favor the status quo or incremental improvements, reinforced through feedback from existing customers and suppliers (Christensen, 1997). Extant competitive advantages are destined to be temporary unless the enterprise learns new approaches and let go of old capabilities related to the search, selection and implementation issues in innovation processes. The ability to review the efficiency of the prevailing routines and the willingness to extend or change them, is a dynamic capability (Teece, Pisano, & Shuen, 1997). In other words, dynamic capabilities may be enacted to overcome inertia and barriers to using new (external) partners in their innovation processes. Introducing the concept of complementarities in this context may serve analytical as well as practical purposes.

The question why some firms persistently outperform their competitors has been elaborated within the resource based theory of strategy, which argues that enterprises consist of idiosyncratic and difficult to trade assets and competencies (Barney, 1991; Foss, 1997; Wernerfelt, 1984). These resources are often classified into four broad categories: physical capital, financial capital, human capital and organizational capital. For the purposes of this study, the two latter categories are most relevant. The human capital assets include the knowledge, skills and attitudes of managers and employees, their training, experience and judgment. The organizational resources typically include attributes of teams or individuals associated with the firm, a firm's culture, its formal and informal reporting systems, decision processes, coordination mechanisms, and its reputation in the market place and its relationships with all stakeholders in the firm. These resources will have differential impact on firms and their capacity to offer potential competitive advantages. For a hotel, the location may be the superior advantage. For oil and gas companies, convenient access to their raw materials increasingly is a differentiating factor. Obviously, not all locations and not all raw materials constitute a

basis for sustained competitive advantage. In a country with strong political control of all resources it will be especially difficult to obtain sustainable competitive advantage.

At a point in time ownership of valuable and rare resources may provide competitive advantage. However, valuable, rare or scarce human or organizational resources may only be sources of sustained competitive advantage when other firms cannot obtain them by duplication or substitution. This requirement may be fulfilled from at least three sources:

- The ability of a firm to obtain or develop the resource is dependent on unique historical conditions, often coined path dependency (Brian, 1994; Pierson, 2000)
- The link between the resource possessed and utilized by the firm and that firm's sustained competitive advantage is causally ambiguous
- The resource or capability generating the firm's advantage is socially complex

These features may all be present in a firm's link to local and non-local suppliers and sub suppliers, but will of course depend on the length and depth of the collaboration.

The resource-based thinking has recently been extended by viewing the firm as a stock as well as a dynamic flow of resources (McKelvie and Davidsson, 2009). The constantly changing circumstances to a firm call for the constant restructuring and transformation of resources (Eisenhardt and Martin, 2009). Dynamic capabilities are now seen as the firm's extant resource base and transform it in such a way that a new bundle or configuration of resources is created so that the firm can sustain or enhance competitive advantage (Ambrosini and Bowman, 2009).

4.3 Knowledge based theories and DC

Knowledge is a widely debated concept without any agreed-upon definition, and different views exist in the knowledge management field. In some approaches knowledge and information have a tendency to be treated as equals (Wang & Noe 2010), however, we can with certainty distinguish knowledge and information from data. Whereas data represent letters and raw numbers, thus provides no meaning without a context, information is regarded as processed data (Wang & Noe, 2010). This article adopts the view that information can be transformed to knowledge by being combined with experience, context, interpretation, and reflection. Subsequently, knowledge represents action and development, and can be characterized as both dynamic and personal (Nonaka, 1994). We further focus attention on the subjective and social constructed nature of knowledge (Alveson & Kärreman, 2001), and from this socio-cultural perspective, it is

argued that knowledge is constructed and negotiated through social interaction (Newell, Robertson, Scarbrough, & Swan, 2009).

Competence might be defined as the integration of knowledge, skills and attitudes into professionalism. The integration might be what we are defining as professional experiences for reuse and relearning. The attitude is crucial for de learning and the attitude is linked to the corporate culture and a corporate positivism as found in Olympic Shipping for de learning might be a dynamic capability for adapting to internal and external changes.

In the same way as knowledge is a debated topic, so is the topic of knowledge sharing. Most definitions include an element of movement of knowledge from person, unit or organization to another that enables creation, acquisition, integration and use of knowledge (Staples & Webster, 2008). A definition that is in line with the socio-cultural view that has been adopted, explains knowledge sharing as mutual exchange of both tacit and explicit knowledge and a joint creation of knowledge (Van den Hooff & De Ridder 2004).

It is possible to delineate between two types of knowledge, namely explicit- and tacit knowledge (Newell et al., 2009). Although the two are often interconnected, they presuppose different methods of sharing knowledge. A common notion is that explicit knowledge easily can be shared with all team members using technology. Hence distributed teams will be more inclined to share knowledge that is explicit in nature, because technology more easily supports this kind of declarative knowledge. On the other hand, tacit knowledge is acquired from experience, and for this reason, healthy social relationships are consequently important for the sharing of tacit knowledge in virtual teams (Maznevski & Atanassiou, 2003). Moreover, the ability to facilitate for the sharing of explicit-, but maybe more importantly, the sharing of tacit knowledge between individuals and in teams is crucial to exploit experiences into new learning to enable the creation of new possibilities.

4.3 The Theory of Corporate Entrepreneurship and DC

In an open and globalizing business environment, sustainable advantage requires more than ownership of valuable, rare and difficult-to-copy resources (Teece, 2007). Resources that created competitive advantages in a particular market context may be obsolete with no value in a new environment. This new environment might have a different political,

social and cultural setting where the rules are changed compared to what have given the company former competitive advantages. Thus if the business system is not flexible enough to find new reconfiguration of their resources they will have difficulties competing in different business cultures. On a general level, we argue that if a firm's ability to implement innovations is valuable, rare and costly to imitate, then a firm's capability to innovate and standardize the innovations into procedure and routines is a potential source of sustained competitive advantage. In the same vein, we argue that an entrepreneurial capacity may represent a hard-to-imitate dynamic capability. By entrepreneurship we mean the capacity to sense and shape opportunities and threats, to seize these opportunities and to reconfigure resources into new flexible business models and successfully introduce new products or services into different marketplaces. Sensing new opportunities and threats implies differential access to knowledge either by seeing something that others don't see, or by understanding something that others don't understand. Secondly, it implies the capacity to transform that knowledge into opportunities. Making sense of local as well as distant political, social and cultural information is another dynamic capability.

4.4 The theory of complementarities and DC

Firms can improve their innovative capabilities by interacting with a variety of partners such as existing suppliers and customers (see e.g. Lorenzoni & Lipparini, 1999; Lundvall, 1992; Von Hippel, 1988), political and bureaucratic institutions (see e.g. Kaufmann & Tödtling, 2001; MacPherson, 2002; Mansfield, 1995; Santoro, 2000), and even potential or existing industry competitors (see e.g. Dodgson, 1993; Hamel, 1991). Why should they collaborate with political institutions, which are inherently difficult to link up with? We argue that potential conflicts are outweighed by the potential benefits of complementarities especially in different cultural settings.

Complementarities involve how the interactions among changes in different activities are affecting performance. Two activities are complements when doing (more of) one of them increases the returns to doing (more of) the other. If one of a pair of complements is instituted or increased, it will be more attractive than before to introduce or increase the other (Roberts, 2004). For example in Venezuela will a strong link to the political system make it much easier to handle time, cost and quality in the different project stages and processes. This is a strategic choice. In this context, Complementarities give rise to

business and innovation systems effects, with the whole being more than the sum of its parts.

Roberts tells the dismal story of General Motor's innovation policy in the 1980's: In that decade GM spent more than the combined market value of Toyota and Nissan on flexible automation and other lean measures to increase its potential agility and flexibility. However, it failed to speed up its product development processes, adjust its product mix, production scheduling and reform its human resource practices according to the market needs outside US which also in the long run made the much less competitive in their domestic market (Roberts, 2004). The GM way was to design and dominate together with acquiring companies making them exclusive outside the emergent way of partnership and relationships through networks and clusters. Connecting and sharing was never a part of GM's policy.

The acquisition of knowledge and resources from external sources has been identified as a key component of both competitive advantage and new product development in firms (Van de Ven, Polley, Garud, & Venkataraman, 1999; Von Hippel, 1988). Van de Ven (2009) argues that the acquisition of external knowledge is not the key for competitive advantage, but the key is of course how the company is using this knowledge in the local market place and thus having a central business system that might adjust to both different market need and different political and cultural situations. This is what we will define as knowledge in action and more importantly a business system in action.

4.5 The theory of dynamic capabilities revisited

Dynamic capabilities are viewed as drivers behind creation, evolution, and recombination of other resources into a new source of competitive advantage (Henderson and Cockburn, 1994, Teece et al, 1997). Barney (1991) described resources as all assets, capabilities, organizational processes, firm attributes, information and knowledge controlled by the firm which enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness. However, resources alone are not enough to explain firm's competitive advantage, they need to be employed in a combination in order to be useful (Penrose, 1959, Grant, 1991). In reply to this critique, the dynamic capability approach has evolved, and defined as the ability to coordinate and deploy resources in order to achieve the firm's goals (Amit and Schoemaker, 1993). This capabilities approach thus overcomes the critique of whether possession or usage of resources is the

primary concern (Wiklund and Shepherd, 2003). Further, as they are not simply inputs into a productive process, capabilities cannot be purchased from the market (Makadok, 2001).

Therefore, the dynamic capability perspective offers an attempt to explain and explore how firms can leverage their strategies and change their valuable resources that enable them to confront and overcome multiple challenges over long time. Eisenhardt and Martin (2009) defined dynamic capabilities as “the firms processes a ‘that use resources – specifically the processes to integrate, reconfigure, gain and release resources- to match or create a market change.

As one of the most central and difficult questions within the domain of business strategy this theme has been characterized as “The Holy Grail of Strategic Management“ (Helfat & Peteraf, 2009:91). Being concerned with change and development the concept of DC contrasts with ordinary or operational capabilities (Winter, 2003:992). The concept reflects an organization's ability to achieve new and innovative forms of competitive advantage given path dependencies and market positions (Leonard-Barton, 1992; Teece et al., 1997:516). The ambition of the framework is to explain the sources of enterprise-level competitive advantage over time (Teece, 2007:1320). As a strategic framework the DC view is said to be of particular relevance in "fast-moving business environments open to global competition and characterized by dispersion in the geographical and organizational sources of innovation and manufacturing. Here sustainable competitive advantage requires more than ownership and difficult to-replicate (knowledge) assets" (Teece, 2007:1319). For analytical purposes dynamic capabilities can be disaggregated into three capacities:

- 1) To sense and shape opportunities and threats
- 2) To seize opportunities
- 3) To maintain competitiveness through enhancing, combining, protecting and, when necessary, reconfigure the business enterprise's intangible and tangible assets (ibid).

Arent and Bromiley (2009) systematically criticized the DC framework for being the "new touchstone firm-based performance-focused theory". They assess the ability of the dynamic capability view (DCV) to explain successful change with logical consistency, conceptual clarity and empirical rigor" (2009:75). The DCV does not live up to these criteria. Their assessment identifies four major problems that limits the potential contribution of the CDV:

- 1) Unclear value -added relative to existing concepts
- 2) Lack of a coherent theoretical foundation
- 3) Weak empirical support
- 4) Unclear practical implications (ibid).

We would add to point 3 that DC is difficult to investigate empirically and such studies are facing an immanent danger of tautological explanations. Does well performing firms in dynamic environments achieve because of their dynamic capabilities? If so, how do we observe these capabilities and seize them in variables or constructs? Or do all firms that create extraordinary rent over time in dynamic business environments pr. definition embody dynamic capabilities? Another research challenge is related to the dependent variable "extraordinary rent over time" which manifest itself at the firm level, while the causes or independent variables may be exogenous like changing markets or at an individual level and related to positions, mindsets, influence and decision making concerning resource allocation over time.

Two of the most famous studies in the search for the Holy Grail of business performance are "In search of Excellence" (Peters & Waterman, 1982)¹ and "From Good to Great" (Collins, 2001)². In both analyses the companies selected for investigations had to pass a number of criteria, among these superior financial performance over a long period of time (30 years). Which would fit the definition of dynamic capabilities at work. However, in both studies firms got into trouble short after the results were published. Enduring extraordinary financial results in the past was not a rock-solid pointer for future success. The explanations for greatness or excellence in both studies are to a large extent given at firm level as culture and discipline. These give little insight in micro foundations or internal competencies in the formation of such firm qualities. Collins (2001) states that "greatness is not a function of circumstance, greatness is largely a matter of conscious choice and discipline", but we do not get any variables we can evaluate or operationalize. Even when they claim "level 5 leadership" (Collins) or "hands on value driven management" (Peters and Waterman) it is hard to grasp a significant link to firm performance. In addition it may also be a long time span between actions taken and change in performance measurements shows up which make it hard to estimate functional

¹ According to Wikipedia the book sold 3 million copies the first 4 years and being the most widely held library book in the United States from 1989 to 2006.

² The book has so far sold more than 4 million copies (<http://www.economist.com/node/21540219>). Both books are translated to a number of different languages.

relationships. These conditions illustrate some of the difficulties concerning theory development within the DCV.

Dynamic capabilities theory started out as a part of the resource based theory and has developed as a theory in its own right explaining how to act upon increased internal and external complexity where the key is both to exploit and explore the reality. This is what Olaisen (1983) labeled as the clarified subjectivity paradigm where explanation is not the key, but exploiting and exploring or in his words “what we don’t know that we know”.

5. Organizational ambidexterity (OA)

The start of ambidexterity was the Bauhaus art period in Germany in the 1920’s. Kandinsky found the mathematical formula for combining colors and mathematical figures. Klee labeled this in 1928 as the ambidexterity of art (Gale 2013) where his pictures “Shooting The Moon” and “The Fire” are examples of exactness in rational form and at the same time subjective irrational strong colors (Paul Klee Making Visible, Tate Modern 2013). It describes the combination of rationality and irrationality describing the entrepreneurial owners of Olympic Shipping as rational and irrational at the same time setting up the company in a bet for greener, smarter and safer. The stock market tolerate only financial rationality and you have to be an entrepreneur and/or artist to tolerate a high rate of irrationality. It represent a tacit knowledge with very objective results either it is art or business.

Another stream of knowledge development concerning superior firm performance over time are labeled organizational ambidexterity (OA). The concept originates from describing a human being able to use both hands with equal ease. In organization theory defined as the ability to manage trade-offs emerging from a simultaneous focus on alignment and adaptation (Rothaermel & Alexandre 2009: 759), or as the ability of an organization to simultaneously pursue both explorative (discontinuous) and exploitative (incremental) change i.e. "explore new opportunities even as they work diligently to exploit existing capabilities" (O'Reilly & Tushman, 2004:74). Because OA facilitates new resource configurations that can offer competitive advantage (Eisenhardt & Martin, 2000) it is dynamic capabilities in practice (O'Reilly & Tushman, 2008: 192-196). In other words successful management of OA over a long time will classify as DC.

As in the DCV the level of analysis is crucial in OA studies. Even if ambidexterity is viewed as a multilevel construct (Birkinshaw & Gupta, 2013: 293-294) most of the

empirical OA-performance studies have been conducted at the firm level (Junni et al., 2013:301). The implication is that the question of how organizations manage the allocation of resources between exploration of future possibilities and present needs is under prioritized at the expense of general mapping of the field through gallant quantitative calculations of measurable general variables.

Ambidexterity has typically been viewed in structural, contextual and sequential terms (Eriksson, 2013:334; Kang & Snell, 2009:66). In structural ambidexterity sometimes called spatial partitioning, organizational units engaged in exploration and exploitation is separated from each other (Tushman & O'Reilly, 1996; Benner & Tushman, 2003). Contextual ambidexterity applies to situations where there is a capacity and competence to simultaneously pursue exploitation and exploration within the same organizational unit (Gibson & Birkinshaw, 2004; Gupta & Birkinshaw, 2013; Gupta, Smith & Shalley, 2006; Teece, 2007). This term allows for the possibility that there is a multitude of ways to handle the tensions involved in doing two different things at the same time (Birkinshaw & Gupta, 2013: 288), and these possibilities arise from features in the context of the focal organization. To understand the ability of organizations to handle the tensions that conflicting goals put on resource allocation we need to give careful consideration to the role of managerial capabilities (Birkinshaw & Gupta; 2013:293). The third category, sequential or punctuated equilibrium terms situations where there is temporal cycling between short rushes of exploration and long stable periods of exploitation (Adler, Goldoftas & Levine; 1999; Gupta, Smith & Shalley, 2006: 698). Sequential equilibrium can take place when exploration and exploitation are mutually exclusive ends of a continuum. For example in the case of system-level architecture (Henderson & Clark: 1990), like building a new vessel equipped with a unique set of technologies (exploration) and then learning to operate it more and more efficient (exploitation).

Most research is concentrated on one of these three categories. Recent contributions have found that all three in combination can be fruitful in giving meaning to empirical data (Andriopoulos & Lewis, 2010; Ericsson, 2013; Raich et al. 2009). Combining them may provide answers to: what kind of knowledge and skills are needed to explore and exploit and what kind of organizational solutions balance the interplay between these needs in a dynamic perspective?

6. Analyzing the case: ambidexterity, tensions and knowledge

6.1 Performance

The company was founded in 1996 operating 2 supply vessels. It is organized as a private limited company and the two founders still own all the shares. The CEO (also chairman of the board) own more than 67% and have full control over the company. The main expansion took place between 2005 and 2013 when the company grew from seven to twenty-two ships. It is now the second largest supply company in Fosnavåg in terms of number of ships. In the same period the estimated value of the vessels increased by 453 percent, making the company the most valuable supply company in Fosnavåg. In 2005 the company was ranked no. three in market value of vessels, approximately half of the most valuable firm, today they are valued 15% more than no. 2. In 2013 they had a turnover of approximately 200 million dollars and a profit margin of 48% before depreciations and tax. Equity is around 40%. Historically the operating margins have been huge - sometimes 60% of turnover, but have varied considerably due to market variations. Evaluated in relative economical parameters our case is a highly successful business. It is not the profit margins that are outstanding compared to competitors, but the increase in the value of the vessels. The underlying explanation is their search for cutting-edge capabilities and eco-friendly technological solutions in their new builds. The market value of these ships decreases more slowly than the value of less complex vessels.

The two project assignment groups including the two owners in the following six questions identified the crucial questions for further development of Olympic Shipping:

1. What are the logistics and value creation of our value chain? Where and how are we making our money or satisfying our primary goals? How do we become a global prime mover in in the supply boat offshore industry?
2. What knowledge, skills and attitudes are needed to deliver a smarter, greener and more secure value chain?
3. What co-creation with local partners and global customers do we need to deliver our value chain?
4. What local cluster do we need to understand, satisfy and take responsibility for our stakeholders in different contexts in our value chain?

5. Will the strategy be dynamic and innovative enough to meet the challenges and changes in the global market? Are the global market willing to pay for smarter, greener and more secure supply boats?

6. How must/can we balance leadership and strategizing entrepreneurship to get the right value dialogue in different corporate contexts? What strategy, leadership and organizational forms are needed to enable what Olympic Shipping describes as healthy greediness? Is it possible to keep the strategizing entrepreneurial owner mind-set when going more global?

6.2 The Business and the Mission of the Case Company

A supply shipping company usually owns a fleet of specialized ships that constitute the production capacity of the company. It is very common that each ship is a separate corporation fully owned by the shipping company. The vessels are contracted by customers in the oil industry, either on long-term contracts (3-5 years) or operate on a spot market.

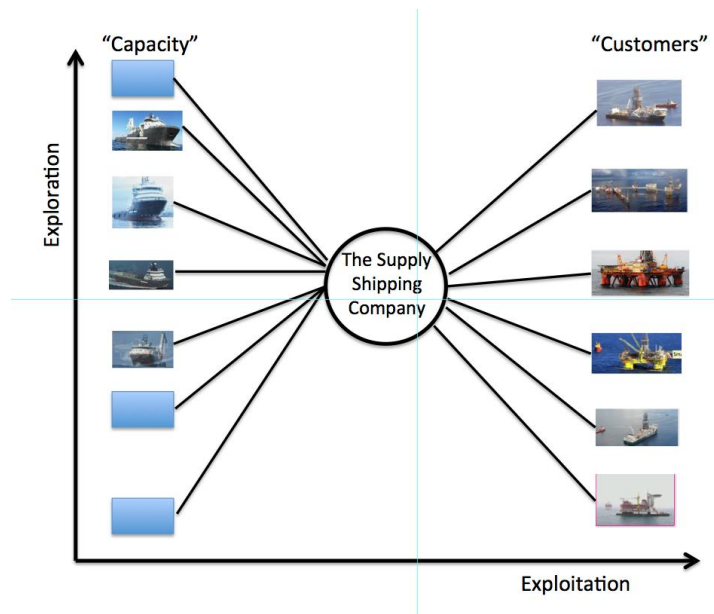


Figure 1. The value creation logic of the supply shipping company

At the organizational level the company is a mediating technology (Thompson, 1967:16-17) with pooled interdependence between the parts, each part renders a discrete contribution to the whole and each part is supported by the whole. Actions taken by one ship can proceed without regard to actions taken by other vessels so long as the overall organization remains viable. Exploration takes place along the vertical axis in the model as development in technology, design and equipment from one build to the next. Exploitation takes place in along the horizontal axis as contracting vessels to customers and efficient delivery of services in accordance with contract. According to Thompson (1967) the proper strategy for firms based on the abstraction called mediating technology is to expand the population served. Hence, growth in capacity by adding more ships, serving more customer driven projects through diversification, expanding into new markets etc., all becomes appropriate strategic actions. The company has established a "best operating practices" mission, operationalized as working "safer, smarter and greener". They strongly believe that performing their activities the right way will give the company the best results.

The practice of operating greener is especially important for the exploration - exploitation tension. Working greener has become a guiding intention when they invest in technologies. So they compose vessels with technology and solutions that are neither obligatory nor mandated by the authorities or the oil companies at the time of construction. The strategic idea is that the market and formal requirements will continually progress in a more eco-friendly direction affecting the market value of "early eco-friendly" vessels positively. This indirectly states that being ambidextrous will exclude the company from being a low-cost actor, but the investments are anticipated to be compensate for this in the long run.

6.3 Mediating projects on two sides

The primary operating activities performed by the company fall in to two main categories 1) "design" and order vessels from shipyards 2) operating the vessels and deliver services according to negotiated contract. In addition there are important supporting activities in different knowledge areas like: financing the builds, the negotiation of contracts, crew staffing, and accounting.

1) The company is located in one of the few complete maritime clusters in the world with several companies in each segment of the industry value chain - shipping, ship

design, equipment suppliers and shipbuilding. This cluster is a world leader in the concept of "advanced marine operations" i.e. operations for the oil industry. In this industry the general trend are greener, deeper and colder. In the sense that environmental restrictions are increasing, and that new discoveries are deeper and further north.

Innovations in isolated technologies as cranes, propellers and engines are to a large extent constructed outside the company. However, there are dyadic relations between the suppliers and our company so both parts can have influence in development processes. An example may be:

We have a zero-tolerance emission target, and this played into our choice of a hybrid (diesel-mechanical/diesel-electric) propulsion solution on our next-generation AHTS/offshore construction vessels. While the technology was in place, it still wasn't in commercial use on these types of vessels as of yet. We then invited three ship design companies and shipyards to try and help us turn this challenge into a reality. We felt that Ulstein Yard and Ulstein Design & Solutions had the best proposition, and their combination of quality, standing, reputation, solidity and knowledge sealed the deal, says senior vice president ...³

For each build there is a process of technology brokering (Haragon & Sutton, 1997) where the end result is technical specifications for a vessel that is ordered from a local shipbuilder. The top management takes part in the discussions about technical solutions and the CEO has the final word. There after project control activities follow where the technical department checks progression and mounted technical equipment during the building period. After the vessel finished and handed over to the shipping company, the technical department shifts focus from building to operations and is responsible for required technical examinations as well as maintenance planning and execution.

2) Vessels are contracted to customers for a fixed period of time usually with an option of prolongation. The contract period can be viewed as an operating project with a priori definitions of time, cost and quality. A central located team of 5-6 persons is following the operations and manages the logistics of fuel, food, equipment, crew etc. The two most advanced segments of the industry are vessels for anchor handling and vessels for subsea operations. The ship's crew performs the operations and can be an important factor when customers decide contracts for a supplier. Repeatedly we were told about customers after having decided the technical level of the ship asked for the captain's name. One of the reasons is that good captains maneuver their vessel efficiently saving

³ <http://www.maritime-executive.com/pressrelease/proven-olympic-shipping-eco-friendly-operations/>

the customer fuel costs and time. An example from the use of hybrid (diesel-mechanical/diesel-electric) vessels:

On one of the first jobs we carried out, our customer wondered if we was actually subsidizing fuel as they didn't think that it was possible to work with such low fuel consumption, says... In order to prove our capabilities I asked permission to move an entire anchor system that was used on a rig. This action normally requires two to three vessels to complete. The system consisted of eight anchors in total with about 10,000 meters of chain and wire, and we carried it out. As far as I know, this has never been done before.

After a number of jobs, we have proven to the market that we in average can run the ship on 70% of the fuel of what a conventional diesel anchor handler can, and that we can save up to 70% in some modes compared to a conventional ship. A true hybrid provides a world of possibilities. Many of our competitors simply cannot carry out anchor handling in diesel-electric mode, even though their systems are hybrid. They only have the capacity to boost the diesel-mechanical system with the diesel-electric mode, so they don't achieve the same fuel consumption and emission savings as we do.

These examples tell us that the technological capabilities of the vessel together with human knowledge about technology besides operative experience and skills are significant factors for a superior execution of operations (exploitation).

We have described and exemplified a process that starts with exploration activities internally, and expands to interaction with external firms to find and finalize technological solutions. How shall we equip the vessel to become greener, and enhance our possibilities of smart and safe operations? It is a process where idea generation and checking out what is possible follow an "unstructured" path.

6. 4 Cross Functional Learning

One of the main issues in March seminal work on exploration and exploitation where organizational learning in the development of individual and collective knowledge (March, 1991:74). Concerning knowledge, learning and competitive advantage he writes "... multiple, independent projects may have advantage over a single coordinated effort. Organizations that develop effective instruments of coordination and communication probably can be expected to do better (on average) than those that are more loosely coupled" (March, 1991: 84). In a supply shipping company the vessels are loosely coupled. They do they job without operational relations to other vessels. Execution of operations generates experience both for efficiency in operations and for the strengths and limitations of the technology. This knowledge is important both for the

development of new vessels and for learning best practices across ships. In other words it can be useful both for exploitation and exploration processes.

The industrial value chain goes from left to right in figure 2. At a general level there are three important phases that have great impact on the firm revenue. First the specification of the vessel and the associated construction cost; second the process where operational contracts are negotiated; and third the performance in executing operative activities.

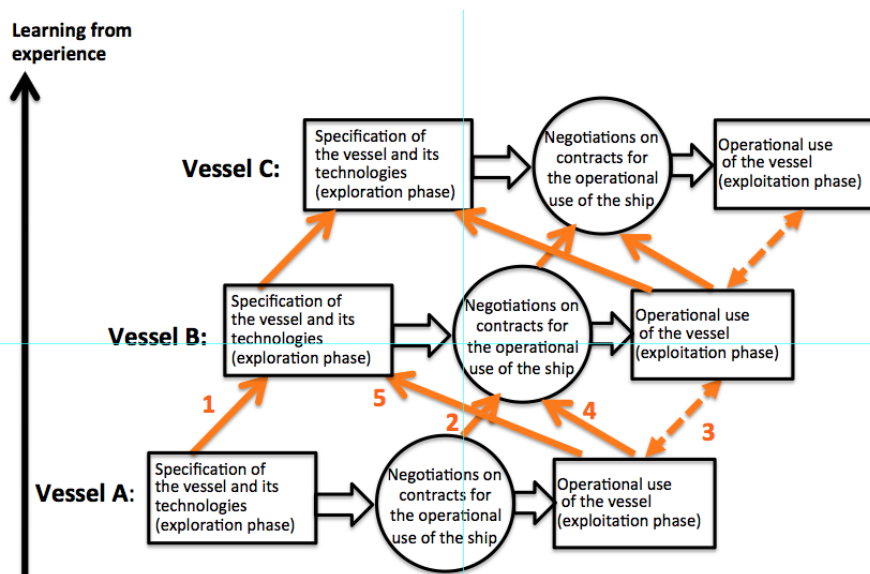


FIGURE 2: Main phases and the internal links of information and learning

Here we identified five main learning relations:

1) Personal experience from working with technical specifications and project control from build to build. This takes place within the technical department and generates a collective knowledge.

2) Experience in negotiations. Although the industry have standard contracts these are negotiated, both existing paragraphs/text and wants and formulations concerning additions to the contract.

3) Experienced learning from operating the ship shared with other crews. The company attempts to standardize the design of the bridge on their vessels, which makes it

easier to change crews, collect data, and share experiences. They also arrange a "seminar" in Fosnavåg once a year where officers share experiences and have dialogues with people at the HQ.

4) Experience from operational use that are of importance for contracting in the future. Contracts are negotiated and it is of great importance to reduce economic risk. However, negotiations are also a question of power. So price, risk and power affect the formulation of the final contract.

5) Experience from operational use that is of importance for the design of new builds. There is a sophisticated data system in use that logs a lot of operational data. For example: load on the engines, fuel consumption, CO₂ and NO_x⁴ emissions⁵, damages, and many more data categories. These data flows across operational units and constitute a ground for learning from experience, and sharing lessons learned. In addition the data flows feeds the people responsible for exploration and innovation considerations with hard data about productivity in operations (exploitation).

From a theoretical point of view stream 4 and 5 originate from structural ambidexterity the division of exploitation and exploration in separate organizational units, but they represent a basis for coordination and learning across these units to constitute sequential or punctuated equilibrium. So here we have a case where sequential ambidexterity works in parallel with structural ambidexterity.

All the knowledge flows above are internal. As previously pointed out the company is located in a maritime business cluster. This business environment constitute a rich source for information on technical innovations, industry news etc. Here there are many informal channels of information that can affect the internal decision process concerning new vessels. Here information flows are more organic, personal and random than the internal processes. In the cluster there has been established a lot of informal meeting places as yearly conferences, network meetings etc. These arrangements facilitate information flows between companies at different stages in the industrial value chain.

6.5 Communication challenges and their solution

Two of the Master Theses investigated the need to improve the communication issues at Olympic Shipping. They found that the fundament for communication was solid

⁴ NO_x is a generic term for mono-nitrogen oxides NO and NO₂.

⁵ Such data must be reported to governmental authorities

and robust in the corporation even if an own department for corporate communication and information systems was needed. Their conclusion was that the mainly informal information system had worked very well owing to the following eight factors, but the key improvement was the formalize the communication and information system and keep the informal trust and togetherness feeling. These two Master theses found that a trusting communication relationship in Olympic Shipping consisted of eight factors:

- (1) Support - Employees felt that through communications with their nearest leader they had their own value and importance established and sustained;
- (2) Influence - Employees felt that they could freely communicate upwards and had an influence on decisions;
- (3) Trust and trustworthiness – Employees felt that communication sources, messages and processes were trustworthy;
- (4) Openness and honesty – Employees felt that their relationships were open and honest with others both listening and conversing; and
- (5) Goals and expectations – Employees were told clearly and explicitly what is expected of all employees in the organization.
- (6) Self-confidence - Employees felt that they were expected to be self-managed and display self-discipline in all work tasks.
- (7) Responsibility for own learning – Employees felt that the organization expected them to take responsibility for own learning. This gave employees motivation to knowledge and information sharing
- (8) Mastery - Employees develop a felt of self-efficacy in that they believed they were the masters of the change and anything is possible.

All of these eight factors were supported by the findings in the Olympic Shipping case. These eight factors are our suggestion as a model for the primary task for any functional informal and formal communication. If you satisfy these eight goals with a good score you are secured knowledge and information sharing.

At the same time, it is important to bear in mind that a good communication climate not only means peace and harmony, but there should also be enough safety to handle complex and emotion laden discussions, conflicts, creative disturbances, and amusements (Erlie 2003). These are a reality in any organization but as Jensen (2002) states, “Battles and conflicts can be difficult, but we are not getting anywhere without it (sic)”. We experienced in the Statoil case how open disagreement is necessary to come up with the

good solutions for the complex issues faced in this change to a smarter, greener and safer organization but no open battles or conflicts. Because Norwegian cultural values cause employees to avoid battles and conflicts (Sørhaug 2010), we did not find any such conflicts at Olympic Shipping. Indeed, we found the opposite as all those interviewed talked very well about each other and told us how easily they were able to share information and knowledge. Olympic Shipping is obviously gaining the benefits of the Norwegian cultural value of avoiding battles and conflicts. This could be due to a cultural difference where the Norwegian collective win-win cultural value of making each other good enhances the company values of Olympic Shipping.

7 Balancing the future and the present - leadership issues

So far we have reported on structural aspects and processes balancing tensions concerning the allocation of resources. Now we turn to leadership issues. In 2005 Smith & Tushman stated that effective management of strategic contradictions as exploitation and exploration has not been at the center of organizational analysis. Contributions during recent years have increased and are centered on top management teams (Smith & Tushman, 2005; Lubatkin et al., 2006; Carmeli & Halevi, 2009), senior teams (Jansen et al., 2008); and leadership action (Gibson & Birkinshaw, 2004; O'Reilly & Tushman, 2011; Tushman, Smith & Binns, 2011).

The two entrepreneurs that founded our case company had very different backgrounds concerning skills, experience and knowledge. At the age of 15 the CEO got employed on a fishing vessel and was captain on his own ship at the age of 22. He has many years of experience in arctic waters. He has always wanted to beat the competition. As a young captain he expressed to the media that in order to be the best he "needed the best boat, the best people, and the best technology. It was too late to do anything with the boat, so I invested in technology and people – and it worked". The other entrepreneur had worked in different shipping companies through his whole life and has unique insight into markets and companies, as well as decades of experience in negotiating contracts internationally. From the beginning the "fisherman" funded most of the shares and became CEO and Chairman of the board. The other took responsibility for negotiation and operations. The CEO had a personal interest in ship technology and eager to bring advanced technology from fishing boats into the supply business. So the entrepreneurs

had CVs that was adequate for a structural split in exploration and exploitation activities.

But he also engages himself in decision concerning contracting and exploitation.

Two examples of internal tensions in negotiations:

1) The minority owner: "I have spent my summer holiday travelling between London, the Canary Islands (where the vessel was) and Dubai, trying to establish an engagement for the XX vessel". I: "I thought you finalized this in May"? The minority owner: "No, we had a customer willing to pay 55.000\$ a day, but he demanded 58.000 \$. A competitor got the contract so we had to find another client for the vessel".

2) The technical director: "We went in and told him that the additional (greener) investments in the vessel would cost approximately 4,5 million dollars, and that it would affect the cash flow, at least in a short perspective. Then he replied: just do it!"

These quotes indicate that the ambidextrous relation between responsibility, and the concern about trade-offs between future and present are not separated into fixed roles. It shows that the CEO is concerned about the present in addition to the future, and is ready to use his power to affect the contracting process. In conclusion, the CEO holds the power to finalize the ratio of resource allocated to exploitation and exploration activities.

The distribution of power, the skillset of two persons and their long time relationship (trust) are main explanations for managing the tensions between the future and present business issues. Here the skills of the co-owner cannot be underestimated as an explanation for the present success in utilizing existing resources. Because the CEO owns most of the company and is well aligned with the other owner, there are no powerful counterforces against his green investments, and it's mainly his own money he "gambles" with.

The most important factor for explaining the successful dynamic management of exploitation - exploration tensions namely: power based on (personal) ownership, has to our knowledge not been highlighted by any study so far. It appears to be a little naive that nobody within the OA tradition has addressed the influence from ownership on balancing tensions between exploitation and exploitation activities. From research on principal-agent theory we know for example that spread ownership can lead to short-termism and that a long-term perspective is better taken care of in cases with concentrated personal ownership. In our case there is no separation between principal and agent and hence no separation between ownership and control (Jensen & Meckling, 1976). In such cases the

personality of the agent will determine the trade-off between allocating resources for short or long time profit.

8 Challenges concerning growth

During many years the company operated all their ships in the North Sea, one of the most demanding environments when it comes to weather and operations. Their vessels were design for the most extreme conditions facing the industry and could easily do jobs in other geographical areas. However, the expansions of operations to new geographical areas raise a number of organizational questions. Where shall the follow up team of be located? How can one ensure that the contract is adhered? How shall we team up with local suppliers? These and similar questions related to efficiency in operations have to be solved.

In addition negotiating activities takes place in foreign and unknown cultures. Being familiar with "Nordic conditions" with a high level of trust between contracting partners, new contracting processes and regimes appear as a paradigm shift.

When all operations took place in the North Sea "right outside" the HQ it was much easier to stay in touch with the officers and get feedback on constructions and technology, and obtain proposals for improvements. In the future such feedback has to be more formalized. On several occasions the CEO reiterated his concern about how the feedback from operations will now be able to reach HQ. Hereby expressing great concern about one of the most important links between exploitation and exploration. If this link is wiped out, the DC's of the firm will be threatened.

9 Conclusions

This paper started with an intention to bring answers to how ambidexterity manifests itself at the micro level? In doing so we have penetrated theory and the practical centered empirical case and combined and confronted theoretical considerations and empirical facts to create meaning and understanding. To sum these up we can highlight a couple of issues that drives exploration and exploitation and conditions that interlink them.

Factors influencing efficiency in exploration:

- Cutting edge technology in the vessel and flexible technology

- Practical knowledge and experience about the technical construction (the vessel)

Standardization across ships (ex. the command bridge)

Learning from others (sharing best practice)

- The quality of the crews
- The quality of the negotiated contracts.

Factors influencing the quality of exploitation decisions:

- Clear formulation about future wants (greener, smarter, safer)
- External info (what is going on in the cluster?)
- Internal info (how does existing technologies perform?)

Factors that balance exploration and exploitation:

- Concentrated decision power based on personal ownership (CEO involvement)
- In-depth knowledge about the market (in different regions)
- Experience and knowledge about vessels and their technology.

With more and more operations taking place in unknown climate the tensions between exploration and exploitation will be filled with more uncertainty. Keeping the present ambidexterity onboard calls for new flows of information and new areas of interactions.

The counterforce to the new uncertainty will be the firm's ability to generate and disseminate knowledge within the company.

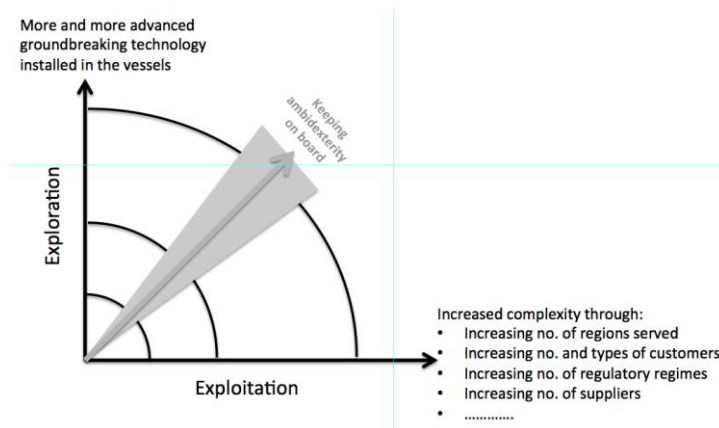


FIGURE 3: Balanced sequential growth through exploration and exploitation

Expanding operations to new geographical markets implies adding complexity to managing exploitation. For example, new local requirements have to be met, contracts with local suppliers, as well as maintenance has to be established and supervised. When operations grow in foreign markets, branch offices are likely to be established. Together these factors will add organizational complexity in the exploitation dimension. The vital question is how to organize responsibilities, communication and control without increasing costs? And how to avoid damage to the existing tension between exploration and exploitation? We need to keep ambidexterity on board and we will use our case to show how this is done in our case for the future strategy 2014-2020 and discuss the practical implications of this strategy. The outcome of this application will be a general model to be used for understanding practical challenges, dilemmas and critical success factors for exploitation and exploration in an ambidexterity organizational setting.

10. Practical implications

10.1 Working at the edge

We have working with Olympic shipping found four clear requirements for working at the edge in business development for Olympic Shipping.

1. The observability – it is few who sees the edge and who are at the same time able to connect the externalities with the internalities. This was according to our observations done by the two owners.

The owners are therefore crucial both in observing the business edge and in taking action upon their observations.

2. The knowledge about the edge must be shared and everybody has both to know their role and have to understand the expectations. When the edge was observed and the direction given this worked well since the middle managers had a long working familiarity with the two owners. They also had a long-term respect according to the delivered results and their own knowledge growth in the process and of course from their monetary reward in the process.

3. Working at the edge. This is getting the organization to work at the edge. We observed this as the most difficult part getting more difficult in a larger organizational setting. We have identified this as a critical success factor for further success in Olympic

Shipping. The whole organization has to be working at the edge to become smarter, greener and safer. This requires better formal systems without losing the creativity.

4. The integrity of the edge involves defining the edge, to evolve the edge and to defend the edge. To define the edge was done by the two owners while evolving the edge were done by the middle managers and defending the edge was done by the whole organization. The key is to define continuously new edges and getting the organization to evolve them and to defend them.

5. The contractual part is extremely important – working at the edge demand that Olympic Shipping has to be secure about their contractual basics – the company must always be sure that the contractual work is solid and robust – being at the edge gives larger risk and the most important part for reducing this risk is contractual management. This was identified as a weak point since the owners and their nearest middle managers had little interest for seeing the contract as a main tool for sustainable success. The contractual process must be changed from success by luck to success by professionalism and contractual systems.

10.2 Leadership challenges

1. Olympic Shipping business model leverage your human assets. All the human assets must participate and this is a democratization of the leadership role since a total participation is expected and during hard phases it is expected to put in up to 50 hours a week and according to the project assignments this is demanding in double income families.

2. The architectural control at the edge must vary from total empowerment to those handling and defining issues to total control from the two owners. This stretch in empowerment and responsibility is difficult to handle.

3. The organizational coherence demand sharing cultural values and attitudes through the work process- this is a hard working hard playing culture where everybody has to rely on each other.

The big issue is if working on the edge can be taken from a large but still local shipping company to a large and global shipping company in 2020. With a needed formalization of the structures and processes including stronger management control will it still be possible to be working at the edge in a dynamic changing organization pushing working greener and smarter than the competitors?

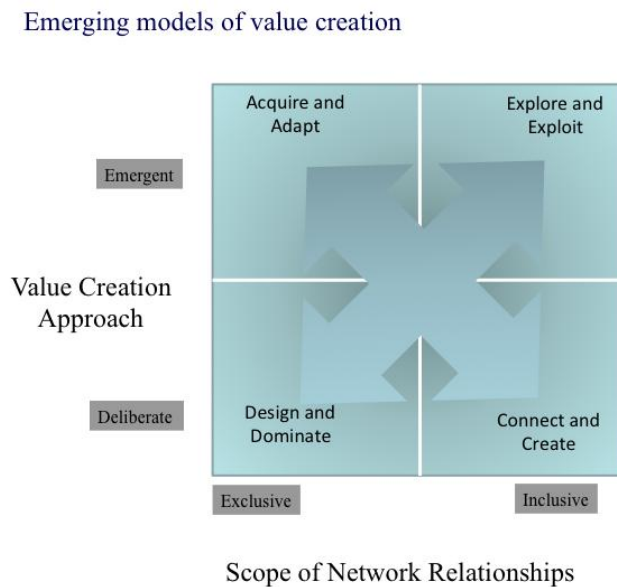
11 The concluding general theoretical model

The case of Olympic Shipping represents an emergent value creation approach of exploring and exploiting the business opportunities. The other way of doing this would be to acquire companies

And/or adapt to the market situation. The position of the market leader would be to design and dominate the market. The scope of local network relationships is inclusive in the Olympic Shipping way of doing business. The key for the company is not to connect and create in partnerships, but to explore and exploit the networks in competition with other local companies. The network relationship might also be exclusive in the value creation approaches of design and dominate and acquire and adapt.

As a third dimension we conclude that to design and dominate is closest to exploring and exploiting while acquire and adapt is closest to connect and create. The first represent more the entrepreneurial mindset of ambidexterity and knowledge dynamic while the latter represent more the planned and traditional business mindset.

We have therefor developed the following theoretical model from our case study:



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Sustainable Knowledge Management: Outsourcing and Core Competences. A Literature Review

Susanne Durst *

School of Business, University of Skövde
Högskolevägen, 54128 Skövde, Sweden

Ingi Runar Edvardsson

School of Business, University of Iceland
Gimli, 101 Reykjavik, Iceland

Guido Bruns

EkoBygg
Landbyn 1, 544 94 Hjo

** Corresponding author*

Structured Abstract

Purpose – The purpose of this paper is to review extant research on outsourcing and knowledge competences to establish our understanding and to identify gaps justifying further research activities.

Design/methodology/approach – The study consists of a systematic review of refereed empirical articles on outsourcing and knowledge competences. In order to get access to the articles we used two scientific databases: ProQuest and Web of Science. As keywords we decided to use multiple keyword combinations. We only included peer reviewed articles published in English. Twelve papers were identified and analysed in the paper.

Originality/value –This methodology proofs evidence that there is a small number of papers addressing outsourcing and its consequences for KM sustainability.

Practical implications – The outcomes of this study can assist researchers, managers and consultants to better understand the link between outsourcing and the sustainability of KM. This can be useful for managers in particular as more specific measures can be derived.

Keywords – Outsourcing, Knowledge management, Knowledge competence, Systematic review

Paper type – Academic Research Paper

1 Introduction

Strategy-driven outsourcing has become more common in recent years, which may result in improved business performance and effectiveness. Perhaps the most prominent strategic reasons for outsourcing involve allowing organizations to better focus on their core competences with which other firms have difficulty in copying. Another widely cited rationale is to gain access to unique resources, skills and talents, and capabilities possessed by other firms. Greater flexibility in managing demand swings and reducing company risk by sharing it with suppliers are also mentioned as motives for outsourcing (e.g. Kremic et al., 2006; Di Gregorio et al., 2009; Quinn, 1999). Despite the benefits, there are also some indication that outsourcing can undermine the knowledge base of companies. Schlosser et al. (2006), for instance, argue that outsourcing weakens organizational learning as its temporary nature undermines the traditions and routines associated with a strong organizational culture. Similarly, firms that outsource their core activities may lose touch with their technological know-how that provides opportunities for product and process innovation (Martínez-Sánchez et al., 2007). Consequently, if the negative aspects of outsourcing overtake the positive ones, the knowledge (management) of the firms concerned is at risk, i.e. its sustainability is threatened, which can also have serious implications for the firms' overall survivability.

Having this in mind, the purpose of this paper is to review extant research on outsourcing and knowledge competences to establish our understanding and to identify gaps justifying further research activities. Thereby, outsourcing is defined here as allocating or reallocating a firm's internal activities and services to outside providers. Whereas knowledge competences refer to a specific set of abilities that enable firms to compete and develop to meet current and future business requirements.

2 Literature background

Much of the existing literature on knowledge management (KM) is concerned with how organisations can capture knowledge from experts within the organisation, and formalise and package knowledge assets for dissemination and reuse by other employees (Markus, 2001). Various mechanisms and structures, often technology-supported, have been proposed to facilitate this endeavour including Intranets (McKinlay, 2002), discussion forums (Hansen, 2001), lessons learned databases (Brown and Duguid, 2000), expert yellow pages (Storey and Barnett, 2000), mentor groups (Zack, 1999) and

communities of practice (Wenger et al., 2002). The emphasis has also been on transferring tacit knowledge into explicit (Nonaka, 1991). KM is thus viewed largely as an internal strategy where the focus is on leveraging knowledge from within the confines of the organisation. This paper proposes an alternative and less widely discussed view of KM, referred to here as “knowledge outsourcing” (KO). In KO, external experts are explicitly contracted to generate knowledge-intensive assets, which are subsequently internalised by the organisation. Hence, KO exploits external sources for knowledge creation rather than relies on internal capability. While the general concept of outsourcing is not new, as evidenced by the wealth of published literature in the area of information systems (e.g. McKeen et al., 2002; Lam and Chua, 2009), the study of KO, however, is in its infancy (Tarn and Chien-Chih, 2012).

Along with the rising share of services and knowledge in the economy, some organizational restructuring has been taking place, such as networking and supply chain change manifested in outsourcing and offshoring. Outsourcing has grown rapidly among public and private organizations in recent years (see Bryson, 2007; Di Gregorio, Musteen & Thomas, 2009; Kadabade & Kadabade, 2002). In all cases, outsourcing always requires third party involvement (Jagersma & van Gorp, 2007).

Outsourcing is a strategic move which involves both sourcing absent activities that new firms may not have completed in-house in the past, or the substitution of internal activities by transferring these, in part or whole, to a third party supplier that performs the task, function, or process (Gilley & Rasheed, 2000; Holcomb & Hitt, 2007). Advances in information and communication technologies have enabled new firms to pursue the outsourcing of value-creating activities such as software development, engineering, and research and development (Hui, Davis-Blake, & Broschak, 2008). To date, researchers have focused on outsourcing by large, established firms (Bhalla, Sodhi, & Son, 2008; McIvor, 2009); however, there is evidence that new biotechnology firms also utilize intermediate markets for a variety of value chain activities (Mills, 2002). Why might new firms outsource activities, including value-creating activities such as research and development, which are known to contribute to the value-creating potential of firms (Kumar, Van Fenema, & Von Glinow, 2009)? Researchers subscribing to the integrated view of transaction cost theory (TCT) and resource-based view (RBV) argue that by establishing relationships specifically with high-status firms, new firms can not only reduce the search and monitoring costs associated with finding a reliable partner but also

acquire recognition and use it to draw vital combinations of resources such as status and physical resources (Lin, Yang, & Arya, 2009). This is crucial for new firms as they face adverse initial resource and capability barriers such as scarcity of talent and operational know-how, presented by liabilities of newness and smallness (Aldrich & Auster, 1986; Baum & Oliver, 1992; Stinchcombe, 1965; Bhalla and Terjesen, 2013).

3 Methodology of literature review

In our review process, we adopted the principles of a systematic review as recommended by Jesson et al. (2011) namely:

- 1) Mapping the field through a scoping review
- 2) Comprehensive search
- 3) Quality assessment
- 4) Data extraction
- 5) Synthesis
- 6) Write-up

First, we developed a research plan comprising the research questions we were interested in answering. This also involved the keywords, and a set of inclusion and exclusion criteria. We were interested in the current status of research on outsourcing of knowledge processes in order to identify promising areas for future research. The questions formulated, as outlined above, were: 1) Which topics are well researched in relation to outsourcing and which are not? 2) Which were the main findings of the studies?

We decided to use multiple keywords to identify relevant studies, such as outsourcing, knowledge competence, knowledge-based service. Our inclusion criteria were: empirical research papers, peer reviewed, English language, ProQuest and Web of Science databases. We excluded grey literature such as reports and non-academic research, other languages than English, and other databases than ProQuest and Web of Science.

Additionally, we produced an excel data sheet consisting of key aspects related to our research aim. In our case these were: name of author(s), year of publication, research aim/objectives, theoretical perspective/framework, method, main findings, and name of the journal.

Second, once we had specified all the relevant issues, one of us accessed ProQuest and Web of Science and searched using combinations of the keywords set. We looked for

combinations of these keywords in the title, keywords and abstract. The literature review included papers published until 19 March, 2014. Depending on the combination of keywords used, different numbers of hits were generated.

Third, each of us manually scanned the abstracts of the respective papers and, if relevant, more parts of the articles to make sure that they actually fell within our scope of interest. This reduced the number of articles without duplications to the final number of 12 articles which fulfilled our criteria and were then analyzed.

Fourth, all authors read the 12 papers individually and entered relevant data regarding our research purpose in the excel sheet.

Fifth, in the next stage we discussed the findings, synthesised the individual data into one and identified themes. This helped us to establish the current body of knowledge with regard to outsourcing (and offshoring) of knowledge processes.

Sixth, the final stage of our review process was devoted to the write-up of our findings.

4 Presentation of findings

Among the twelve papers that formed the basis for our analysis, the oldest publication is from 2006 and the most recent ones are from 2013 (two papers). Four of the papers were published in 2009. Four papers were published in 2010, and one in 2011. No papers were published in 2007, 2008, and 2012.

In the sections below we present our analysis concerning the following aspects: general observations which outline the research methods applied. After that, the study's main findings according to the themes identified are presented.

4.1 General observations

With regard to the methodology, the most common method applied is the case study approach (nine papers). Additionally, surveys, focus groups, and secondary data (one of each) were used as research methods. We identified one paper which was longitudinal in nature (Brege *et al.*, 2010).

The 12 papers were published in 10 different journals. Six of the 12 journals can be assigned to the field of operations, technology and management, two journals to international business, and the remaining journals address fields such as innovation, marketing, entrepreneurship and small business management, and organization studies.

This suggests the topic interests a broad audience.

4.2 Body of knowledge regarding the outsourcing of knowledge competences

We summarized the main findings of the investigated studies under six topics:

- Consequences of knowledge competence (KC) outsourcing
- Reasons for KC outsourcing
- Reasons against KC outsourcing
- Risk
- Framework
- Others

Table 1 displays the different topics and the articles assigned to them.

Authors	Consequences of KC outsourcing	Reasons for KC outsourcing	Reasons against KC outsourcing	Risk	Framework	Others
Agndal & Nordin	x					
Bustinza et al.	x					
Bhalla & Terjesen	x					
Brege et al.	x					
Chang et al.					x	
Cheng et al.					x	
Hanzah et al.						x
Lacity & Willcocks						x
Lam & Chua				x		
Lau & Zhang		x	x			
Mahmoodzadeh et al.				x		
Rundquist & Halila		x	x	x		

Table 1. Topics identified

Consequences of KC outsourcing

Four papers can be assigned to this topic. Agndal and Nordin (2009) highlight in their paper negative (non-financial) consequence KC outsourcing can have for firms (e.g. loss of knowledge and skills). Based on their findings the authors propose ways to overcome these. Bustinza et al. (2010) demonstrate the contribution of outsourcing activities for learning capacities of firms and the firms stock of knowledge resources. Bhalla and Terjesen (2013) show as to how KC outsourcing can help firms to expand their supplier

network and operational knowledge base. Additionally, their findings point at learning as the consequences of activities contribute to reduced relationship specific investments and cost efficiency. Finally, Brege et al. (2010) study highlight lower costs, development of core competences, control and flexibility as consequences. Moreover, their finding suggest that KC outsourcing assists in business development.

Reasons for KC outsourcing

Two papers specifically highlighted the reasons for KC outsourcing. Lau and Zhang (2006) showed that the reasons can be found in three areas: economic, strategic and environmental. Based on their study Rundquist and Halila (2010) concluded that the main reason for KC outsourcing is the need for knowledge that is missing in the firm.

Reasons against KC outsourcing

The same papers as presented before can be assigned to this topic. Lau and Zhang (2006) considered the following reasons as essential: Lack of capable service providers, loss of control, poor transportation and IT infrastructure, local protection regulations, and lack of overall post-outsourcing measurement. Whereas Rundquist and Halila (2010) found strategic decisions from the board and risk of competence drainage as main reasons. The author stressed the relevance of personal interaction for integrative issues regarding KC outsourcing.

Risks related to KC outsourcing

Three papers were positioned under this topic. Lam and Chua (2009) highlighted quality, time and effort as main risks in KC outsourcing. Mahmoodzadeh et al. (2009) who studied outsourcing in the context of business process management and knowledge management found the following risks: “(1) dependency on the suppliers and changing collaborative to opportunistic behavior of the supplier; (2) losing touch with new technological opportunities for product and process innovations; (3) communication and coordination problems; (4) cognitive distance between suppliers and firm therefore makes it more difficult to align decisions and exchange knowledge; (5) outsourcing functions that should not be outsourced; and (6) decreasing control over the outsourced functions” (p. 861). Eventually, Rundquist and Halila (2010) identified the risk of competence drainage.

Framework

Two papers can be assigned to this topic, which refers to theoretical frameworks and perspectives in order to study KC outsourcing. Chang et al. (2009) propose an integrated model consisting of three different theoretical perspectives (i.e. technological regime, resource-based view and transaction cost theory) as a basis for the identification of factors influencing outsourcing strategies. Cheng et al. (2010), on the other hand, describe and classify different means for knowledge transfer according to their usages and propose a means framework to integrate all the elements systematically.

Others

Two papers were assigned to this topic. Hamzah et al. (2011) who mainly studied knowledge management practices as found in an offshoring outsourcing company. Lacity and Willcocks (2013) studied Legal Process Outsourcing and mainly demonstrated the opportunities available in this new field of KC outsourcing.

5 Conclusions

The aim of this paper was to review extant research on outsourcing and knowledge competences to establish our understanding and to identify gaps justifying further research activities. We used the method of systematic literature review to identify papers. We found twelve papers that formed the basis of our analysis. The papers were published in the years 2006-2013, indicating a recent origin of the topic, and the small number of papers show that this is an underresearched field of study.

The main findings were categorised into six main themes: Consequences of knowledge competence (KC) outsourcing; Reasons for KC outsourcing; Reasons against KC outsourcing; Risk; Framework and Others aspects.

The main methods used in the papers were case studies. This calls for more variety in resource methods. Also, the analysis indicates that a stronger theoretical framework is needed for the future analysis of knowledge competence outsourcing.

Two themes are very important for future research and practical application of KO outsourcing: On the one hand, the learning potential of such outsourcing, enhancing core competence, and expanding international coverage by collaborating with other companies. On the other hand, the risks associated with outsourcing. Important research topics are risk of competence drainage, dependency on suppliers or other stakeholders,

opportunistic behavior of these stakeholders, losing touch as regards new technological opportunities for product and process innovations, and decreasing control over the outsourced functions.

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Supporting eco-innovation by green HRM practices

Viktor Kulhavý

Department of Corporate Economy
Faculty of Economics and Administration, Masaryk University
Lipová 41a, Brno, Czech Republic

Structured Abstract

Purpose – To explore the conceptual links between Green Human Resources Management and Strategic Sustainable Development with the focus on knowledge management practices. The question explored is “In what ways can human resources management tools, processes and practices help to support employee participation in eco-innovation birth and at the same time be strategically moving an organisation towards sustainability?”

Design/methodology/approach – The paper uses a literature review approach. An overview of the contemporary state-of-the-art employee participation practices in the context of knowledge management is presented. Possible future integration of knowledge management tools within the Framework for Strategic Sustainable Development is being proposed.

Originality/value – The strategic aspect of human resources management and sustainability constitutes a joint connection. Scholars have been currently exploring the environmental management issues integration within the human resources research field. Knowledge management practices such as suggestion programmes or problem solving circles are one of the main measures used in continuous improvement efforts in companies. But little is known on how to use these tools strategically when dealing with environmental issues.

Practical implications – Environmental knowledge and values are reported to be predictors of employee environmental behaviours. The workers wide participation increases the business performance by sharing the knowledge of all workers within an organisation. Designing knowledge management processes in a way that will ensure the innovation tools and actions are aligned with a viable sustainability strategy can bring stronger employee engagement and better environmental performance.

Keywords – corporate sustainability, strategic knowledge management, environmental management, employee participation, FSSD

Paper type – Academic Research Paper

1 Introduction

The issue of sustainability is inherently settled on the edge of several disciplines of human understanding of the complex world. In the Human Resources research field the contemporary debate focuses on the environmental management aspects of human resources management, the so called Green Human Resources Management - GHRM (Jackson et al., 2011; Renwick et al., 2013).

According to the research studies of several authors (Rennings et al., 2001; Boiral, 2002; Rogers, 2003; Rothenberg, 2003; Jabbour and Santos, 2008b; Jackson et al., 2011) one of the most efficient means of enhancing company's environmental performance is to engage employees in environmental innovation activities (eco-innovations), i.e. to stimulate the workers to propose improvements that will lower or diminish the negative impact of company's production on the environment. Workers participation in environmental improvement enhances organization's capability for knowledge creation and is being considered as a source of competitive advantage (Rothenberg, 2003; del Brío et al., 2007). In the companies' suggestion programmes the employee tacit knowledge can be particularly used for pollution sources identification, developing preventive solutions and managing emergency situations (Boiral, 2002). However environmental tools, actions and strategies need to be deeply rooted in organisation culture - reflecting the mission, values and relating different stakeholders' interest (Fryxell and Lo, 2003; Linnenluecke et al., 2009, Renwick et al., 2013). An overarching framework that would encompass economic, environmental and social side of organisation sustainability is needed in order to move strategically towards more sustainable business models. In the sustainability field there has been a constant call for such conceptual framework. One of the approaches that have an ambition to provide such platform is the Framework for Strategic Sustainable Development - FSSD (Broman et al., 2000; Ny et al. 2006; Robèrt, 2000; Robèrt et al., 2002).

The objective of the paper is to explore the conceptual links between Green Human Resources Management and Strategic Sustainable Development with the focus on knowledge management practices. The question explored is "In what ways can human resources management tools, processes and practices help to support employee participation in eco-innovation birth and at the same time be strategically moving an organisation towards sustainability?" In order to reach the objective the contemporary

Green HRM agenda is described and knowledge management position discussed. Conceptual links between Green HRM and Strategic Sustainable Development are presented.

The core concept central to the presented paper is environmental innovation (in short eco-innovation). According to Rennings (2000) the general concept of innovation is neutral by its nature – there is no constraint regarding the direction of innovation. However, the *environmental innovation* concept is narrower – it assumes that the innovation activity will be oriented towards actions of stakeholders that will contribute to a reduction of environmental impact of organization or towards reaching given ecological objectives. This definition is somewhat broad; however there is one other aspect that should be mentioned here. Rothenberg (2003) in her case study in automotive industry points out that in reality just few innovation projects were initiated because of environmental reasons. The more common situation is that environmental benefits are just a side effect of other innovation intentions. Usually project initiation is more likely to stem from specialist staff, line level workers participate during project implementation and their role is likely such as receiving training or one time consultation.

2 Methodology

A literature review on the topic of employee involvement in environmental innovation creation has been conducted. The key words used were: employee participation; employee engagement; eco-innovation; environmental innovation; continuous improvement; corporate sustainability; green human resource management; knowledge; strategic sustainable development. A set of research articles was collected using Scopus and Google Scholar database. The most cited research articles from years 2000-2014 were reviewed and possible links between adoption of green human resources practices dealing with knowledge management area and strategic move towards corporate sustainability were examined. In order to assess green human management practices from the perspective of Strategic Sustainable Development, several questions derived from the literature review were posed (Rothenberg, 2003):

- What is the role of the workers? How they participate in the innovation process?
- What kind of knowledge content is being held by different employee groups (e.g. workers, moderators, foremen, technologists, environmental managers)?

3 Green human resources management practices

The area of green human resources management has become a research focus just in the past ten years. There are several conceptual studies that deal with the means how working with people can support corporate sustainability (Jabbour and Santos, 2008a; Jackson et al., 2011; Renwick et al., 2013) and also other studies showing the benefits of such approach in different organizational contexts (e.g. Boiral, 2002; Rothenberg, 2003; Huang and Kung, 2011; Shatouri et al., 2012 and many others).

Strategic human resources management is based on three assumptions described by Jackson and Seo (2010): 1) the primary objective of effective HRM is to improve the company's performance; 2) people management practices should be aligned with overall strategic objectives; and 3) many different practices that comprise HRM system should be interconnected (e.g. by a competency framework). According to Boudreau and Ramstad (2005) the role of human resources management in heading towards corporate sustainability is twofold. First, the strategic perspective of contemporary HRM (Jackson and Seo, 2010) supposes meeting objectives related to economic, social and sustainability objectives. Actions developed in this way should have long-term and be developed with systemic approach. As will be shown below Strategic Sustainable Development can offer such platform. As Linnenluecke et al (2009) argue the employee understanding of what sustainability in given organizational context means is moderated by existence of organizational subcultures adhering different values. Second, the challenge of globalization and need for continuous innovation require HRM to attract, develop and retain talented employees (Boudreau and Ramstad, 2005; Fernández et al, 2003).

There are specific personal processes and practices among which green practices can be distinguished, for an overview see Jackson et al. (2011) and Renwick et al. (2013). These are: recruiting and selection, staffing, training including management development and leadership, empowerment and engagement, performance management and appraisal, compensation, organization culture stewardship and knowledge management.

3.1 Knowledge management importance in Green HRM

The issue of knowledge management is found crosswise the human resources processes. Authors of research studies often stress the notion that knowledge management processes should be designed in ways that allow wide employee participation (Boiral, 2002; Renwick et al., 2013). Within formalized environmental management systems

(such as ISO14001) this might be even required and thoroughly documented – for such bureaucratic structure explicit and well codified technical knowledge (auditing, impact measurement, regulation compliance, technological solutions, statistical data analysis, administration and documentation) seem to be crucial. To distinguish the knowledge management practices from just formal training it is important to note that environmental management initiatives require the staff to acquire new techniques and knowledge regarding clean technologies implementation, learning about the causes of pollution and overall environmental management system functioning (Jabbour and Santos, 2008b). However, there is more subtle and intangible knowledge to be addressed. Formal structures can have difficulty in capturing employee experience, practices and routine behaviours that are inherently subjective, context-specific, hidden in people’s heads and therefore escaping the formal codification processes. Therefore decentralised initiatives allowing for informal learning may better suit the need for tacit knowledge exploitation. The well-known concept of tacit (implicit knowledge) and how tacit knowledge can be used to improve organizational environmental practices represent a major challenge for managers of today’s organizations. Tacit knowledge may be perceived as something that is very difficult to access, articulate, and share. The nature of tacit knowledge could be described by a “paradox of internalising” (Boiral, 2002) – it is difficult to share something that we are not aware of or that we are not convinced to be important to share with others. However the tacit knowledge cannot be separated from explicit knowledge (Boiral, 2002). Using tacit employee knowledge should be accompanied by specialist explicit knowledge providing platform for capturing, further elaborating and evaluating tacit knowledge.

Unlike the concept of explicit-tacit continuum, different categorization points out the knowledge content differentiation (Rothenberg, 2003) – see Table 1 below. It is stressed that the birth of innovation is started when the combination of employee knowledge can occur. Interpersonal trust is reported to be a crucial prerequisite for a greater level of knowledge sharing and combination (Rothenberg, 2003).

Table 1. Knowledge content classification

Knowledge Content Type	Description
Contextual knowledge	Knowledge regarding the setting in which the process of concern exists and interacts
Process knowledge	Understanding the mechanical and chemical properties at hand, as well as the performance parameters within which the process should operate

Intra-organizational knowledge	Knowledge about how the process and people involved with the process interact with other parts of the organization
External knowledge	Knowledge that resides external to the firm that is relevant to the process

Source: Adapted from Rothenberg, 2003, p. 1791

The environmental management process is often controlled by an environmental department with specialist staff and by highly skilled engineers or technologists. Its main objectives are the adherence to environmental legislative, following internal standards and dealing with pollution. On the contrary, when dealing with preventive measures the role of employees (manual workers, operators) is irreplaceable. There are several reasons for that (Boiral, 2002): 1) the employees are the ones who are physically present in the industrial process and who perform the operations which have environmental consequences; 2) employee participation in preventive measures is desirable because of greater losses avoided when environmental issues become critical (e.g. hazardous substance leakage, factory surroundings contamination); 3) employees that are observers of an environmental accident need to be prepared to react promptly.

Also it is important to recognize there are many interconnections knowledge management has with the other human resources management functions. To point out just some of them:

- Formal training programmes usually target explicit knowledge. However contemporary organizational training focuses on on-the-job training programmes which are better suited to tacit knowledge appreciation.
- Subordinate behaviour is reported to have significant influence on employee willingness to engage in continual process of implicit-explicit knowledge transformation (Ramus and Steger, 2003).
- Staff turnover may influence the retention of tacit knowledge in organization (Boiral, 2002).
- Recruitment strategy could focus on candidate dexterity rather than formal qualification (Boiral, 2002).
- The promotion of an employee idea is based on teamwork (colleagues, subordinate, environmental department) rather than on an individual suggestion.

Boiral (2002) distinguishes active and passive employee participation. The passive way treats the workers just as “repositories of knowledge” which needs to be exploited.

The active approach sees a worker as a change agent, being a natural part of the change process. The common problem of continuous improvement programmes is that the employee ideas are harvested, but the employees themselves are not involved in the idea implementation (or are involved just formally, lacking any intentional involvement or empowerment). According to the study conducted by Siebenhüner and Arnold (2007) change agents were identified to be the main influencing factor of innovation birth and innovation process continuation.

The role of individuals is also stressed by Busck (2006) using term “environmental champions”. It is referring to individuals that are deliberately offered participation in environmental initiatives with the expectation of promoting in the future. However this is corresponding to the Anglo-Saxon individualistic culture. The idea of collective sharing and cooperation is much more promoted by contemporary research literature. Nevertheless individuals play important role in influencing others through their personal networks.

4 A perspective of Strategic Sustainable Development

In the previous text it has been shown that the strategic aspect of human resources development is a generally accepted concept and represents a cornerstone of effective workforce management. Jabbour and Santos (2008a) claim that for HRM integration with organizational sustainability, human resources strategies stimulating economic, social and environmental development need to be formulated.

However it is much less clear in what ways the environmental initiatives fit the strategic notion of how the organization should be managed. For economic sustainability itself many theories, procedures, rules have been developed ensuring that the organizational existence will pay off. Common definitions of corporate sustainability often refer to Brundtland explanation of sustainability or are trying to define sustainable development through the triple-bottom line concept referred to as 3P – People, Profit and Planet. The crucial questions which are dealt by day-to-day organizational practice are:

- What does sustainability mean to us?
- Which environmental actions should be prioritized?
- What environmental goals should be set up and fulfilled?
- How to identify the most relevant environmental issues now and in the future that the organization is / will be facing?

To answer those questions an overarching sustainability framework is needed in order to provide an understanding of what sustainability is, how to set the objectives, choose actions or tools that will bring the best effect and measure the progress. Such framework could represent a guideline for knowledge management indicating what knowledge needs to be searched for, captured and retained within the organization. For planning in complex systems a unifying structure has been created (Azar et al., 1996; Robèrt et al., 2000; Robèrt et al., 2002). Sustainability is not defined as a certain state that should be reached but rather by a set of principles that should not be violated in order not to undermine the capacity of ecosystems to provide the necessary services (e.g. purification of water and air, carbon sequestration and climate regulation, recreational experiences).

The concept of Strategic Sustainable Development introduces a framework distinguishing five levels of sustainability perspective (Robèrt et al., 2001; Missimer et al., 2010) - FSSD:

1. The overall **system level** (society and ecosystems as part of the biosphere¹) – organizational surroundings are analyzed including legislative and other norms, stakeholders interests; notion of socio-economical system functioning within biosphere is taken into account (e.g. natural laws, accessibility and scarcity of natural resources).
2. The **success level** is operationalized by four distinct principles of sustainability and the backcasting approach. The organizational vision and the sustainability principles can be regarded as constraints within which the organization operates. As long as the principles are not violated, the organization socio-ecological sustainability may be reached.
3. The **strategy level** is depicting different ways of arriving to desired state. Different strategic guidelines can be used as long as they contribute to reaching defined success in the system.
4. The **actions level** is offering a range of possible actions that are in line with strategies that can be taken in order to follow the success principles and organizational vision.
5. The **tools level** is collecting the necessary methods, tools and concepts to focus on specific impacts, to monitor and measure the progress and evaluate the result

¹ This view is corresponding with the concept of ecological economics (Daly and Farley, 2010).

of actions. For example tools such as Life Cycle Assessment or Environmental management systems can be used here.

The four sustainability principles which are stated below show a direction in which organizations should manoeuvre in the socio-ecological system in order to eliminate risks that stem from behaving unsustainably. The first three principles deal with sustainability in environmental meaning, the fourth focuses on social sustainability. The economical sustainability is not captured in these principles; however it is dealt with at the success level and strategy level of the framework when seeking the return on investments.

“In the sustainable society, nature is not subject to systematically increasing:

1. ...concentrations of substances extracted from the Earth's crust,
2. ...concentrations of substances produced by society,
3. ...degradation by physical means and
4. ...people are not subject to conditions that systematically undermine their capacity to meet their needs.” (Azar et al., 1996; Robèrt et al., 2000; Missimer et al., 2010, p. 1109)

5 Issue integration and practical implications

Getting back to the question posed in the beginning, we can reflect on the ways human resources management and especially knowledge management can support employee participation in eco-innovation birth in a strategic way. Strategic sustainability perspective taken into account means that working with people in an organization does occur on all of the FSSD levels. In organizations usually the tools and actions are widely used, however their relevance to the HR strategies, overall organization strategy and organization’s sustainability strategy are weak. It is the interconnection between these three which makes the processes comprehensible for all the employee groups involved and also for other stakeholders. Competency frameworks reflecting the tight unity of strategy and HR processes can also encompass sustainability competences.

HR practices can help to make the tacit knowledge more visible; but not every tacit knowledge needs to be exploited, because the corresponding resources (time, money) has to be considered. Certain tacit knowledge which is highest importance for the organization’s operations needs to have the most attention.

In Table 2 a set of question that should be answered by management of an organization is presented. These questions were derived based on the literature review and

represent a checklist of whether human resources management practices within an organization provide strategic support for eco-innovation birth. The perspective of Strategic sustainable development is used here to structure the questions so that their relevance to the various levels of FSSD is made clear. For each question the rationale is explained and corresponding studies identified in the literature review are referenced (studies providing examples of such HR practices or defining those concepts as crucial).

Table 2. Assessment of Green HRM practices from the perspective of knowledge management and Strategic Sustainable Development (Green HRM Checklist)

Question/Area	Rationale	Research evidence
<i>SYSTEM LEVEL – what is the system the organization is operating in</i>		
<i>Who are the stakeholders of the organization?</i>	Organization's employees are an important stakeholder group. In contemporary HR management the building of relationship with employees is being stressed as a mean for building a coalition.	Del Brío et al., 2007 Fernández et al, 2003 Jackson and Seo, 2010
<i>What are the demands the legislation is posing on the organization regarding human resources?</i>	Fair treatment of employees means beyond others an adherence to legislative requirements. The basis of psychological contract needs to be settled in order to build an atmosphere of trust and cooperation.	Jackson et al., 2011 Renwick et al., 2013
<i>SUCCESS LEVEL – organizational vision, culture and sustainability principles</i>		
<i>Is sustainability defined in the organization?</i>	FSSD recommends defining sustainability by a set of four principles. These principles comprise a constraint within which organizational vision can be realized.	Ny et al., 2006 Robèrt et al., 2000 Robèrt et al., 2002
<i>Is sustainability one of the core values within the organizational culture?</i>	The sustainability commitment approach differs from a greenwashing one in a way that sustainability is regarded a core value and not just a way for building organization's image in the eyes of public.	Rothenberg, 2003 Linnenluecke et al., 2009 Fernández et al, 2003
<i>How is sustainability understood in the organization by different employee subcultures?</i>	Different understandings of sustainability might co-exist in one organization. Explaining the desired state by various means will increase the probability it will speak to various employee subcultures.	Linnenluecke et al., 2009

<i>Are the basic assumptions, values, symbols and organizational artefacts reflecting desire or necessity of company to operate in an environmentally correct way?</i>	The research studies indicate that building interpersonal trust, close working relationships, increased level of communication and access, reducing distinction power in the organization, letting managers spent time on the shop floor, eliminating fear or replacing when sharing knowledge and hands-on approach to management and especially environmental staff create an environment where employee willingness to participate is supported.	Jabour and Santos, 2008b Harris and Crane, 2002 Rothenberg, 2003 Fernández et al, 2003
<i>Is the top management demonstrating support for sustainability?</i>	Recognizing and spreading environmental dimension as a value and explaining how environmental management practices influence the day-to-day operations.	Govindarajulu and Daily, 2004 Del Brío et al., 2007 Jabour and Santos, 2008b
STRATEGY LEVEL – organizational strategy		
<i>Are principles of sustainability reflected in HR strategy?</i>	Especially fourth sustainability principle deals with social sustainability – people should be treated in such way it does not undermine fulfilling their needs. This aims at assuring fair employee treatment, building mutual trust, supporting the learning environment.	Jabour and Santos, 2008b Missimer et al., 2010
<i>Does sustainability strategy allow for prioritization of potential measures?</i>	Corporate sustainability strategy should be able to identify the “low hanging fruit”, i.e. the actions that will bring the quickest economical, environmental or social improvement.	Robèrt et al., 2000 Robèrt et al., 2002
ACTIONS AND TOOLS LEVEL – supporting HR practices		
RECRUITMENT		
<i>Are the environmental responsibilities found in the job descriptions?</i>	Job descriptions and required competencies are usually transformed into selection criteria and presented to a target group of potential candidates.	Jabour and Santos, 2008b
TRAINING AND DEVELOPMENT		
<i>Have employees received appropriate training?</i>	The employee training can be focused on general issues such as raising employee awareness, identify the problematic environmental issues, finding a best way how to solve them; or issues related to the	Govindarajulu and Daily, 2004 Jabour and Santos, 2008b

	organization operations: hazardous materials use, training on plant environmental policy, recycling, pollution prevention.	
PERFORMANCE MANAGEMENT		
<i>Are the environmental indicators used for employee performance evaluation?</i>	Performance management criteria can be stated as desired results (e.g. defined by Key Performance Indicators) and/or by desired employee behaviour (e.g. defined by competency framework).	Linnenluecke et al., 2009
<i>Are awards, recognition, praises and financial rewards linked to employee performance related to environmental management goals?</i>	Performance management system is regarded as the managerial tool for influencing the employee motivation. Financial rewards are regarded as the most important ones especially by the shop floor workers.	Wehrmeyer, 1996
<i>Are training opportunities provided for those employees who do not follow the criteria for desired results and behaviour?</i>	The performance management should be able to identify the gaps between the current competency level and the desired competency level.	Jackson et al., 2011 Renwick et al., 2013
ORGANIZATIONAL LEARNING		
<i>Is teamwork practised? (e.g. quality circles, green teams...)</i>	Knowledge combination seems to be the key mechanism for innovation birth. Small groups of people with complementary knowledge – environmental management staff, engineering staff, suppliers, factory floor workers – represent the appropriate environment for innovative thinking.	Rothenberg, 2003 Busck, 2006
<i>Is employee participation and empowerment a key approach to HR management?</i>	The shop floor workers, specialists and environmental management staff can be involved through different means such as: consultations, suggestion programmes, problem solving circles, training.	Boiral, 2002
<i>Are the processes constantly documented in order to retain the knowledge?</i>	On the one hand the documentation requirement may be perceived as a bureaucratic burden; on the other hand it remains one of the main sources of knowledge sharing in organization.	Rothenberg, 2003
<i>Is organization striving for employee knowledge capture?</i>	There are several means of deliberate endeavour for knowledge capture such as suggestion programmes, circles of quality,	Busck, 2006 Rothenberg, 2003 Boiral, 2002

	green teams, and employee consultations. The information technology provides infrastructure for such process.	
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Strategic sustainability approach provides a necessary structure for working with people in organizations. It stresses that there are several layers of sustainability thinking. The most visible environmental actions that are taken or environmental tools that are used do not constitute the real core of sustainability awareness building and understanding. Siebenhüner and Arnold (2007) argue that sustainability-oriented learning processes are initiated and carried out in an environment where sustainability-related requirements are part of the organizational culture. This idea is further supported by the research findings of Linnenluecke et al (2009). The integration of environmental indicators into employee performance evaluation is considered to be an important element for developing an employee understanding of corporate sustainability. Linnenluecke et al (2009) found that successful implementation of corporate sustainability is preconditioned by diffusion of knowledge about sustainability throughout the organization. Therefore internal communication of sustainability should encompass various dimensions of sustainability concept in order to speak to different employee subcultures which have different conceptualizations (understandings) of it. Tailor made training programmes of new environmental knowledge and behaviours are needed for building employee sustainability awareness, explaining consequences of unwanted behaviour and usefulness of environmental management (Rothenberg, 2003).

6 Conclusions

People are said to be the most valuable asset of organizations. To energize them for participation in eco-innovation birth the meaning of such effort has to be adopted. This might be achieved if the managers of the organization have developed a deep understanding of what sustainability means for their business. The management of the organization has to be aware of the properties of the global system it is operating in, have clear definition of what they want to achieve and what are the sustainability constraints of such success. The sustainability understanding should be reflected in organizational culture, creating opportunities for innovation birth. Sustainability issue is closely interconnected with human resources management. The social side of sustainability encompasses human needs fulfilling and the environmental effects impact the health and

working conditions of employees and often of their families living in the organization's neighbourhood. Exploiting the advantage of developing sustainable organization in a strategic way may represent a major competitive advantage for the future.

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Sustainable e-parliaments

Mauro Romanelli

Università degli Studi di Napoli Parthenope
Dipartimento di Studi Aziendali ed Economici
Palazzo Paganowski, via Generale Parisi, 13, Napoli, 80132, Italy

Structured Abstract

Purpose – The aim of this paper is to elucidate that parliaments are seeking legitimacy as accountable and sustainable democratic institutions by managing new technologies and knowledge to design an e-parliament where stakeholders use information and communication technologies to perform more effectively their core functions of lawmaking, representation, and oversight.

Design/methodology/approach – Parliaments under increasing pressure to revisit their concept of sustainability may select different approach to policymaking and lawmaking connecting citizens to knowledge and information in the policy process. Organizations seeking greater legitimacy than better performance tend to conform to the expectations of the key stakeholders. Managing and sharing knowledge and information can help to face uncertainty and environmental complexity as the fundamental problem for organizations such as parliaments. This study is based on archival and qualitative data drawn by literature review about the use of knowledge management systems and internet technologies of information and communication within parliamentary institutions.

Originality/value – Technology has made possible greater access to the policy process enhancing quality of democratic governance if citizens are better informed and included in decision making processes. ICTs offer different scenarios to representative democracy leading parliamentary institutions to sustain public trust to survive in their current forms to cope with distrust and disengagement of people feeling unheard by politicians.

Practical implications – Parliaments embracing new technologies coherently with international standards and best practices may select different choices in order to use new technologies, managing knowledge and information in order to develop their internal workings engaging citizens in the public policy process.

Keywords – e-parliament, social sustainability, knowledge and information management.

Paper type – Academic research paper

1 Introduction

Parliaments, as the institutions through which governments are held accountable to the electorate, are designing an e-parliament keeping up with complexity of managing new technologies, information and knowledge.

The aim of this paper is to elucidate that parliaments can select different e-parliament strategies managing knowledge and new technologies of information and communication seeking legitimacy to appear as accountable and sustainable knowledge based democratic institutions engaging effectively citizens in the political process. This study is based on archival and qualitative data drawn by literature review about the use of knowledge management systems and information and communication technologies within parliamentary institutions.

Parliaments qualify as complex organizations playing a different strategic behavior and being supported by a consistent support staff. According to the Institutional view organizations tend to achieve greater legitimacy than better performance to conform to the expectations of the key stakeholders in their environments. Managing and sharing knowledge and information can help to face uncertainty and environmental complexity as the fundamental problem for organizations such as parliaments.

Knowledge management as a systematic approach to the capture, structure, management, and dissemination of knowledge has the potential to transform public sector organizations through the distribution and use of information and knowledge supported by Internet technologies sustaining citizens to participate in public decision-making and consultation in the knowledge and information society. New technologies of information and the Internet lead parliaments as open and accountable institutions to improve their internal procedures and communicate with citizens and effectively engage them in the political process through websites that make available documents and information about parliamentary activities.

2 A neo-institutional framework on change and design

Institutional theory provides an interesting lens for understanding the organizational processes of continuity and change in public sector and public administrations (Greenwood and Hinings, 1996). The primary objective of organizational change is to

achieve not better substantive performance but greater legitimacy. Ideas, values, and beliefs that originate in the institutional context and external to an organization may limit the range of available organizational designs. Organizations do not always embrace strategies, structures, and processes that enhance their performance but seek ways to accommodate pressures following external scrutiny and regulation and adapt their internal characteristics in order to conform to the expectations of the key stakeholders in their environments becoming increasingly similar. through coercive, normative and mimetic mechanisms (Di Maggio and Powell, 1983). Coercive isomorphism is dependent of an organization's pressure to conform to the cultural expectations of the large society. Normative isomorphism as a result of professionalization. Mimetic isomorphism as a response to uncertainty leading to the adoption of management practices for which there is little empirical evidence of performance benefits such as in government or non-profit organization (Ashworth and Boyne, 2009).

3 Managing knowledge, information and technologies in the public sector

Knowledge management (KM) as a systematic approach to the capture, management, and dissemination of knowledge has the potential to transform public sector organizations through the distribution and use of information and knowledge supported by new technologies. ICTs can play an important role in determining success or failure of the implementation of knowledge management systems. Organizations should translate their knowledge strategy into an organizational and technical architecture to support knowledge creation, management, and utilization processes (Zack, 1999). However, every organization may develop its own way of dealing with information and knowledge (Tseng, 2007). Organizations knowledge-based have to provide an environment favorable to knowledge creation, assimilation and dissemination (Misra, Hariharan and Khaneja, 2003). Developing the Internet and Information Technologies as dimension of KM may help to ensure excellence and improve quality (Sher and Lee, 2003). Tools and concepts of information management which are developed and implemented through technologies cannot be used to design KM systems (McDermott, 1999). While information can be captured, stored and transmitted in digital form, knowledge can exist only within an intelligent system. Information may support knowledge as the outcome of a knowledge process (Blumentritt and Johnston, 1999). Information technologies make government responsible of engaging citizen in participation and having the potential of maximizing

the knowledge of decision makers before solutions are applied (Henry, 1974). Managing knowledge in the public sector as a fundamental resource in public policy formulation implies the design and implementation of information systems improving the organizational responsiveness to social needs as to influence the political dialogue within public institutions (Gates, 1975). Transparent processes that facilitate effective two-way transfers of knowledge between public organizations and stakeholder are considered to be as fundamental for building a successful partnership to better develop sustainable policy solutions (Riege and Lindsay, 2006). Thereby, KM is still in its infancy even if technology-based KM tools are in rapid development while information management systems are well developed (Cong and Pandya, 2003; Wiig, 2002; Blumentritt and Johnston, 1999). In the public sector KM should focus on organizational culture to stimulate the sharing and use of knowledge, on processes to create and capture knowledge, on technology too to store and make knowledge accessible (Cong and Pandya, 2003). KM enhance decision making within public service; aiding the public to participate effectively in decision making and ICTs have an enabling role in leading change in the public sector (Wiig, 2002). New technologies lead to designing of flat and less hierarchical, flexible organizational structures that foster the development of information and knowledge sharing among work units (Fang, 2000) providing sophisticated means for development, management and application of information when data collected can be integrated and become resource of significance and application (Bellamy and Taylor, 1994). KM may produce effects on organizational processes enhancing information sharing as to require behaviors that influence the way the organization operates and should be fit with existing information technology infrastructure (King, Marks, McCoy, 2002). Thereby, web technology should be tested with regard to maturity of an organization to be adopted as part of the organizational knowledge sharing (Levy, 2007).

3.1 Parliament as organization. Models of parliament and parliamentary administration

Parliaments qualify as complex organizations and the institutions through which governments are held accountable to the electorate by overseeing the executive authority, performing lawmaking and policymaking. Parliament is the representative body through which the will of the people is manifested, the differences between them are debated and

negotiated, as the means through which a public interest is realized by discussion and compromise. Parliaments are considered to be as professional bureaucracies and intensive information demanding organizations able to perform their task as knowledge based organizations that use, disseminate and share knowledge establishing objectives related to social and environmental issues (Leon, 2013). Parliaments as democratic institutions perform three main functions: oversight, representation and legislation; issue and enact laws, represent the interest of voters and oversee and monitor the work of the executive branch of government, debate and define policy priorities, allocate resources, represent different constituencies and political parties. Parliamentarians acting as the operating core and knowledge workers develop their expertise in particular areas to contribute to policy formulation (Suurla, Markkula, and Mustajarvi, 2002). In any organization work staff is vital. Parliament could not perform lawmaking and policymaking activities without support of its administrative and legislative staff providing assistance and aide to the organization outside the operating work flow (Bontadini, 1983). Parliaments need their own source of information and expertise to remain independent from the government. Without its staff Congress would quickly become the prisoner of its outside sources of information in the executive branch and interest groups (Malbin, 1980). Staff structure and operations rely on strategic behaviour of the Parliament and also reflect the role of the legislature in the political system. There are different models of parliament and parliamentary support staff. Parliaments may select a strategy in terms of decisional/ratifying behaviour on policymaking in front of the executive authority and then tailor the staff structure to fit. Ratifying Parliament cannot exert any influence on policymaking. It is aided by registration staff able to ensure a merely administrative support, in terms of registration of sittings and transcript of debates. Parliaments need their own source of information and expertise to remain independent from the government. Decisional parliament as governing legislatures may play a proactive, powerful and more independent role in formulating policy and overseeing its implementation. It is supported by consulting administration knowledge oriented and able to provide technical and professional support on lawmaking and policymaking. The role of legislature is fluid over time. Mixed models of parliament and administration may develop and emerge over time (Chimenti, 1981).

3.2 Parliaments, sustainable democracy, and new technologies

Public organizations are likely to come under increasing pressure to rethink their approach to concept of sustainability moving away from absorbing simply managerial practices in managing information and knowledge about their sustainable activities (Dumay, Guthrie and Farneti, 2010). Social sustainability as life-enhancing condition and process within communities may rely on the widespread political participation and contribution of citizens in every policy area in terms of effective democratic citizenship (McKenzie, 2004) implying the development of models of democratic engagement inclusive of public participation (Gezi, 2007). The idea of citizens first should require the design and implementation of public policy as result of dialogue and shared values (Denhardt and Denhardt, 2001). E-democracy refers to the use of information and communication technologies to engage citizens, support the democratic decision-making processes strengthening representative democracy moving citizens from passive information access to active citizen participation and facilitating a way of communication between citizens empowered to hold politicians accountable and responsive for their actions (Trechsel et al., 2004). Adding a socially sustainable perspective to e-democracy let to adequately analyse social development coherently with need of inclusion, information, discussion, participation to decision-making about policies that are desired in a democratic society (Lidèn, 2012). When politicians set the agenda and citizens may be mainly included in decision-making processes or have a defined role in decision making processes ICTs should improve quality of information exchange between government and citizens (liberal democracy) or improve citizen participation and involvement in decision-making processes (deliberative democracy) (Päivärinta and Sæbø, 2006). ICTs offer to representative democracy more or less favorable scenarios (Gibson, Lusoli and Römmele, 2004): Internet technologies lead to new forms of political participation and direct democracy (erosion) reducing the reliance on intermediary representative bodies (limited erosion). Thereby, new technologies may improve the image of representative institutions that use and implement websites as marketing tool for seeking legitimacy and consensus (modernization and reform) as to permit to representative democratic institutions to use technology for performing their existing functions or reinvigorate representative institutions engaging people to participate in the political system (reinvigoration). Internet technologies permit to restructure the linkages among the institutions in representative democracies as to supplement existing channels of political communication and

information in virtue of Internet global capacity networking (Norris, 2000). Parliaments are slow to utilize the new media and tend not to have corporate communication strategies even if are likely to connect more directly citizens as to avoid to become marginalized institutions under increasing pressure to present themselves accessible, transparent and open to the public (Coleman and Spiller, 2003). Internet technologies offer new capabilities through which traditional representative arrangements can be reinvigorated and renewed (Dai and Norton, 2007) leading both representative systems to become decentralized, accessible and responsive (Zittel, 2003) and citizens to exert influence over decision-making processes (Grönlund, 2003). Thereby, only an equalized access to technologies may ensure new people to participate into democratic policy processes (Krueger, 2002). Internet technologies enhance the quality of democratic governance if citizens are better informed (Kakabadse and Kakabadse, 1999) and more likely to be involved in the political process having easily access to their representative institution. Parliaments embracing new technologies may connect to the public and inform, interact and engage with citizens to cope with the increasing disengagement and distrust of citizens feeling unheard by politicians (Lusoli, Ward and Gibson, 2006). Representative institutions should sustain public trust to survive in their current forms stimulating greater participation through e-voting, e-polling, e-consultations and e-petition (Lindh and Miles, 2007) playing a role of legitimacy of their political system promoting citizenship and accountability through their websites (Griffith and Leston-Bandeira, 2012).

4. The challenge of the e-parliament to support parliamentary functions

Democratic parliament should be representative of the diversity of the people, transparent in the conduct of its business, accessible involving the public, accountable to the electorate for performance in office and integrity of conduct and effective in the organization of business in accordance with these democratic values (World Report, 2008). Recently, parliaments have integrated the internet technologies of information and communication into their workflow to enhance primary parliamentary functions (representative, legislative, scrutiny, oversight, legitimacy, education, conflict resolution), by improving work organization and reinforcing their image in terms of communication possibilities, dissemination and management of information (Leston-Bandeira, 2007) towards the building of e-parliament that is defined to be as the use of ICTs to enhance and strengthen parliamentary core functions and operations (Oppd). An e-parliament, as

an efficient organization where stakeholders use information and communication technologies to perform their primary functions of lawmaking, representation, and oversight more effectively, is a legislature that is empowered to be more open, transparent and accountable through ICT encouraging people to be more engaged in public life by providing higher quality information and greater access to documents and activities of the legislative body. An e-parliament, through the application of modern technology and standards and the adoption of supportive policies, may foster the development of an equitable and inclusive information society (World Report, 2008). E-parliament infrastructure may provide an opportunity for parliamentarians to communicate ideas and best practices and develop common ground for model legislation that subsequently could be introduced in their national legislatures (Johansen, 2006). Citizens may be included in decision making processes through service that enable people to actively engage in interaction with Members of Parliament. E-parliament services as a supplementary venture, enable automation of parliamentary information and the tracking of decisions and documents like the stages of development of legislation, sharing of information, facilitate information exchange between parliaments and the work of parliamentarians, permit to citizens to contact their parliamentarians and give feedback, permit to parliament to attract citizens participation reinforcing participatory democracy (Papaloi and Gouscos, 2011).

Parliaments as information intensive organizations are traditionally seen as closed organizations that need to appear as transparent and accessible institutions (Leston-Bandeira, 2007) using new technologies in order to improve their communication and information capacity and connecting to people and citizens. ICTs contribute to design efficient operational process for managing documentation and information and facilitate parliamentary work by providing access to a wide range of digital information which parliamentarians can use and appreciate. ICTs can be used to help parliaments to be more efficient improving their internal workings and give a wide access to government services developing websites enabling people to acquire the advantages of information and on-line provisions of services. ICTs make parliamentarians to be more representative in front of the constituencies and contribute a new form of policies sharing and participatory democracy (Kingham, 2003). International organizations have strongly supported the development of ICT in parliaments: the International Parliamentary Union, the European Union, United Nations Development Programme (UNDP), the United States Agency for

International Development (USAID), the World Bank. The potential importance played by ICTs for parliaments is shown by developments such as the Global Centre for ICT in Parliament, a joint venture between the United Nations Department of Economic and Social Affairs (UNDESA) and the Inter-parliamentary Union (IPU) together with a group of parliaments, which aims to promote and strengthen the development of ICT in parliaments across the world treated. The Global Center has two main lines of action: promote the use of ICT as a means to modernize parliamentary processes; strengthen the role of parliaments in the promotion of the Information society through fostering ICT-related legislation by performing three tasks: information sharing and networking, analysis and research, technical assistance and advisory services; increase citizens' access to parliaments activities and documentation, thereby improving openness and accountability in legislatures; find new modalities of coordination between the international community and parliaments in supporting ICT-related initiatives.

ICTs may offer to parliamentarians support with regard to communications, information management and gathering (research) and dissemination (publishing) (Campbell, Harrop and Thompson, 1999). For instance, the Senate of the Dutch Parliament may distribute its meeting documents to its senators by tablet computer to consult and manage the complete information flow of calendars, legislative bills, correspondence and other meeting documents (World parliamentary report, 2012). ICT-based management systems significantly expand the scope of information and knowledge on a issue ensuring that the law makers are better informed about the possible outcomes of their decisions, improve parliamentary workflow increasing the speed, accuracy and flexibility and permit to parliamentarians and committees to handle pending legislation, spend more time for access to documents and consideration of proposals and recommend additional improvements making informed and responsible voting choices. Thereby, the Internet as engine of change may impact on legislative and political processes and serve as tool of control and evaluation on public policy reinforcing the lawmaking functions and operational activities of parliamentary assemblies (De Rosa, 2010). In the European Parliament the e-parliament is designed to modernize core parliamentary information system and ensure the use of the most appropriate ICTs tools and applications to support legislative and administrative parliamentary processes enabling the institution to perform its duties in an effective way and better support the work of its Members. The e-parliament implantation should follow two phases: in the first phase the focus is on

parliamentary text management and changes in related processes; in the second phase the attention is oriented to activity/process dealing with the optimization of the text production processes and supporting workflows (World Report, 2012). In the young Scottish Parliament ICTs daily entrenched within parliamentarians' activities support legislative and oversight functions of representatives linking the work of the operating core and the staff or parliamentary administration with regard to: legislative and oversight functions, in terms of access to legislative, committee, government and administrative documentation, and communication with internal and external actors; representation function, in terms of access to party and local office documentation, communication with constituents, lobby groups (Smith and Websters, 2008). Parliaments, by using Internet technologies to manage legislative documents and internal information resources are able to build a knowledge resource in order to operate efficiently, legislate effectively providing the public with relevant and accountable information (Oppd). ICTs offer an effective way to gather legislative document, prepare verbatim account and summaries integrating it with other legislative information to provide a complete picture of legislative actions. Through databases, intranets, and digital libraries parliamentarians have access to resource relating to legislative documents (bills and proceedings) and legislative committee reports on line to monitor legislation in process and under debate. ICTs can support for plenary session activity on legislation needs to be another component for managing and tracking legislation. Effective document management systems permit to manage documentation in digital formats and make parliamentary operations more efficient and support transparency. KM as systematic location, processing, storage and distribution of knowledge, competence and expertise within an organization should enhance the Parliament's routine work efficiency and its capability to react to environmental changes. ICTs support extensively parliamentary basic functions and data processing have become integrated as to provide new opportunities for KM (Suurla, Makkula and Mustajarvi, 2004).

The publicity of political decision making is a central element of representative democracies. Technology may enable parliaments to realize the value of transparency, openness, accessibility and accountability developing information and communication flows with voters and public opinion to legitimize public policies (Hoff, Coleman, Filzmaier and Cardoso, 2004) and making available to citizens: information about parliamentary process; issues debated and ability for participation through petitions;

communication with committees and parliamentarians (Missingham, 2001). The practice of e-parliament is related to the concept of e-democracy that enables citizen participation in the policy-making and requires that parliamentary records have to be available to be viewed and discussed by citizens through websites that provide greater access to its parliamentary documents and make available a growing amount of information about legislative process. The Inter-Parliamentary Union (2009) proposed some guidelines for structuring parliamentary websites that include: access to parliament (information, diagram, organization of the website); history and role; functions, composition and activities; data and pictures of Presiding Officers, Vice-Presidents, powers and prerogatives; information about committees and committees' work; members of parliament, party groups, electoral systems, general links to websites; general information about legislative, budget/public financing and oversight activities. The goals of parliamentary websites concern: providing basic information about the history, the functions, the leadership, and the membership of the legislature; providing copies of official texts of proposed legislation, then the verbatim accounts of debates and summaries of plenary actions and copies of committee documents. Parliamentary website as a virtual face of the parliament and digital bridge between parliaments and citizens constitute an important way for citizens to learn about their legislature providing a central accessible source for disseminating information about the current legislative activity, and administrative acts increasing the chances of ex ante and ex post public scrutiny of legislatures (Setälä and Grönlund, 2006) becoming the primary means by which parliaments make their work known to citizens and an important tool for the parliament to 'market' itself to the citizens in order to appear as accountable voice in front of the executive authority and government (Dai and Norton, 2007). The website of parliament must be no partisan providing a focus on the institution collectively but also on the individual Members of Parliament. The website should be easy to understand and use, and be freely accessible to all, well managed and supported so that it can respond to the growing needs of both citizens and parliamentarians coherently with the objectives of transparency, accessibility, accountability. Websites should require mindset change on the part of both parliaments and the citizens, leading to change of practices and procedures increasing the internal efficiency through reengineering of lawmaking processes and strengthen legislatures-citizens connections by establishing a close communication between parliamentary institution and citizenry (Sobaci, 2010). Quality and completeness

of information and availability can be very different in terms of transparency and accountability. Websites are conceived as an important tool for parliaments seeking to stimulate deliberation, discourse and active citizenship (Taylor and Burt, 1999). Parliaments improving their websites to meet internationally recognized standards and best practices are advanced in using social media to improve communication and interaction than in implementation of their websites (Griffith and Leston-Bandeira, 2012). Building a website that fails to offer current, comprehensive and reliable data because the parliament lacks a document management system can actually be counterproductive to the goal of keeping citizens well informed and engaged with their parliament (Oppd, 2010). Parliaments are engaging citizens in discussing and participating actively in social issues making their voice heard (Papaloi and Gouscos, 2011). Thereby most of Parliaments are in the phase where one-way access of information is the main use of parliamentary websites even if there are initiative for promoting feedback and participation from the public (Undp, 2006). Parliaments should facilitate a two-way interaction and accountability in terms of information and communication meaningful and relevant for citizens in everyday life: representatives should interact with citizens that may express their concerns for engendering a meaningful dialogue (Marcella, Baxter and Moore, 2002; Papaloi, Ravekka Staiou and Gouscos, 2012).

5. Discussion and conclusions

Parliaments are embracing digital and internet technologies to develop more efficient internal operations connecting people to information and knowledge. Thereby, institutional and political differences play an important role in terms of nature and independence of legislature from the government that may have an effective impact on the means and extent to which parliaments may decide to provide citizens with information and documents (Leston-Bandeira, 2007; Griffith and Leston-Bandeira, 2012). Decisional parliament should search for the effective support of citizens, restoring the relationship of confidence, by sharing knowledge and information encouraging citizen participation or behave as accountable, open and transparent legislature being supported by a registration staff. Ratifying parliament should play a role of seeking legitimacy in front of the electorate or providing general information about its activity.

The e-parliament concept is fruitful of opportunities for increasing the internal efficiency through reengineering of processes and procedure, managing the parliamentary administration overcoming bureaucratic obstacles avoiding the transformation of

traditional bureaucracy into an infocracy (Zuurmond, 2005). Parliaments should design the support staff coherently with strategic choices. Parliamentary staff take most of the day-to-day decision on the management of parliamentary affairs (Leston-Bandeira, 2007). ICTs make parliamentary staff as gate-keeper able to play a relevant role in the process of gathering, selecting, interpreting information and require organizational innovation within design of administrative and legislative staff structure by developing professionalism in order to incorporate and absorb technology advent and pervasiveness (Dai and Norton, 2007; Leston-Bandeira, 2007; Mulder, 1999).

Thereby, within parliaments the introduction and implementation of ICT as difficult and complex process should imply both relevant technological, procedural and cultural change (Leston-Bandeira, 2007). Thereby, with ICTs being embedded in parliamentarians' activities parliamentary core functions seem to be unchanged. The high levels of use and positive orientation towards new technologies of parliamentarians and the emergent ICT culture may contribute to improve lawmaking and policymaking activity enhancing the relationship between citizens and representatives (Smith and Webster, 2004). Websites, that seem not to involve the citizens as a partner into the processes of legislative and policy formulation (Sobaci, 2010), stressing the classical view of parliament (Norris, 2000), can be used as a platform to conduct polls on policy matters via online-surveys can be equipped with e-mail addresses and discussion boards to deliberate with citizens (Zittel, 2003) strengthening the committee's role with regard to information, consultation and dialogue (Bosch, 2003; Leston-Bandeira, 2007).

There is no one way towards the design and implementation of an e-parliament infrastructure. Even if international standards and best practices drive the introduction and implementation of ICTs within parliamentary, the role of parliament in the constitutional arena, the relationships between political actors (parties and parliamentary groups), the work organization and structure of parliamentary staff can influence on management of technologies, information and knowledge (Leston-Bandeira, 2007). Parliaments may select different choices in order to use new technologies, knowledge and information for enhancing their internal workings and engaging citizen participation in the public policy process by integrating different forms and mechanism of direct, mediate and participatory democracy (Anttiroiko, 2003). Parliaments may develop knowledge or information management systems supported by technologies designing different typologies of e-parliament (fig. 1).

Figure 1 – Designing e-parliaments

	Managing Knowledge	Managing Information
Enhancing internal workings	Knowledge Based E-Parliament	Basic E-Parliament
Engaging citizen participation	Sustainable E-Parliament	Accountable E-Parliament

The future of democratic sustainability in terms of effective legitimacy of parliaments within democratic governance may rely on capacity to integrate the building of a knowledge management system supported by technologies, stimulating citizens contribution and participation to the policy process. ICTs capabilities that merely mimic existing communication systems support good management than good democracy (D’Agostino, Schwester, Carrizales and Melitzki, 2011). Most of parliament providing high degree of transparency do not use opportunities of ICTs for increasing participation (Berntzen, Healy, Hahamis, Dunville and Esteves, 2006). Parliament as sustainable knowledge organizations (Leon, 2013) may develop technological and organizational structure, and practices that encourage creation, dissemination and use also strategic of knowledge for social and economic issues regarding community and society, strengthening forms of political dialogue with citizens in terms of knowledge and information sharing and creation about planning and implementation of public policies. Parliaments connecting to public should follow some issues: what information is of citizen’s interest, whether the information published will be used for gathering citizens’ feedback, how to manage negative comments (Papaloi, Ravekka Staiou and Gouscos, 2012). Without involving citizens to participate in the public debate the focus on internal processes supported by use of knowledge or by information management systems may permit to parliament to make more efficient internal workings. Parliaments using technologies as support to information management may appear as accountable and accessible institutions connecting to the public and seeking legitimacy in front of the executive authority. This study is descriptive. Future research should investigate the relationship between e-parliaments and e-participation in terms of seeking the areas of convergence and symbiosis or conflict.

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An empirical study on the influence of organizational and technological aspects on the knowledge sharing behaviour in the Vietnam's university context

Anh Tuan Pham *

Faculty of Business Administration
University of Economics and Business, Vietnam National University Hanoi
144 Xuan Thuy Street, Cau Giay district, Hanoi, Vietnam

Ngoc Thang Nguyen

Hanoi School of Business
Vietnam National University Hanoi
144 Xuan Thuy Street, Cau Giay district, Hanoi, Vietnam

Dang Minh Nguyen

Research, Cooperation and Development Department
University of Economics and Business, Vietnam National University Hanoi
144 Xuan Thuy Street, Cau Giay district, Hanoi, Vietnam

Thi Phuong Anh Tran

Faculty of Economic Informatics, National Economics University
207 Giai Phong street, Hai Ba Trung district, Hanoi, Vietnam

** Corresponding author*

Structured Abstract

Purpose – For decades, Vietnamese universities have been criticized for producing low quality training and research outputs. This study tries to investigate the influence of organisational culture, leadership style, human resource practices, technology support and job characteristics on the knowledge sharing behaviour of academic and administrative staff in Vietnamese universities. Findings from this study are expected to help university management understand better the enabling factors of knowledge sharing behaviour in universities and therefore can develop relevant policies to promote knowledge sharing among lecturers/researchers to advance the quality of teaching and research activities in universities.

Design/methodology/approach – Six research hypotheses related to the relationships between culture, leadership style, HR practices, technology support, job demands and knowledge sharing behaviour were formulated in this study. To test the hypotheses, the

authors developed the measures based on the works of previous researchers as well as on their own reflections. The sample used for this study consists of 123 lecturers and supporting staffs working in ten universities in Hanoi. A multiple regression was applied to investigate the relationships between the six independent variables and the dependent variable (knowledge sharing behaviour). Age, job category, position, gender, working experiences were used as control variables in the regression analysis.

Originality/value - This study reveals some interesting results related to the non-significant association between culture, reward and the knowledge sharing behaviour of individuals in university context. This unexpected finding is however consistent with the results of some studies in the existing literature which also failed to prove the influence of culture and reward on knowledge sharing. The role of leadership style and IT support on the knowledge sharing behaviour of individuals in organisations is confirmed by this study, however when only lecturers are considered as research sample, leadership style loses importance in terms of its influence on knowledge sharing behaviour.

Practical implications – Findings from this study suggest that job demands; training and development; and technology support are the strongest drivers for the knowledge sharing behaviour of lecturers in universities. University management should therefore pay due attention to these aspects to promote knowledge sharing among lecturers/researchers, thus enhancing the “intelligence” of the university. For example, by providing lecturers with regular training opportunities and access to a strong IT system/knowledge base of the university, the later will demonstrate a stronger knowledge sharing behaviour.

Keywords – Knowledge sharing behaviour, Culture, Leadership, HR practices, Technology

Paper type – Academic Research Paper

1 Introduction

University is a type of organization which is aimed to produce students being “knowledge intensive products” to the society. Although KM over the past few decades has evolved as the most prominent field of research in management science, KM in education sector has more or less remained a little-explore domain (Vashisth *et al* 2010). There are two main categories of employee in universities: i. *academic staffs or lecturers* whose main job is teaching and ii. *supporting staffs* who perform non-academic functions in such areas as administration, organization and personnel, planning and finance, etc. These two personnel categories are different in some aspects such as work type, work process, work output and therefore, are expected to experience different KM practices.

For decades, Vietnamese universities have been criticized for producing low quality training and research outputs. For instance, each year, the number of publications by Vietnamese universities in international journals is far low compared to that in

neighboring countries in the regions such as Thailand, Malaysia. A question emerges here is whether poor KM leads to poor training and research performance in Vietnamese universities?

Knowledge sharing is widely recognized as the most important step or activity in the KM process. By sharing information and knowledge, individual employees can learn from others' know-how and work experience (Kang, Kim, Chang 2008). It's widely recognized that knowledge sharing is influenced by the organizational, cultural and technological contexts in which individuals are working and interacting with each other.

This empirical study tries to investigate the relationship between different organizational, cultural and technological factors and knowledge sharing performance in the university context. The paper first presents a review of contextual literature, discusses the methodology used by the authors, proposes some hypotheses to be tested using data collected from selected Vietnamese universities, mentions the implications for university managers and finally ends with summary and conclusions.

2. Literature Review & Problem statement

Tacit vs explicit knowledge

According to Michael Polanyi (1954), knowledge in any organizations exists in two types: explicit knowledge and tacit knowledge. The former is knowledge asset that can be codified, documented and transferred among members in organization. In the context of universities, written working procedures, training manuals, information of students, etc can be seen as explicit knowledge. The later is personal, contextual, exists in the form of know-how, skills, institution,... and normally can not be easily formalized, codified or documented for sharing purpose.

This classification of knowledge is later further studied and developed by Nonaka et al, who in their famous SECI model, explains the ways knowledge transforms from explicit to tacit form and vice versa to create organizational intellectual asset.

Knowledge sharing. Knowledge sharing is known as one of the most researched topics in the field of KM and being the most used key word according to a review of 235 papers published over the past 10 years in the journal Knowledge Management Research and Practice (Ribiere & Walter, 2013).

Knowledge sharing is more than transferring knowledge but creating it (Van den Hooff, 2009). Riege (2005) posits that purposeful sharing of useful knowledge translates into accelerated individual and organizational learning and innovation. Social Capital Theory explains that knowledge sharing occurs because it provides social benefits for both the sharer and the organization (Nahapiet and Ghoshal, 1998). Bock et al (2005) emphasize that the movement of knowledge across individual and organizational boundaries is ultimately dependent on employees' knowledge sharing behaviour and that even with the codification of knowledge, knowledge objects remain unexposed to others until the knowledge owner makes the objects available.

In practice, many large consulting firms such as Ernst and Young, KPMG, McKinsey have invested in robust KM system to foster the sharing of knowledge, ideas, best practices among individuals or groups (Cabrera & Cabrera, 2002).

Organizational culture and knowledge sharing. Organizational culture is defined as a system of shared assumptions, values and norms (Schein, 1985). Organizational culture influences the way individuals interact and share information with each other in the organization. An organizational climate where people are free to express their ideas or opinions, are encouraged to challenge others' perspectives is believed to facilitate the sharing of knowledge and information. Organizational climate, demonstrated in the form of shared value, beliefs and work atmospheres plays an essential role in shaping employees' behaviors and influencing their perception of knowledge management (Chen & Lin, 2004). The relationship between organizational culture and knowledge management has been analyzed by several scholars. Nahapiet and Ghoshal (1998) proved that individuals are more willing to engage in cooperative behaviors, such as knowledge sharing behavior, when a relationship is characterized by a high level of trust. Kim and Lee (2006) pointed out that employees who are attached to each other by social networks will demonstrate higher level of knowledge sharing.

De Long and Fahey (2000) suggest that while trust and cooperation may lead the employees to share knowledge, a working climate which encourages individual power and competition may result in knowledge hoarding behaviors among individuals.

Hypothesis 1. Knowledge-centered culture positively influences the knowledge sharing behavior of individuals in organization

Job demands and knowledge sharing. Lecturer and supporting staff in universities differ in their working approaches. The former mainly works at home or in the class. In

addition, lecturers are not obliged to go to school every day, therefore they have limited chance for formal interaction and for sharing knowledge with their colleagues and their managers. Riege (2005) identified “lack of time to interact and share knowledge” as one of the barriers to knowledge management. Although lecturers’ physical working environment may not be conducive to knowledge sharing, the demand for sharing knowledge seems to be higher for lecturer than for supporting staff in universities. It’s therefore expected that the more the job holder is required to share knowledge with others, the better his or her knowledge sharing behavior. So far, very few studies in the existing literature have been carried out to examine the relationship between knowledge-oriented job demand and knowledge sharing.

Hypothesis 2. There is a positive association between job demands and the knowledge sharing behavior of individual s in organization

Knowledge- centered HR practices and knowledge sharing. Knowledge-centered HR practices include a set of HR initiatives such as staff performance appraisal, reward, training, job rotation, coaching & mentoring, etc which encourage and foster knowledge sharing behavior in organizations. Numerous studies have been conducted with findings leading to a positive interaction between KM activities and HR practices.

McDermott and O’Dell (2001), in their study of five “best practice” knowledge sharing companies, showed how sharing knowledge is included in the company performance appraisal system. Cabrera and Cabrera (2005) posit that firms can create an environment that was conducive to KM by using practices such as team work, team performance appraisal, compensation and reward systems. Kim and Lee (2006) proved that performance-based reward can foster knowledge sharing in organization. Armbrecht et al (2001), Riege (2005) argue that the lack of appropriate rewards, incentives and recognition systems is one of the barriers for KM implementation in organizations. Training and development is an important mechanism to foster knowledge sharing in organization (Cabrera and Cabrera, 2005; Kang et al, 2003).

Hypothesis 3. Knowledge-centered HR practices positively influences the knowledge sharing behavior of individual s in organization

Knowledge-oriented leadership and knowledge sharing. There have been several empirical studies conducted to examine the relationship between different leadership styles and knowledge management. Yang (2007) pointed out that when leaders play the

roles of “innovator”, “mentor” or “facilitator”, knowledge sharing in organizations will be enhanced.

Many scholars (Bryant, 2003, Srivastava et al, 2006) also proved that KM is positively influenced by transformational leadership style which is characterized by empowerment, promotion of trust and commitment.

Singh (2008) suggested that the best form of leadership style for managing knowledge in organization is the delegating style wherein employees are given adequate power, authority and responsibility. Xue et al (2010) found out that team climate and empowering leadership significantly influence individuals’ knowledge-sharing behavior by affecting their attitude toward knowledge sharing. Donate and Guadamillas (2011) defined knowledge-oriented leadership as the style whereby leader plays the role of knowledge facilitator, role-modeling; recognizes and rewards knowledge sharing; promotes trust and learning; and put emphasis on staff empowerment.

This study tries to confirm the findings from existing literature that knowledge-oriented leadership will positively influence individuals’ knowledge-sharing behavior.

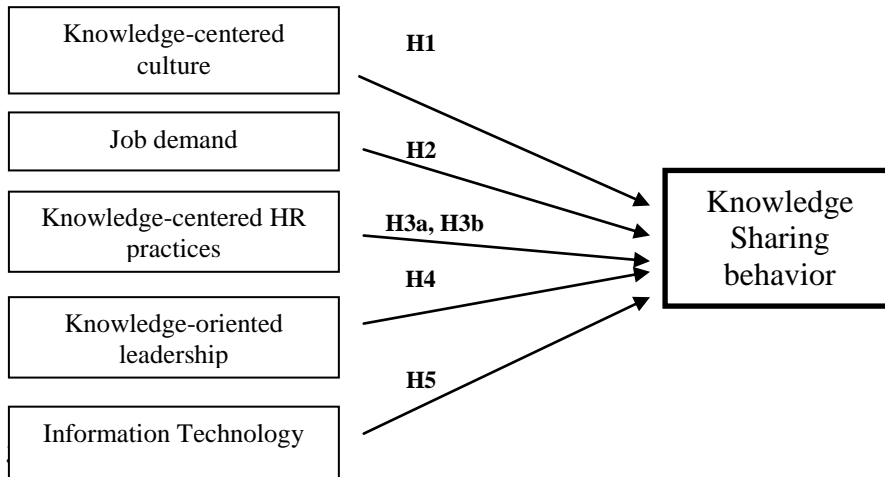
Hypothesis 4. Knowledge-oriented leadership positively influences the knowledge sharing behavior of individuals in organization

Technology and knowledge sharing. Thank to the rapid development of information technology, organizations can create and make use of different tools from sophisticated ones such as groupware, intranet, knowledge base to simple ones like email to foster knowledge sharing and knowledge acquisition. ICT enables knowledge management activities for collaborative decision support, information sharing, organizational learning and organizational memory (Yoo & Kim, 2002).

In recent years, ICT is increasingly considered merely as an enabling tool for KM activities and no longer as a determining factor for the success of KM programs in organizations. Bock et al (2005) recognize that individual’s knowledge does not easily translate into organizational knowledge despite the implementation of knowledge repositories because of the tendency to hoard knowledge. Soliman and Spooner (2000) also posit that KM is about people, not about technology. Lecturers in universities due to their limited face-to-face interaction, tend to rely heavily on ICT to exchange information and knowledge with their colleagues.

Hypothesis 5. The use of information technology positively influences the knowledge sharing behavior of individuals in organization

Figure 1. Research model



3.1 Data Collection

Data for this study was collected from ten different universities in Hanoi. A close ended questionnaire was developed and distributed to both lecturers and staff working in those universities. 143 questionnaires were returned out of nearly 200 questionnaires sent to ten universities located in Hanoi Capital, 123 questionnaires are usable for data analysis.

3.2 Sample Characteristic

Table 1. Sample statistics

	Variables	Frequency	Percent %
Gender	Male	36	29.3
	Female	80	65.0
	Missing	7	4.1
Age	20-30 year old	40	32.5
	31-40 year old	62	50.4
	41-50 year old	14	11.4
	above 50 year old	7	5.7
Seniority	under 2 years	32	26.0
	2-5 years	26	21.1
	6-10 years	26	21.1
	11-20 years	22	17.9

	above 20 years	6	4.9
	Missing	11	8.9
Job	Lecturer	59	48.0
	Staff	63	51.2
	Missing	9	99.2
Position	Manager	26	21.1
	Non-manager	97	78.9

About 48% of the participants in this study are lecturers and 51% are supporting staffs. The majority of the participants are non-managers (78.9%) and only 21.1% are managers of functional departments or faculties in university. 50.4% of the participants are between 31 and 40 year old and up to 32.5% are less than 30 year old. Female participants account for 65% of the sample while male account for only 29.3%. In terms of number of years working in the university, 47.1% of the participants have worked in their universities for less than 5 years, 21.1% of them have worked from 5 to 10 years in their current organization, and 22.8% of the participants have had more than 10 years of working in their current organization

3.3 Measures

In order to examine the relationship between different organizational factors and knowledge sharing behavior, the authors used the five point Likert scale for all items constituting the constructs as shown in the theoretical model proposed by this study.

Table 2. Scale items for independent and dependent variable	Source
Knowledge-centered culture	
Cul1. I see my working unit as a “big family”	Adapted from Bock <i>et al</i> (2005)
Cul2. We consider the problems of my organization our own problems	Self developed
Cul3. I trust my colleagues and share with them job related information	Adapted from Kim & Lee (2006)
Knowledge-centered HR practices	
Hr1. The more I contribute ideas/initiatives to my organization, the better chance I have for job promotion or salary increase	Self developed
Hr2. The ability to work well in team is one of the criteria for staff performance appraisal	Adapted from Donate & Guadamillas (2011)
Hr3. We are given many opportunities to attend training courses to improve knowledge and skill	Adapted from Donate & Guadamillas (2011)
Hr4. We are encouraged to teach different courses or to	Adapted from Donate &

perform different tasks	Guadamillas (2011)
Hr5. Old staff is responsible to provide on the job training for new staff	Adapted from Cabrera & Cabrera (2005)
Knowledge-oriented leadership	
Ld1. Leader of my unit praises or gives compliment whenever a staff has a new idea or initiative to contribute to the organization	Adapted from Donate & Guadamillas (2011)
Ld2. Leader plays the role of advisor and welcomes all opinions, perspectives from staff	Adapted from Donate & Guadamillas (2011)
Ld3. Leader encourages teamwork	Adapted from Donate & Guadamillas (2011)
Ld4. Leader encourages staff to seek information, knowledge from outside	Adapted from Donate & Guadamillas (2011)
Ld5. Whenever a staff makes mistakes in work, leader encourages him or her to draw lessons from those mistakes	Adapted from Donate & Guadamillas (2011)
Ld6. Leader always creates an open and exciting working atmosphere	Self developed
Technology support	
Tec1. Work related information and knowledge are stored, classified and updated in a scientific and regular manner	Self developed
Tec2. The organization's IT system provides valuable and useful information/data for my work	Adapted from Lee & Choi (2003)
Tec3. The organization's IT system facilitates the sharing of knowledge and information among members	Adapted from Lee & Choi (2003)
Job demands	
JobD1. My job requires me to coordinate, interact and share information regularly with my colleagues	Adapted from Casimir <i>et al</i> (2012)
JobD2. Sharing knowledge is a part of my job	Adapted from Casimir <i>et al</i> (2012)
JobD3. Knowledge, information related to my job are easy to understand, describe and to transfer to others	Self developed
Knowledge Sharing behavior	
Ks1. I often participate in seminars, workshops at my university to share knowledge or learn from colleagues	Self developed
Ks2. I often express my thinking or ideas in meetings at my university	Self developed
Ks3. I often share information and knowledge I have with colleagues in my unit	Adapted from Van den Hooff and de Ridder (2004)
Ks4. I am ready to share understanding, know-how, institution gained through work with colleagues in my unit	Adapted from Suppiah and Sandhu (2011).
Ks5. Whenever I learn something new from training activities, I see in it that I have to share that new learning with colleagues in my unit	Adapted from Van den Hooff and de Ridder (2004)
Ks6. I am not reluctant to share success stories and failure lessons with colleagues in my unit	Adapted from Suppiah and Sandhu (2011).
Ks7. I feel responsible to mentor and coach new staff/colleague who has little work experience	Adapted from Suppiah and Sandhu (2011).

Independent variables

The scale for knowledge-centered organizational culture include three items related to values that should support and promote KM activities in organization, including the promotion of trust (Kim and Lee, 2006), affiliation of employee to the working unit (Bock et al, 2005), and affiliation of employee to the organization.

This study uses a five item scale for knowledge-centered HR practices. This scale is largely based on the works of Donate and Guadamillas (2011), Cabrera and Cabrera (2005). It emphasizes that relevant HR practices such as knowledge-based reward and evaluation policies, job rotation, training and development, mentoring should be in place to encourage knowledge sharing among individuals in organization.

Knowledge-oriented leadership was measured through a six item scale adapted from prior research on KM and leadership, especially from the work of Donate and Guadamillas (2011). These authors developed a scale for knowledge-oriented leadership with items related to encouraging and rewarding employees to share knowledge (Pan and Scarbrough, 1999), leading by example (von Krogh et al, 2011), and creating an environment conducive to KM.

Information Technology scale consists of three items, among which two are referred to the role of IT in providing useful knowledge for the work of university employees and in fostering knowledge sharing among the later. The last one is referred to the role of IT in codifying the university's explicit knowledge. This IT-related scale is largely adapted from the work of Lee and Choi (2003) and Gold et al (2001). Job demand scale consists of three items, which are largely based on the scale used by Casimir et al (2012).

Dependent variable

A seven item scale for knowledge sharing behavior was developed for this study. This scale was adapted from previous scales developed by Van den Hooff and de Ridder (2004), Chang Lee et al (2005), Suppiah and Sandhu (2011). Knowledge sharing behavior, as conceptualized in this study, includes not only the act of sharing knowledge but also the willingness or intention of individuals to share knowledge with others. By willingness, it recognizes that knowledge owner will share his/her information, knowledge, know-how, or skills with others whenever he or she has the chance to do it.

In addition, as knowledge exists either in tacit form or explicit form, this scale also considers the sharing of codified information or data (explicit knowledge) and of know-how, skill, best practices, institution (tacit knowledge) among individuals in organization.

4. Empirical study results

Factor analysis

A principal components analysis was conducted on the items selected to measure knowledge-centered organizational climate, knowledge centered-HR practices, Knowledge-oriented leadership, job demand, and knowledge supporting technology. Table 2 below provides the result of a six component varimax solution with a cut-off value of 0.4 for item loadings.

Item loadings table reveals the following:

- All three items used for knowledge-centered organizational culture loaded satisfactorily
- All five items related to knowledge-centered HR practices loaded satisfactorily into two separate components. Hence, the scale for HR practices should be broken into two separate scales, namely *i. knowledge-centered reward and evaluation* and *ii. training and development* and two hypotheses related to HR practices (H3a & H3b) are formulated accordingly.
- All six items related to knowledge-oriented leadership loaded satisfactorily.
- All three items related to technology loaded satisfactorily
- All three items related to job demand loaded satisfactorily

Table 3. Rotated Component Matrix

	Component					
	1	2	3	4	5	6
Cul1						.667
Cul2						.755
Cul3						.837
Hr1			.782			
Hr2			.717			
Hr3					.615	
Hr4					.815	

Hr5						.680
Ld1	.548					
Ld2	.645					
Ld3	.415					
Ld4	.667					
Ld5	.745					
Ld6	.747					
Tec1		.811				
Tec2		.890				
Tec3		.749				
JobD1				.715		
JobD2				.819		
JobD3				.653		
% Explained variance	14.63	13.05	11.43	10.79	10.77	9.83

Notes: Loadings above 0.40 are shown. Kaiser-Meyer-Olkin test = 0.831, Bartlett's Test of Sphericity = 1085.645, Significance = 0.000. Total explained variance of six components is 70.5%

Internal consistency of measures

To assess the internal consistency reliability of all measures, the famous Cronbach's alpha was used. Knowledge-centered culture measure has an acceptable consistency ($\alpha = 0.71$). HR practices measures were split into two separate measures and the consistency level of these two new measures are also acceptable for analysis ($\alpha = 0.67$ for HR1; $\alpha = 0.76$ for HR2). Consistency level is highest for leadership measure ($\alpha = 0.86$), followed by IT support measure ($\alpha = 0.84$) and knowledge sharing measure ($\alpha = 0.82$).

A correlation matrix of all variables is shown in Table 4, along with means, standard deviations and Cronbach alpha for both independent and dependent variable. This study used a multiple regression analysis with six different models to test the different hypotheses presented in previous section. The first model includes five control variables: job category, age, gender, position of respondents and the size of the unit where they are working. The two variables job category and position were created in the form of dummy variable with 1 equals lecturer, 0 equals staff and 1 equals manager, 0 equals non-manager.

In the second model, two independent variables Culture and Reward were first added, ruling out the effect of other independent variables. In the third model, all remaining independent variables were added so that direct effect of each independent

variable on the dependent variable can be measured controlling for all other variables. Models 4a, 4b and models 5a, 5b examine the effects of control and independent variables on the knowledge sharing behavior of lecturers and supporting staffs respectively.

Results of multiple regression

All three models: 1, 2, 3 are significant. The position of the participants in this study has a positive influence on knowledge sharing behavior across the models 1-3. This indicates that managers do a better job in knowledge sharing than their staff. Job category has a negative influence on knowledge sharing behavior in model 2 & 3, as job category has been coded as lecturer = 0, staff = 1, this could mean that knowledge sharing behavior is stronger for lecturer than supporting staff in university context. Other variables in the control model such as unit size or number of staff, age and gender of respondents don't have any effect on knowledge sharing behavior.

The second model is significant (adjusted R² = 16.9) and R² is increased by 9.7%, mainly due to the effects created by the two independent variables: reward and culture. Both these two independent variables show a positive significant relationship to the knowledge sharing behavior of respondents. However, as this 2nd model does not control for other important variables such as leadership style, training, IT support,..any conclusions drawn at this stage could be misleading.

Table 4. Means, standard deviations, correlations

	Mean	SD	Job category	Size	Age	Gender	Position	Job demand	Lead	Culture	Reward	Train	IT	KS
Size			.017											
Age			-.189*	.042										
Gender			-.030	-	-.141									
Position				.062										
Job demand	4.02	.52	.023	.011	.305**	-.072								
			.020	.000	-.028	-.005	.170	0.72						

Leadershi	4.00	.52	.048	-	-.224*	.120	.091	.527**	0.86					
p					.022									
Culture	3.94	.58	-.039	-	-.169	.037	-.047	.177	.371**	0.71				
					.086									
Reward	3.57	.70	.258**	.121	-.019	.179*	.153	.322**	.510**	.215*	0.67			
Training	3.82	.68	-.234**	.002	-.120	.129	.080	.486**	.573**	.420**	.385**	0.76		
IT support	3.65	.71	.343**	.003	-.207*	.097	.033	.348**	.425**	.212*	.469**	.314**	0.84	
Knowledg	3.89	.45	-.140	.033	.032	-.021	.297**	.556**	.515**	.232*	.253**	.530**	.356**	0.82

e sharing

*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed). Dummy variables coded as *Lecturer = 1, Staff=0; Manager =1, Non-Manager = 0*. Numbers in italic are Cronbach's Apha coefficient.

Table 5: Multiple Regression

	<i>Model 1</i>		<i>Model 2</i>		<i>Model 3</i>	
	Beta	t-value	Beta	t-value	Beta	t-value
(Constant)		21.490		8.513		3.780
Job Category	-.168	-1.885	-.215	-2.425*	-.145	-1.778*
Size	.035	.406	.020	.232	.047	.697
Age	-.104	-1.104	-.073	-.799	.061	.796
Gender	-.015	-.169	-.064	-.743	-.051	-.738
Position	.331	3.607***	.292	3.298**	.207	2.870**
Culture			.179	2.043**	.014	.182
Reward			.233	2.508**	-.125	-1.395
Job demand					.265	3.154**
LeadStyle					.233	2.398**
Training					.205	2.110**
IT support					.216	2.562**
		<i>Model 1</i>		<i>Model 2</i>		<i>Model 3</i>
F		3.164		4.51		10.467
(%) R ²		12		21.7		51.1
(%) Adjusted R ²		8.2		16.9		46.3
(%) Increase in R ²		12		9.7		29.4
Change in F		3.164		7.05		16.58

In the 3rd model, when all the independent variables were entered, R2 is improved by 29.4% and this model explains 46.3% of the variance of the knowledge sharing behavior result. All the newly added variables (i.e. job demand, leadership style, IT

support, training) have positive and significant relationship to knowledge sharing behavior whereas the two variables (reward and culture) previously entered in the 2nd model lose importance in terms of their relationship to knowledge sharing behavior.

Model 4b is highly significant and explains 60.7% of the variance of the knowledge sharing behavior result. Only three out of the six independent variables, i.e. job demand, IT support and training show a direct and significant relationship to knowledge sharing behavior. Leadership style doesn't have a significant effect on knowledge sharing behavior in this model, suggesting that the leadership style of faculty manager does not play an important role in deciding the knowledge sharing behavior of lecturer and the knowledge sharing behaviour of the later is rather influenced by other aspects such as IT support and training.

Model 5b is also significant and explains only 33% of the variance of the knowledge sharing behavior result. Among the six independent variables, only Job demand has positive influence on knowledge sharing behavior for both sub-groups. Similar to the 3rd model, there are no direct relationships between the two variables: culture and reward and the knowledge sharing behavior of both sub-groups: lecturer and staff.

Table 6: Multiple Regression for *Lecturer* sub-group

	<i>Model 4a</i>		<i>Model 4b</i>	
	Beta	t-value	Beta	t-value
(Constant)		15.130		1.983
Size	-.014	-.122	.021	.235
Age	-.085	-.698	.097	1.044
Gender	-.082	-.693	-.087	-.979
Position	.544	4.515***	.304	3.110***
Job demand			.249	2.447**
Leadership Style			.165	1.402
Culture			-.030	-.274
Reward			-.045	-.453
Training			.257	2.225**
IT support			.292	3.196***
F		5.578		9.943
(%) R ²		29.2		67.4
(%) Adjusted R ²		24		60.7
(%) Increase in R ²		29.2		38.2
Change in F		5.578		9.387

Notes: Dependent Variable: Knowledge Sharing; *Significant p < 0.1; **Significant p < 0.05; ***Significant p < 0.01

Knowledge-centered leadership has a strong direct positive effect on the knowledge sharing behavior for staff ($\beta = 0.48$, $p < 0.01$), but not for lecturer. This can be explained by the fact that faculty leaders don't interact with lecturers on a daily basis, thus the former doesn't have strong power over or influence on the working behavior of the later.

IT support has a significant influence on the knowledge sharing behavior of lecturer ($\beta = 0.29$, $p < 0.01$), however it doesn't have any influence of knowledge sharing behavior of staff. This could be logical as lecturers nowadays should rely heavily on the information technology, especially on the internet to constantly look for updated professional knowledge and to share knowledge with their colleagues on a regular basis.

Table 7: Multiple Regression for *Staff* sub-group

	<i>Model 5a</i>		<i>Model 5b</i>		
	Beta	t-value	Beta	t-value	
(Constant)		16.986		3.293	
Size	.134	1.041	.116	1.093	
Age	-.155	-1.130	-.026	-.203	
Gender	.083	.646	.029	.264	
Position	.091	.667	.038	.339	
Job demand			.270	1.850*	
Leadership Style			.480	2.715***	
Culture			.026	.221	
Reward			-.202	-1.325	
Training			.187	1.196	
ITsupport			-.111	-.701	
F		0.751			4.048
(%) R ²		4.9			43.8
(%) Adjusted R ²		-1.6			33
(%) Increase in R ²		4.9			38.8
Change in F		0.751			5.988

Notes: Dependent Variable: Knowledge Sharing; *Significant $p < 0.1$; **Significant $p < 0.05$; ***Significant $p < 0.01$

Training also has a significant influence on the knowledge sharing behavior of lecturer ($\beta = 0.257$, $p < 0.05$), but doesn't have a direct effect on the knowledge sharing behavior of staff. Training obviously is a very important channel for lecturers to upgrade their knowledge and to share knowledge with others in class.

5. Discussion

Findings from this study have shown that most demographic information such as the size of the working unit, age and gender don't have any effect on the respondents'

knowledge sharing behavior. Job category (lecturer vs staff) has a significant negative association with knowledge sharing behavior. The position of the respondents (manager vs non-manager) does have a significant positive relationship to knowledge sharing behavior. In university context, the need for knowledge sharing is therefore more important for lecturer than for staff. Similarly, the knowledge sharing behavior of managers is better than staffs in universities.

Culture has been widely considered as a catalyst for knowledge management in organizations. However, this study shows that culture values including trust, affiliation to the organization and affiliation to the working unit don't have a direct effect on the knowledge sharing behavior of employees in universities. This finding contradicts with the results from a number of studies in the existing literature, for example Lee and Choi (2003) and Alawi et al (2007) have identified a positive relationship between trust among employees and knowledge sharing in organizations.

In the same manner, this study could not point out a direct relationship between knowledge-oriented reward policy and knowledge sharing behavior. This is not contradictory as some previous studies in the existing literature also pointed out that extrinsic reward did not have a positive influence on knowledge sharing. Bock et al (2005) found out a negative effect of extrinsic rewards on knowledge sharing attitude while Chang, Yeh and Yeh (2007) assert that outcome-based rewards do not foster knowledge sharing among team members. This study shows that reward lose its importance in terms of its effect on knowledge sharing behavior in the presence of other predictors such as leadership, training and job demand. It could be suggested that the relationships between culture, reward and knowledge sharing behavior seems to be controlled by other factors such as leadership, job characteristic, technology support, etc.

Knowledge-oriented leadership has a significant positive effect on the knowledge sharing behavior for individuals in universities. This is consistent with the results of a number of previous studies showing that appropriate leadership style would foster knowledge management. For example, Srivastava et al (2009) argue that leadership style focusing on empowerment positively influences team efficacy and knowledge sharing. However, when only lecturers are taken into account as research sample, the relationship between leadership style and knowledge sharing behavior is no longer significant. Hence, the role of leadership in fostering knowledge sharing may be contingent on the frequency of interaction between leader and staff, i.e. when individuals don't interact with their

leader on a daily basis like in the case of university lecturers, leadership does not have a significant effect on knowledge sharing behavior.

Technology support is positively associated with knowledge sharing behavior in both model 3 and model 4b. This study points out that more the IT system of the university facilitates the work and communication of lecturers, the better the knowledge sharing behaviour of the later. This result confirms the findings from previous studies which suggest a positive and direct effect of technology on knowledge sharing. Information technology is undoubtedly a vital tool for lecturers to enrich their knowledge and to share knowledge/information with their colleagues. Adel Ismail et al (2007) argue that information systems together with other organizational factors such as trust, communication, organizational structure are positively related to knowledge sharing in organizations. Cabrera and Cabrera (2005) suggest that one of the best ways to reduce the perceived cost of sharing knowledge is to have well designed, user-friendly technological tool that simplifies the tasks and reduces the time necessary for sharing one's ideas with others.

Training also has a positive and significant influence on knowledge sharing behavior in both model 3 and model 4b, thus suggesting that training and development is an effective HR practice to foster knowledge sharing among lecturers in universities. Cabrera and Cabrera (2005) emphasize that when training and development help to increase self-efficacy among organizational employees, the later will feel more assured of their abilities and will be more willing to exchange knowledge with others. Training place is not only an ideal environment to foster knowledge exchange but also is where employees from different divisions can socialize and build trust. The relationship between training and the knowledge sharing behavior of staffs, however is not found in model 5b. One explanation could be that staffs in universities are given fewer training opportunities compared to lecturers, hence training is not perceived by staffs in university as a facilitator for their sharing knowledge with others.

Knowledge oriented job demand has a positive and significant association with the knowledge sharing behaviour of university employees, including both lecturer sub-group and staff sub-group. This implies that the knowledge sharing behavior is much driven by the extent to which a job itself requires the job holder to share knowledge with others. The findings from this study show that the more a job requires the employee to interact and share knowledge with others, the stronger his or her knowledge sharing behavior.

This study has practical implications for university management in order to promote knowledge sharing. First, knowledge oriented leadership style is vital to foster knowledge sharing in universities. Leaders in universities should be trained on how to encourage lecturers and staffs to acquire knowledge from inside and outside organization, to share knowledge with others, and to learn from mistakes. Leaders of faculties or professional departments in particular should try to create frequent interaction among and with lecturers. By meeting and talking to lecturers more frequently, faculty leaders will strengthen their influence on the knowledge sharing behavior of the lecturers. Training and development has been proved in this study as an effective HR practice to foster knowledge sharing among lecturers, as such, lecturers in university should be given frequent training and job rotation opportunity so that knowledge is effectively shared among individuals in university and the intelligence of the university as a whole is built up. In addition, universities should place priority on developing a strong IT system that enables knowledge to be easily stored, acquired, and shared among lecturers. Lastly, human resources manager in university may consider to institutionalize knowledge sharing as a duty or responsibility specified in the job description of both lecturer and staff as the findings from this study has shown that the more a job requires knowledge to be shared, the better the knowledge sharing behavior of the job holder.

6. Limitations of this study and suggestions for future research

This research presents several similar limitations as found in common organizational behavior research. First, the cross-sectional nature of the research design in this study does not allow causality to be inferred. Second, data related to all constructed was collected using a single questionnaire, findings were based on self-reports of respondents, thus the issue of common methods variance cannot be avoided. Third, a single liker five point scale was used for all constructs, as a result, some of responses seemed to be deliberately replicated and had to be rejected. This study only focused on the main effects of organizational and technological aspects on knowledge sharing behavior and did not consider other aspects moderating these relationships. Also, in this study, knowledge sharing behavior was treated as the “final outcome” of organizational and technological factors, not as an intermediate outcome to reveal its moderating or mediating role in the relationships between those organizational antecedents and organizational or individual performance. Future research may investigate how knowledge sharing leads to improved

organizational performance of universities that could be justified by the number of international publications, ranking of university, post graduation employment rate , etc. Future research may also examine how the organizational, cultural and technological factors interact internally or with knowledge management strategies (codification verses personalization) to influence on the organizational performance of universities.

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Infrastructure for Knowledge Sharing in Universities and Research Centres in Iran

Leila Nemati-Anaraki

Iranian Research Institute for Information Science and Technology
(IRANDOC), Tehran, Iran
Enghelab Street, Conjunction of Felestin Street, No. 1090, 1315773314

Structured Abstract

Purpose – Nowadays, knowledge sharing has become a strategic source of gaining and preserving competitive advantage and collaboration between universities (centers of science) and research organizations (centers for practice). So, knowledge sharing between different organizations, is the cause of their retain in today's competitive environment and providing the necessary platforms and infrastructure is must in this process. Accordingly, the purpose of the present study is to investigate the technical and infrastructural factors that influence knowledge sharing process in medical universities and research centers in Iran, and then identify the most effective platforms, methods and channels of inter- and intra knowledge sharing.

Design/methodology/approach – The method of this paper is mixed and applied research (a combination of library and Delphi method) that was conducted in 2013. The study population considered of the faculty members of medical universities and research centres in Iran which by use of stratified sampling 423 samples selected. According to the statistical results around 17 percent of professors considered the organizational structure as acceptable. There was also a sharing of knowledge and experience of faculties in the 48/2 percent somewhat faculty teaching and research within their organization more than other organizations. From the view of faculties, conferences and forums, with an average rank of 4/93 and personnel exchanges with the average 4/24 are the most effective ways of sharing.

Originality/value – A few attempts have been made to investigate success factors for inter- and intra-organizational knowledge sharing empirically or even theoretically, but this is the first of its kind that provides role of infrastructures for the knowledge sharing in medical science collaborations. It serves as a useful starting point for those interested in knowledge management. So, it can serve as a roadmap of significant knowledge sharing research for researchers, designers, and managers considering their options for fostering knowledge management.

Practical implications – The outcomes of the application will provide empirical basis for planning and implementing knowledge sharing mechanisms.

Keywords – Knowledge Management, Knowledge Sharing, Information Technology, Faculty Members, University

Paper type – Academic Research Paper / Practical Paper

1 Introduction

Today, it seems that many countries have recognized the importance and role of higher education in knowledge production and transferring it to the research society as a section of general process of knowledge management and thus have provided the grounds to align the academic research to the research centres' priorities (Hasanzadeh and MohammadKhani, 2010). In other words, the survival of education and research is interdependent. The faculty members and the employees of these centres are main capitals for knowledge sharing. Cooperation and participation of human resources need sharing the effective knowledge in and out of the organization and management of the activities, as stated by Kim and Ju (2008) if the necessary conditions, infrastructures, and the grounds are provided for faculty members, they can share their knowledge and thus help the organization succeed. So, this critical knowledge flows when the infrastructures, grounds and channels of knowledge sharing are regarded by the organizations.

One of the best methods of improving the knowledge sharing is the recognition of current conditions and moving towards the favourable conditions, therefore studying the current circumstances and the points that need promotion are feasible through using the most important technical factors effective on knowledge sharing and continuous assessment of universities and research centres. Therefore, the present research is aimed at studying the technical and infrastructural factors effective on knowledge sharing process among the faculty members of universities and the research centres all over the country in the field of medicine while identifying the most effective grounds, methods and channels of knowledge sharing.

2 Literature Review

The tendency of countries to admit globalization along with development of information and communication technology, have developed powerful tools to create global networks of education and research (Abel et al., 2007). Activities of the universities in modern days have affected the sole mission of knowledge production and have turned universities into problem solving service institutes for local, national, and global problems. This significant issue duplicates the responsibility of universities on qualitative and quantitative promotion of knowledge sharing. The research and education organizations that utilize the knowledge sharing concepts manage and reinforce their

human and organizational capitals through sharing the effective and useful knowledge and promote their knowledge-based capabilities (Hsu, 2008). Knowledge sharing involves a set of common understandings that are created through accessing the organizational information and leads to utilization of knowledge-based networks inside the organization (Hogel, Parboteeah, and Munson, 2003). Several factors are considered in the research conducted to study the factors effective on knowledge sharing. These factors are generally divided in two groups of individual and organizational. On the other hand the applied studies demonstrate that human and organizational factors and a large number of modern technologies are related to the knowledge sharing process (Huang, Luther, and Tayles, 2007).

KhatamianFar (2007), in his thesis, studies the condition of knowledge sharing, its infrastructures, grounds and knowledge sharing methods in Astane-Qodse-Razavi. The research findings demonstrated that the general infrastructural condition of knowledge sharing is rather suitable in the related organization. Alvani, ZareiMatin and Pashazadeh (2009) identified in their research effective factors in knowledge sharing. One of the factors they identified was technology that involved existence of capabilities of information technology and the amount of utilization of each one of the related tools. In ShamiZanjani`s research (2010) all the interviewees in the research recognized leadership and solutions as the most important infrastructural weak points of knowledge sharing in the State Tax General Plan. Trusting the management and high concentration were also recognized as the next important infrastructural weak points in that place. In a research conducted by Rofova (2011), the human infrastructures included the (ability to conduct a teamwork and communication interpersonal skills), the process infrastructures involved (attitude, support by manager, guidelines, structure, culture of the organizations), and the technology infrastructure as the third infrastructure studied in the research. The results of the research demonstrated that the infrastructures of knowledge sharing in these companies were of a medium quality condition. Among the subject infrastructures, the process infrastructures had the best condition and the human infrastructures had the weakest. In the results of the research conducted by Brennenraedts, Bekkers and Verspagen (2006) the most usable channels were arbitration in scientific publications and books, conferences and workshops, participation in the organizations' expertise councils, social networks and the networks based on friend finding, projects participation, simultaneous activity in teaching and industry, thesis advisor, information sharing,

productions and facilities and industry. The results of Han and Anantatmulas' research (2007) showed that regarding the accessibility and applicability of information technology, around 95 percent of individuals confirmed accessibility to the technologies such as the internet, intranet, email, telephone, fax, video conferencing and telephone conferencing. The research of Sondergaard, Kerr and Clegg (2007) focused on the leadership, organizational, and individual factors effective on knowledge sharing. Studying the technical infrastructures were considered as a part of organizational factors and indicated that the technical factors were not effective on knowledge sharing, however they were required to exist and correct application of technologies was confirmed by the interviewees. Bekkers, Maria and Freitas (2008) conducted a research titled as "analyzing the knowledge sharing channels among the universities and industries". The results generally demonstrated that the activities of industrial factories did not have remarkable difference regarding the significance of a large variety of channels. However, the difference relied in the disciplinary origin, the specifications of the knowledge and in characteristics of the researchers producing such knowledge (that is the individual traits) and the environment where knowledge is produced and applied (organizational characteristics). The findings of Cheng, Ho and Lau (2009) indicated that 60 percent of the individuals, who took part in network knowledge sharing, identified their activity as a result of being mandated by management, while they wouldn't participate in the activity if they were free to participate in network voluntarily. Also, as viewed by knowledge recipients, Share Net cannot be suitable source for faculty members in related university.

Jansen VanVuuren (2011) studied the dynamic role of ICTs and also the interactions they undertake in the process. The main output of this research was development of a conceptual framework that can support the cooperation and knowledge sharing among the universities and other involving groups. This framework included 6 important factors as the way of cooperation, the role of leadership, facilitation of using the information technology, the profitability of using the information technology, individuals' capability and skills and eventually the individuals' commitment. The findings showed that the official or unofficial knowledge sharing activities were different in organizations and their existence was different in various communities, for example some of the knowledge sharing activities was conducted in reports, documents, emails, and telephone and in four cases. While the organized meetings and face to face and unofficial activities were used only in some of the communities. In addition, physical approximation had direct relation

to the amount of interactions and knowledge sharing. Results of the research conducted by Ali *et al.* (2012) showed that although all the respondents used information technology, they most used it for sharing the documents and not much for direct communication with the experts. Interlocution through remote conferencing, video conferencing and emailing were used more than interlocution through social media technology, weblogs, and online discussion groups. Also the results showed that there were significant relations between publications and accessibility to documents, using the cell phone and using the video conferencing, publications and finding small expertise information. Fullwood, Rowley and Delbridge (2013) recognized the role of management, organizational structure, and also the information and communication technology not effective on knowledge sharing. Also, Yuan *et al.* (2013) concluded by their research that although information technology supports the knowledge sharing, there will be a large gap by using the social software between the modern information technologies and the older ones. It can be concluded from the conducted researches that until 2009 more attention was paid to reviewing the literature rather than deep analysis and empirical researches (Wang and Noe 2009). On the other hand, the applied studies have shown that the human and organizational factors and a large range of modern technologies are related to the knowledge sharing processes.

3 Aims of the Survey

1. Determining the condition of technical and infrastructural factors in the universities and research centers in intra/inter organizational knowledge sharing
2. Determining the effect of each one of the grounds, channels and methods in sharing the knowledge and experience among the faculty members of medicine
3. Determining the most effective method in sharing knowledge and transferring the experiences as regarded by the medicine faculty members

4 Research methodology

4.1 Sample and procedure

In the first stage, qualitative and quantitative investigations were used for extraction and formulation of theoretical model. In the second stage, questionnaire survey was carried out to collect data to test proposed hypotheses. In qualitative part of the research, the combination of library and Delphi method was used which was applied method. For

quantitative part, a Delphi-developed questionnaire was used to collect the required data for analysis and also a single cross-sectional study was used where the required data has been compiled from April until the end of September 2012.

The faculty members of medical universities and medical research centers supervised by the Ministry of Health Treatment and Medical Education of Iran constituted the population of the research. The statistic population consisted of 3430 persons employed as full-time faculty members at medical research centers and 12,428 persons employed as full-time faculty members of medical universities. Because the extent of the population, sampling techniques were used to collect the data needed to select the best sampling and according to the type of the universities and research centers, which “stratified random sampling” was used and a minimum required capacity of 423 people were provided. In order to perform sample capacity sufficiency, Bartlett and KMO’s test were used.

4.2 Data collection and measurement development

In this study, data were collected using a validated method of face and construct validity. Therefore, after studying the scientific literature and library studies, items associated with infrastructure factor based on the conceptual model of the research components were extracted. For the implementation the second phase of the Delphi study, the experts were asked to agree or disagree to statements intended to express for any factors. By analyzing the results of the second round Delphi study, besides confirming the conceptual model, the face validity of the questionnaire was reviewed and approved. To evaluate the construct validity of questionnaires using factor analysis and construct validity was confirmed based on a framework designed. Questionnaire survey was carried out to collect data. About 500 questionnaires were distributed to faculty members and a total of 450 questionnaires were received. 50 incomplete questionnaires were excluded due to missing values or double-checked items. In all, 425 questionnaires were valid. For descriptive analysis SPSS statistical software 15 was used and the output was analyzed. Kolmogorov–Smirnov test was used before selecting the type of tests to make sure that the data were normal and to determine the type of tests.

Pearson’s correlation coefficient was used for the amount of relation between knowledge sharing and each one of questionnaire’s aspects in order to evaluate the amount of internal harmony questionnaire’s various aspects and the results demonstrated that the knowledge sharing component (as the dependent variable) has significant

correlation to its dependent variable such as infrastructures. Moreover, there are significant relations among the independent components which show high levels of internal harmony of questionnaire's aspects. It should be noted that by conducting a pilot study and distributing the questionnaire to 15 medical faculty members, its reliability was examined. As a result, Cronbach's alpha for technical factors was equal (0.908), because it is greater than 0.7 thus the reliability of the questionnaire was confirm.

5 Results

Analyzing the demographic factors demonstrated that 73 percent of the respondents were men and 27 percent were women and out of the total, 43.3 percent of professors were engaged in biomedical basic sciences and 56.7 percent were engaged in clinical fields. To answer the question determining the condition of technical and infrastructural factors in the universities and research centers in intra/inter organizational knowledge sharing, the research findings demonstrated that out of various locutions, teaching the way of using information and communication technology to the faculty members took 37 percent and also the way professors get to know the latest changes and decisions made by other organizations through unofficial channels took 35 percent of the total as two most important amounts. The locutions of tools and technologies for knowledge and experience sharing can conform to the individual needs by 36.9 percent, designing the process plan of activities in organization as a software system by 35.8 percent, knowledge sharing through official channels by 34.8 percent and also the favorability and accessibility to the knowledge banks by 34.6 percent as the top to average level among all cases. Generally, around 17 percent of professors evaluated the technical infrastructures as suitable; around half of them (43 percent) evaluated it as rather suitable and around 40 percent regarded it as unsuitable.

To answer the second question of the research determining the effect of each one of the grounds, channels and methods in sharing the knowledge and experience among the faculty members of medicine, this is to state that knowledge sharing among faculty members of organizations can be implemented through various methods, tools and channels. They are generally divided into six categories including the publications and technologies, conferences and associations, transaction of human resources, performing common projects and consultation on research and development programs, sharing the facilities and equipment and cooperation in training and transferring the experiences.

Totally 23 cases were proposed to study the amount of effectiveness of publications and technologies and accordingly the table 1 below is concluded from analyzing the accumulated data from the professors:

Table1 .Frequency distribution of effectiveness amount of publications and technologies on knowledge sharing to other faculty members

Locutions	Too few		Below Average		Average (To some extent)		Above Average		Very Much		Total	
	Quantity	Percent	Quantity	Percent	Quantity	Percent	Quantity	Percent	Quantity	Percent	Quantity	Percent
Internal publications of organization and reports	64	15.1	182	42.7	129	30.4	42	9.9	8	1.9	425	100
Guiding libraries, manuscripts and instructions	69	16.2	207	48.7	116	27.3	26	6.1	7	1.7	425	100
New bulletins and electronic notification boards	48	11.3	184	43.3	141	33.2	51	12	1	0.2	425	100
System of recommendations	95	22.4	170	40	123	28.9	28	6.6	9	2.1	245	100
Gray texts (Patent Registration License)	125	29.4	213	50.1	65	15.3	18	4.2	4	0.9	245	100
Organization's Yellow Pages (Specialists' network)	46	10.8	139	32.7	144	33.9	82	19.3	14	3.3	245	100
Knowledge resources in Organization (The bases of articles, research plans, books, ...)	21	4.9	110	25.9	143	33.7	100	23.5	51	12	245	100
Action groups like think tanks or consultation chambers for increasing the cooperation)	32	7.5	80	18.8	159	37.4	122	28.7	32	7.6	245	100
Story telling	54	12.7	142	33.4	102	24	71	16.7	56	13.2	245	100
Continuous asking and answering system	39	9.2	126	29.6	105	24.7	102	24	53	12.5	245	100
Short messaging systems (SMS, RSS, Alert)	24	5.6	100	23.5	109	25.6	130	30.7	62	14.6	245	100
Digital Library	30	7.1	133	31.3	148	34.8	85	20	29	6.8	245	100
Personal Computers	54	12.6	116	27.3	155	36.5	73	17.2	27	6.4	245	100
Organization's Intranet (Internal network of the organization)	31	7.3	149	35.1	170	40	51	12	24	5.6	245	100
Organization's extranet (external network for utilizing the organization's internal services)	17	4	117	27.5	127	29.9	93	21.9	71	16.7	245	100
Organization's exclusive website	10	2.4	31	7.3	106	24.9	139	32.7	139	32.7	245	100
Organization's exclusive email address	3	0.7	41	9.6	129	30.4	178	41.9	74	17.4	245	100
Social networks (Weblogs, Wikis, ...)	35	8.2	43	10.1	98	23.1	111	26.1	138	32.5	245	100
Electronic forums	31	7.3	44	10.4	109	25.6	122	28.7	119	28	245	100
Lecturing in the mass media	6	1.4	65	15.3	101	23.8	143	33.6	110	25.9	245	100
Remote conferences (Telephone, video)	28	6.6	56	13.2	105	24.7	116	27.3	120	28.2	245	100
Virtual seminars and webinars	26	6.1	76	17.9	110	25.9	116	27.3	97	22.8	245	100
Telemedicine	59	13.9	94	22.1	131	30.8	90	21.2	51	12	245	100
The amount of effectiveness of publications and technologies on knowledge sharing	1	0.2	65	15.3	288	67.8	71	16.8	0	0	245	100

From among the publications and technologies, technologies had the largest portion of effect on knowledge sharing. From among the publications, the effect of news bulletins and electronic notification boards by 12 percent and the internal publications and reports of the organizations by 11.8 percent were very much effective. Regarding the other cases the effect of organization's intranet (internal network of the organization)

by 40 percent, action groups such as discussion forums by 37.4 percent, personal computers by 36.5 percent and digital library by 34.8 percent, yellow pages of the organization (network of specialists) and the knowledge resources in organization by around 33 percent, was average. It was also generally observed that 16.8 percent of the professors viewed publications and technology very much effective and more than half of them recognized it averagely effective on knowledge and experience sharing among faculty members.

To study the amount of effectiveness of conferences and associations in knowledge sharing, generally 4 cases were proposed whereby the analysis of professors' opinions showed that around 66 percent of the professors recognized exhibitions, conferences and seminars or the common scientific meetings very much effective, around 48 percent of the professors recognized training workshops in organization for acquiring knowledge and experience very much effective, 60 percent of them (that is above average) recognized the training workshops out of organization for acquiring knowledge and experience (national and international) very much effective, around 71 percent of them recognized personal communications via membership in professional and scientific associations very much effective and 21.9 percent of them recognized the last case averagely effective on knowledge and experience sharing among faculty members . From among the above factors, individual communication via membership in professional and scientific associations was the most effective one on knowledge sharing. It was also generally observed that around 61 percent of the professors viewed the conferences and associations very much effective and 35.5 percent of them recognized it averagely effective on knowledge sharing among faculty members and 3.5 percent of the viewed it ineffective.

To study the effectiveness of exchanging human resources on knowledge sharing, 4 choices were proposed and the data analysis showed that around 61 percent of the professors considered simultaneous activity and occupation in university, medical centres and research centres very much effective, half of the professors in viewed cooperation with other centres in specialty field or related to the field very much effective, around 48 percent of the professors considered passing the supplementary courses in national and international organizations very much effective and 29.6 percent of the considered the same as moderately effective on knowledge and experience

sharing among faculty members and around 8 percent of them evaluated it as ineffective.

To investigate the amount of effectiveness of common projects and consultation on research and development programs on knowledge sharing, 6 choices were proposed and the related data analysis demonstrated that more than half of the professors considered the research cooperation and common projects with other centres very much effective; around 59 percent of them stated common cooperation in guiding the student theses very much effective while 32.7 percent of them considered it moderately effective, 56 percent of the professors considered the common publications among other organizations very much effective; 47 percent of the professors stated participation in research priorities transaction meetings in presence of university professors and research centres very much effective and around half of them (47.5 percent) considered participation at meetings on cooperation development and utilizing the mutual capacities (Cooperation network) as very much effective; around 40 percent of the professors stated the participation in research and development plans very much effective in knowledge and experience sharing among the faculty members. It was also generally observed that half of the professors viewed common projects and consultation on research and development programs very much effective and 38 percent of them considered it moderately effective on knowledge and experience haring and around 11 percent of them evaluated it as ineffective.

In order to investigate the amount of effectiveness of common facilities and equipment on knowledge sharing generally 3 choices were proposed and the related data analysis demonstrated that around 24 percent of the professors recognized sharing the laboratories and sample purchasing as very much effective; around 13 percent of the professors considered the science and technology parks as very much effective; around half of them (around 41 percent) stated the utilization of research and training centres facilities as very much effective and around 40 percent of them considered it moderately effective on knowledge and experience sharing among faculty members. It was also totally observed that around 22 percent of the professors evaluated facility and equipment sharing very much effective and around half of them (around 47 percent) considered it moderately effective on knowledge and experience sharing among faculty members and around 31 percent of them evaluated it ineffective.

With respect to the effectiveness amount of cooperation in training and transferring the experiences, it was observed that cooperation in research centres for training by 56 percent, professors' lectures in universities and research centres by 53 percent and cooperation in scientific and non scientific under the titles (chief editor, editor, editorial board, ...) by 44 percent, were the most effective factors among others. It was also generally observed that around 39 percent of the professors evaluated the training and experience transfer very much effective and half of them considered it moderately effective on knowledge and experience sharing among faculty members and around 11 percent of them evaluated it ineffective.

Since there are six methods and channels used in this research on knowledge and experience sharing, we should realize if the methods have equal effects on knowledge and experience sharing. In case the answer is no, what would be the most effective method on knowledge and experience sharing from the view of faculty members? To answer these two questions, the Freidman's Nonparametric Test was used and the related findings showed that the significance level of Chi Square test (0.000) is smaller than the test level ($\alpha=0.05$) and therefore this is to express by 95 percent of certainty that there is a significant difference between the effectiveness level of each method and channel for knowledge sharing among the faculty members of universities and research centres (table 2).

Table 2.Freidman's Test with respect to the amount of effectiveness of methods and channels of knowledge sharing.

Number of respondents	Statistics of Chi Square Test	Level of Freedom	Significance level
425	829.195	5	0.000

With respect to the differences among each method and channel of knowledge sharing, the rankings of the methods were offered (Table 3).

Table 3.ranking of the methods and channels effective on knowledge sharing among the faculty members

Methods and channels of knowledge sharing	Average (Ranks)	Priorities
Conferences and associations	4.93	1
Exchanging the man power	4.24	2
Performing common projects	4.8	3
Cooperation in training and transferring the knowledge	3.36	4

Publications and technologies	2.28	5
Sharing the equipment and facilities	2.02	6

Based on faculties' opinions, the conferences and associations by average rank 4.93 exchanging the man power by average rank 4.24 and implementing the common projects were the most effective methods in knowledge and experience sharing among the faculty members. However, Freidman test (Table 4) demonstrated (regardless of a particular categorization for methods and channels effective on knowledge sharing) that the significance level of Chi Square test (0.000) was smaller than test level ($\alpha=0.05$) therefore this is to state by 95 percent of certainty that there was a significant difference between the effectiveness level of each tool for knowledge sharing among the faculty members of the universities and research centres.

Table 4.Freidman's test with respect to the significance level in methods and channels of knowledge sharing

Number of respondents	Statistics of Chi Square Test	Level of Freedom	Significance level
425	3951.974	46	0.000

The ranking of each one of the methods and tools of knowledge sharing is offered according to their different effectiveness levels. Noticeably, as regarded by the professors, respectively:

Establishing personal relations via membership at the professional and scientific associations; common exhibitions conferences, seminars or scientific meetings; organization's exclusive website; training workshops out of the organization to obtain national and international knowledge and experience; simultaneous activity and occupation in the college, medical centres and research centres; common cooperation in guiding the student theses; exclusive email of the organization; cooperation in research centres for training; offering lectures in mass media including radio and television; common publications in cooperation with the other organizations were the most effective methods and tools for knowledge and experience sharing among the faculty members. By contrast, the gray texts including the patent registration license, technical and industrial reports, rewarding systems, guiding booklets, manuscripts and instructions, science and technology parks and the internal publications of the

organization and the reports were comparatively less effective on knowledge and experience transferring among the faculty members.

Table 5. Ranking of methods and channels effective on knowledge sharing among faculty members

Methods and tools of knowledge sharing	Average	Priority
Establishing personal relations via membership at the professional and scientific associations	33.58	1
common exhibitions conferences, seminars or scientific meetings	32.61	2
organization's exclusive website	32.12	3
training workshops out of the organization to obtain national and international knowledge and experience	31.06	4
simultaneous activity and occupation in the college, medical centres and research centres	30.50	5
common cooperation in guiding the student theses	30.21	6
exclusive email of the organization	29.81	7
cooperation in research centres for training	29.58	8
offering lectures in mass media including radio and television	29.42	9
common publications in cooperation with the other organizations	29.39	10
offering lectures in universities and research centres	28.97	11
Social networks, weblogs, wikis, ...	28.65	12
Electronic discussion groups	28.37	13
Research cooperation and performing common projects with other centres	28.26	14
Cooperation with other centres in specialty field or related to the specialty field	28.04	15
Teleconferences, telephone conferences, videoconferences, ...	27.70	16
Passing the supplementary courses in national and international organizations	27.41	17
Training workshops in organization for obtaining knowledge and experience	27.40	18
Attending at the meetings of research priorities exchanging participated by professors of universities and research centres	26.50	19
Attending at meetings to develop cooperation and to utilize the mutual capacities	26.50	20
Virtual seminars and webinars	26.15	21
Cooperation in scientific and non-scientific publications of chief editor, editor and editorial board, ...	25.76	22
using the facilities of the research and training centres	25.18	23
Promotional and on-the-job trainings	24.96	24
Short messages, RSS, Alert, ...	24.52	25
(Organization's extranet), network out of organization used for organization's internal services	24.07	26
Cooperation in research and development plans	23.95	27
Participation at retraining courses for professors in and out of organization	23.79	28
Knowledge resources in organization database of articles, research plans and books, ...	23.30	29
Cooperation with retired faculty members for training and transferring the experiences	22.62	30
Action groups like think tanks or consultation chambers for increasing the cooperation)	22.14	31
Virtual training spaces	21.78	32
Study and work opportunities	21.33	33
Continuous asking and answering systems	20.97	34
Telemedicine	20.08	35
Digital library	19.90	36
Story telling	19.07	37
Personal Computer	18.92	38
Organization's intranet, internal network of organization	18.22	39
Yellow pages of the organization, network of specialists	17.89	40
Laboratories and purchasing the samples	17.89	41
News bulletins and electronic notification boards	14.96	42

Internal publications and reports	14.78	43
Science and technology parks	14.78	44
Guidance booklets, manuscripts and instructions	13.25	45
System of recommendations	12.61	46
(Gray pages), patent registration license, industrial and technical reports, ...	9.07	47

6 Conclusions

With respect to analyzing the first question, this is to state that many universities try to required information banks, however there are limits and obstacles in providing the data banks accessibility because of increased prices of annual subscriptions of data banks and in some cases the lack of awareness of professors regarding the existence of such banks or the way to use them so the libraries and authorities should be aware of the issue and solve them as much as possible. Around 34 percent of the professors expressed that modern technologies (hardware and software) existed in organization to a very large extent for knowledge and experience sharing with professors inside the organization. Around 18 percent of the professors expressed that modern technologies (software and hardware) existed to a very large extent for knowledge and experience sharing with the professors out of the organization. The cause of this discrepancy may be lack of awareness of authorities on necessity of interactions among professors of various organizations. Another reason may be the lack of fund for purchasing and mobilizing the technical infrastructures therefore many activists in the field try to primarily solve the organization's internal problems and then purchase the hardware and software needed for communication to the sections out of organization. That is because, the knowledge management is based on three principles of individuals, process and technology and attention to principle of individuals as the infrastructure of knowledge management is of a greater significance than technology. This is also noticeable that technology may become an inhibitor rather than an enabler if it is not adequately regarded. Libraries and research deputies play the main role in this regard and are bound to take responsibility of establishing various training workshops and also accurate informative affairs and this aim depends on the amount of awareness and expertise of the libraries authorities on establishing the necessity to establish the training workshops, using the technologies and knowledge sharing. Around 25 percent of the professors declared that they are informed about the latest changes and decisions of other organizations to a very large extent via official channels, while around 35 percent of the professors stated that professors receive the information about the latest changes to a very large extent through unofficial

channels. Unofficial channels are used generally for being easily communicated and less time consuming. This can also be due to existence of trust and reliability among the co-workers. Thus, the authorities can provide suitable grounds such as co-operational groups, free discussion meetings, forums on lunch break...to increase exchanging the news, knowledge and experience. Totally, around 17 percent of the professors considered the technical infrastructures suitable and 43 percent of them considered it averagely suitable. According to Brennenraedts, Bekkers, and Verspagen (2006), one of the most common unofficial methods of transferring and sharing knowledge is social networks and interaction among individuals on various levels.

It seems by studying the literature that existence of information and communication technologies in organization alone do not suffice and training the way to using such tools plays a significant role on using them. The results obtained by the research conducted by Alvani, ZareiMatin and Pashazadeh (2009) indicate that existence of information technology capabilities is one of the effective factors in effective knowledge sharing. Technologies are accounted as a ground that facilitates accessibility and emission and providing such ground and basis is useless without the capability to utilize technologies (Yang and Chen 2007). The research conducted by some researchers show that the ability of personnel to utilize information technology and the systems based on them can be accounted as important and effective variables on individual's ability to share personal and group knowledge sharing (Gouza 2006; Gao 2004; Hooff and Husman 2009). In this regard, the research of Yang and Chen (2007) demonstrated that the more individuals are skilled in using the information technology, the more they will be interested in knowledge sharing. The results of a research recently conducted in England demonstrate that the role of ICTs is neutral in knowledge sharing (Fullwood, Rowley and Delbridge 2013).

From among various proposed methods, around 52.5 percent of the professors highly exchanged knowledge and experience with other faculty members of the organization regarding the new educational needs of the students. The next ranks were 49 percent for external conferences and the way to attend at them and also around 47 percent for the internal conferences and eventually 46 percent on introducing the new resources, books and publications for knowledge and experience sharing compared to other methods. As you observe, the methods most used by faculty members inside the organization for knowledge sharing were on the students' educational needs and introducing the resources and books and this shows that the professors did put their utmost endeavours on sharing

the affairs that could promote knowledge for advising and training the students, so they tried to use the experiences of other teachers to succeed in this regard. Although knowledge sharing with other organizations' professors was fewer than the intra-organizational knowledge sharing as a total, inter-organizational knowledge sharing was most common in cases as: 16.5 percent of the professors averagely introduced internal conferences and the way to attend at them in knowledge sharing with the faculty members of other organizations. Around 15 percent of the professors exchanged information to a large extent with the faculty members of other organizations on the new educational needs of the students. We can conclude that the faculty members used various methods to share knowledge and experience. As an instance, to share the knowledge inside the organization they used introducing the foreign conferences to a large extent more than other methods probably because value can be added to the origin organization through notification on foreign conferences and even conferences held abroad by any faculty member as a capital of the organization, because under such conditions there will be more communication to the world outside the organization, resources become more up to date and knowledge (intentionally or unintentionally) is exchanged more and this is because individuals are involved in various phenomena and the occupational output of the individuals is increased after returning back to the organization and offering a travel report to be added to the organizational resources. The least significant cases where faculty members shared knowledge with other faculty members in the organization were information related to the welfare and recreational affairs by 16 percent, administrative information and also transferring the scientific experiences of industrial environment, medical equipment and business by around 19 percent. One can concluded by this section that the research and educational professors in the field of medicine are so much engaged in their profession to cure patients and discover new medicines and therapeutic methods and run short of time for the administrative and recreational affairs.

Regarding how effective is each one of the grounds, channels and methods on knowledge and experience sharing, the results of analyzing the faculty members' opinions showed that from among the publications, the internal publications, reports electronic bulletin and news boards of the organization were the most effective ones on knowledge and experience sharing and from among the technologies, the organizations' exclusive website (65 percent), delivering lectures in mass media (60 percent), social networks and electronic discussion groups (59 percent) and also e-mails (59 percent) were respectively

the most effective ones on the process. Low rank of the publications and technologies is associated by two interpretations; first, these tools and publications were not important motivators as viewed by the individuals; second, faculty members could not consider a rank for them because organizations did not care enough to introduce them and train the faculty members to learn them, so the organization should try to alleviate or solve these issues. Aligned with the results of this research, in the research conducted by Jafarzadeh-Kermani (2011) the highest average rank was confirmed for specialty publications (3.46). Accordingly, the research results obtained by Nedjat *et al.* (2008) the article publication in journals and offering the articles and research results at conferences were known among the most effective factors on knowledge sharing activities. These results show that publications and conferences can be a suitable ground for knowledge sharing activities. Accordingly, the research results obtained by Brennenraedts, Bekkers, and Verspagen (2006) similarly demonstrated that as viewed by the researchers, conferences, training workshops and scientific publications (books and magazines) had the highest ranks as the significant channels and foundations for transferring and sharing knowledge at the biomedicine engineering department. Specialty publications existing in the profession and the internal publications and reports of the organization can be regarded and studied in this section. As we know, publications are considered as a basis to emit written and objective knowledge and provide the grounds for scientific activities publications. Therefore, it seems universities and also the research centres can facilitate knowledge sharing through establishing an internal publication than can also facilitate publishing the faculty members' articles and also subscription of specialty scientific magazines (printed or electronic) and providing the conditions for accessibility.

Regarding the significance of training workshops on obtaining the knowledge and experience, this is necessary to provide the suitable circumstances for participation of faculty members. It also seems that training workshops are appropriate environments where younger faculty members can take advantage of more experienced individuals' subjective knowledge who has obtained too much knowledge through many years of teaching and researching; the knowledge that is so volatile and can easily be lost when they retire or lay off. The workshops held in or out of the organization, service location, universities and research centres have already been expensive and therefore they can be established by participation. Moreover, in order to utilize more of the training workshops, providing the equal conditions for all and providing timely utilization, we can establish

such workshops electronically because the faculty members may sometimes be away from such meetings and workshops and cannot attend at them in presence. It seems that the site of specialty and professional associations or the site of the universities and research centres may be suitable for such affairs.

The effect of exchanging the human resources is another method of knowledge and experience sharing as stated by 61 percent of the faculty members the simultaneous activity and occupation in university, the treatment centres and research centres as effective factor on improving the process. The results showed that the respondents were generally the members who were engaged in activities at the treatment and educational hospitals and then simultaneously at universities and research centres or hospitals and as we stated before the simultaneous engagement led in expansion of individuals' views on the problems and weaknesses in the knowledge sharing process and confrontation with the patients add to the necessity of the process among the training and research personnel. On the other hand, individuals, by simultaneous engagement at two or several organizations, can transfer the knowledge and experience from one environment to another and the individuals themselves will become the factors of transferring knowledge and experience and turning the implicit knowledge to the explicit knowledge.

Common projects and consultation in programs can provide the grounds to promote the participating individuals in projects because the individuals are demandingly exposed to the knowledge and experience of the other professors or do their best to accomplish the responsibility they have undertaken and consequently their knowledge is increased by accompanying the knowledge and experience of the colleagues. The research findings obtained by Brennenraedts, Bekkers, and Verspagen (2006) aligned with the results of present research and they introduced the common projects and consultation on research and development programs as one of the suitable provisions for transferring knowledge and sharing experiences. As regarded by the professors, sharing the facilities and equipment of the research and training centres among other factors, were the most important factors in effective knowledge sharing. From among the effective factors on cooperation for training and transferring the experiences, more than half of the professors (around 56 percent) regarded cooperation in research centres for training effective on knowledge and experience sharing. In this regard, we can state that many professors learn the theoretical sciences through books and articles and studying the experiences of others to be up to date, however turning the theoretical into practical science requires

laboratories, hospitals and research centres clinically; therefore sharing the facilities and equipment and participation at the common affairs should be supported and encouraged by authorities.

Generally, by the said factors we can conclude regarding the differences among effectiveness of methods and channels that, considering the professors opinions, the conferences and associations by average rank 4.93, exchanging human resources by average rank 4.24 and performing the common projects by average rank 4.18 were the most effective methods on knowledge and experience sharing among the faculty members. Aligned with this research, in the research conducted by Jafarzadeh-Kermani (2011), the results of Dunkan's test that categorized the grounds into 12 groups show that by the opinions of the faculty members, the grounds of emails, training workshops, seminars and scientific meetings and specialty publications were similarly the most significant ones regarding the suitability for knowledge sharing, and the grounds of scientific parties, forums, weekly or monthly meetings with the group and electronic boards were the least significant ones as viewed by the faculty members regarding suitability for knowledge sharing. The significance of grounds like specialty publications, books, training seminars, scientific congresses and meetings as viewed by the faculty members, showed that the universities should endeavour to provide such grounds. The necessary conditions should be arranged for participation of faculty members in internal and external conferences as lecturers or learners in order to let individuals acquire knowledge and also provide the suitable atmosphere for interaction and knowledge exchanging to emit and share knowledge by co-workers. Sometimes the faculty members face problems in scientific seminars such as lack of time, lack of facilities to attend at seminars (Financial problems, accommodation, ...), lack of adequate support exerted by universities and research centres in this respect, unsuitability of the lecture subject to the faculty members' interests, useless subjects of some presentations, therefore organizations should find solutions and alleviate the problems.

The present research explains that some tools of web and technologies and network facilities observed here and regarding which we consulted by the faculty members, were reposed to the lowest rank with respect to knowledge and experience sharing. This fact demonstrates that this is not sufficient to provide the bases and grounds for knowledge sharing, but it is also necessary to pay attention to the way to use them. Providing the atmosphere of trust and cooperation and settling the culture too. Also the universities

need to provide the necessary infrastructures in advance (such as accessibility to high speed internet, hardware and software facilities for each professor including computers, tools and solutions required for controlling the messages, ...).

It is concluded by studying the results related to technology that around 59 percent of the professors considered the social networks (weblogs, wikis, ...) effective on knowledge and experience sharing and moreover around 57 percent of the professors recognized electronic discussion groups; 55.5 percent of them considered teleconferences (telephone conferences, video conferences, ...); around 50 percent of the professors considered virtual seminars and webinars; and around 33 percent of the professors considered telemedicine the most effective factors on the process. As approved by the research results obtained by Chai and Ki (2010), weblogs should provide an environment replete with trust for the users and their weblog administrators should secure the privacy and safety of their users to increase their trust and this knowledge sharing, otherwise individuals cannot be expected to exploit this facility suitably for knowledge sharing. These results are contrary to the results obtained by Cheng, Ho and Lau (2009) because faculty members had mandatorily subscribed in the network and although 60 percent of the respondents had declared they had participated in the knowledge sharing network of the university, only a few of them would participate in the network if they could subscribe voluntarily. Therefore, we can conclude that this is not possible to encourage individuals to use them through providing modern technologies and demanding them to use the facilities. This aim can be achieved only through motivation in a participatory cultural environment for the employees.

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Knowledge flow and gains in professional global social networks

Bozidar Klicek*

Faculty of organization and informatics
University of Zagreb, Pavlinska 2, Varazdin, Croatia

Ivan Jurinjak

Zagrebacka banka, Poslovni centar
42000 Varaždin, Kapucinski trg 5

Dijana Oreski

Faculty of organization and informatics
University of Zagreb, Pavlinska 2, Varazdin, Croatia

** Corresponding author*

Structured Abstract

Purpose – In today's society, knowledge is the most important capital and it is difficult to control. Knowledge is increasingly obtained outside the company. Social networks have taken the lead because they allow the exchange of information in real time. The aim of this study is to determine if the exchange of knowledge in the professional social network LinkedIn group for Java affects the overall knowledge gain for professional work, depending on the socio-demographic characteristics of respondents, regional affiliation and professional requirements, further motivation and frequency of use of the network and the way they perceive the amount of their knowledge.

Design/methodology/approach–Research is performed as follows: the survey was designed and performed on LinkedIn, the biggest global professional network, among participants of Java programming language professionals. We collected N=448 valid questionnaires from the respondents from India 37.7%, 30.9% from North America, 18.6% from Europe and other regions (12.8%), that properly represent the whole population of these group members. Data analysis (descriptive statistics) and data mining was performed. Data mining models by applying knowledge trees and linear regression were made and gave more insight into patterns.

Originality/value–This research represents the most comprehensive research of knowledge sharing in professional social networks, because others have focused only on particular subgroups of variables covered here. We have conducted research, for the first time, on the gains obtained by knowledge sharing between professionals, while additional value is provided by identification of the most important factors in this process. Research provides an insight into how global processes of knowledge sharing work in the

professional social network, how processes are affected by the socio-demographic data. Research has given an answer to the question of who has the highest benefit from this process.

Practical implications–Technical skills and culture of knowledge sharing of Java technology groups on the LinkedIn social networks is a pioneering process that will be developed for other professionals in future decades. The participants’ region had very little influence on the benefits gained, so these networks contribute to globalization. Gains are influenced by the intensity of use and the quality of knowledge, giving directions to the social networks service providers. Satisfaction with certain services on this professional network, compared with the satisfaction with other (non-professional) social networks is lower, which indicates the potential of this domain and need for development and research.

Keywords–knowledge management, professional social networks, knowledge sharing and knowledge gain.

Paper type – Academic Research Paper

1 Introduction

Knowledge has been described as the “only meaningful resource”, a resource which increases the capacity of an entity for effective action (Drucker, 2001). It has been explored from both the individual and social perspective. Papadopoulos et. al. stated that knowledge is an object that could be stored, operated and reused for current and future situations or the outcome of interaction and sharing within communities of practice (Papadopoulos, Stamati and Nopparuch, 2013.). Knowledge sharing is defined as provision of task information and know-how to help others and to collaborate with others to solve problems, develop new ideas, or implement policies or procedures (Wangand Noe, 2010). A lot of previous research has confirmed that knowledge sharing significantly improves competitive advantage (e.g. Papadopoulos, Stamati and Nopparuch, 2013) and individual learning. Recent research in this field investigates and emphasizes the significant role of technology in knowledge sharing. There are numerous technology tools available to facilitate knowledge sharing, such as forums, e-mails, blogs, as well as social networking sites. Social networks were found as one of the most important factors impacting knowledge sharing (Chowand Chan, 2008).

Knowledge sharing between individuals and firms through social networks has just recently started attracting attention among researchers (Rejeb-Khachlouf, Mezghani and Quélin, 2011). However, knowledge sharing through social networks is highly present

and even specific knowledge is shared. The main reason for this lies in the fact that knowledge and information are flowing more easily in a social network than outside (Østergaard, 2009). The most famous social networks are Facebook, MySpace, Twitter and LinkedIn. The latter stands out because it is a social network of professionals who use this social network to achieve business contacts and create new job opportunities. Professional social networks connect large numbers of experts and provide mutual discussion on particular problems, create new ideas, help in problem solving, improve presentation skills. They allow users who need knowledge to obtain useful information from professional experts. Social media enable the exchange of information and discussion on topics in real time, regardless of location and time (Papadopoulos, Stamati and Nopparuch, 2013).

This article examines globally the current state of these technologies and processes on the example of a typical advanced professional social network. LinkedIn is the most advanced professional social network with over 161 million users, at the moment when research was conducted (Skeels and Grudin, 2009).

As of April of 2014, LinkedIn reports more than 300 million of registered users in more than 200 countries and territories (LinkedIn, 2014).

There are several groups of professionals in the LinkedIn network whose area of interest centers on Java programming. The Java programming language, since its inception as a dominant Open Source technology, connected people who share knowledge, and who also have great knowledge of information and communication technologies. This is potentially a very interesting group of social network users. Since these participants are experienced ICT specialists and are triggers of certain trends, their behavior on social networks could hint toward possible trends in the future for other groups of users.

Online social networking is having a great impact on knowledge sharing through online interaction. Therefore, the purpose of this paper is to explore how knowledge flows in specialized groups that are part of online social networks and which factors play an important role for knowledge gain in the social learning context using online social networking. In addition, the paper will explore what types of knowledge users share and the types of benefits that they obtain through this activity. The methodology of this study is novel, namely in the fact that data mining techniques have been applied.

The paper is organized as follows. In Section 2 we review the theoretical background serving as a basis on which we built our research. Section 3 deals with research methodology and outlines data collection among participants of four groups regarding Java programming in the professional social network LinkedIn. In section 4 we explain data analysis: the application of data mining techniques on our data. Finally, in section 5 we point out concluding remarks.

2 Theoretical background and research hypothesis

Knowledge sharing refers to the provision of task information and know-how to help others and to collaborate with others to solve problems, develop new ideas, or implement policies or procedures (Cummings, 2004.). From the perspective of knowledge management, a social group is a place that can contain a large amount of knowledge, and thus it is a place of great interest. Today, social groups appear in a social network as its subsets. Jeff Weiner, Executive Director of LinkedIn, in a discussion on the topic of "Web 2.0. Summit ", argues that the social networks are developing in two directions: a) social networks that are used for entertainment and b) professional social networks (Hadzic, 2010). Network theory suggests that the formality of the network structure may result in different types of knowledge diffusion (Dyer and Nobeoka, 2000). Thus, this paper focuses on professional social networks since their social groups contain specialized domain knowledge and knowledge sharing behaviour of their members and knowledge flow may be different. In order to integrate and extend existing views, this paper develops theoretical model and performs an empirical investigation to examine relationship between the sources of knowledge and other patterns of knowledge sharing behaviour.

2.1 Research model

Social exchange theory suggests that individuals evaluate the perceived benefits of certain action and base their decisions on the expectation that it will lead to some kind of rewards (Emerson, 1981). Participating in knowledge sharing in an online community also assumes some kind of benefit. In general, knowledge sharing practice has been found to be related to increased internal satisfaction, perceived obligation to reciprocate the knowledge gains from the forum, enhanced professional reputations and helping advance the community. Previous research seems to suggest that knowledge sharing is more

strongly related to participants beliefs that their shared knowledge is useful to others than the personal benefits they gain, especially in a professional network (Siemsen, Balasubramanian and Roth, 2007).

However, there are no research papers that explore the knowledge flow or the perceived benefits of knowledge sharing in social groups within social networks. In this chapter we are exploring previous work regarding knowledge sharing in order to prove the claim and identify elements important for knowledge sharing to set up our research model.

When characterizing benefits of knowledge sharing, demographic characteristics are the one to start since the younger generations are substantially influenced by recent trends. The knowledge they possess is the result of their demographic characteristics and sources from which they acquire it. Their behaviour in the group is the result of their demographic characteristics and the level of knowledge they possess. Finally, the benefits of technology are the result of demographic characteristics, sources of knowledge and group behaviour.

A small part of earlier research comprised investigations on various characteristics of members in the knowledge sharing process. The results of these studies suggest relationship between demographic characteristics and knowledge sharing. For instance, Ojha showed that members who considered themselves a minority based on gender, marital status, or education were less likely to share knowledge within group (Ojha, 2005). Sawng et al. found that teams in large organizations with higher female–male ratios were more likely to engage in knowledge sharing (Sawng et al., 2006).

Furthermore, some of the previous studies suggest the influence of national, cultural and regional characteristics in knowledge sharing process. Chow et al indicate that participants from the Chinese culture tended to share information for the good of the organization even when sharing was potentially personally disadvantageous (Chow et al., 2000). They also found that Chinese participants were less likely than American participants to share knowledge sharing with someone considered out of their group.

Despite all of the above, none of the previous studies examined the effects of these factors on knowledge gain and knowledge flow in a professional social network, which is the focus of this paper.

Richness of knowledge sources has a positive influence on individuals' attitudes toward knowledge sharing. Foss and Pedersen have investigated the relationship between

sources of knowledge and the transfer of that knowledge to others (Foss and Pedersen, 2002).

Their results lead to the conclusion that all knowledge sources have a significantly positive influence on knowledge transfer. Furthermore, they proved that not all knowledge is transferred to the same extent, and that the sources of knowledge seem to be a good indicator for the extent to which knowledge is actually transferred. This is because the sources of knowledge are determining the characteristics of knowledge (Foss and Pedersen, 2002).

One of the most important factors which influence knowledge sharing, according to Rus, Lindvall and Sinha, is the fact that there is a culture of knowledge sharing (Rus, Lindvall and Sinha, 2001).

Many studies in the field of knowledge management have proved the importance of studying motivations, and motivation has been one of the most studied factors in knowledge management (e.g. Papadopoulos, Stamati and Nopparuch, 2013). Knowledge sharing especially cannot be forced and it is more likely to occur when people are motivated. Thus, participants' motivation is considered to be important factor. Knowledge sharing is highly influenced by the participants' willingness to be included in the process.

Members of social networks differ in their interaction frequency. The more participants are involved in the activities of the group the more knowledge they will share (Østergaard, 2009). It is expected that frequent visits to social networks and inclusion enhances the levels of participation in groups' discussions. Therefore, participation in activities in social network may influence behaviour of social network users. They can share information and experience to achieve group participation.

Despite the fact that motivation has been recognized and emphasized in the knowledge sharing literature (e.g., Davenport and Prusak, 1998; Goodman and Darr, 1998; Hansen, Mors and Lovas, 2005), traditional motivation theories (e.g. expectancy theory) have not been used as often in knowledge sharing research. Expectancy theory states that the intensity of a tendency to perform in a particular manner is dependent on the intensity of an expectation that the performance will be followed by a definite outcome and on the appeal of the outcome to the individual. In line with this theory, our model assumes that, the more rewards and enjoyment social network members perceive to be associated with their knowledge sharing, the more they will be inclined to participate

in such activities. Therefore, social network members` intentions to share their knowledge strongly depend on individual motivations.

Different levels of participant`s knowledge lead to different degrees in contribution of knowledge sharing within group. The perception of social network participant`s expertise helps increase participation in knowledge sharing. Some of the previous research examined relationship between estimated level of knowledge and intention for knowledge sharing. For instance, Wasko and Faraj did not find individuals' self-rated expertise to be related to knowledge sharing (Wasko and Faraj, 2005). However, knowledge sharing does appear to be contingent on individuals' confidence of sharing useful knowledge with others. Several studies have shown that individuals who are more confident in their knowledge and ability to share useful knowledge are more likely to share knowledge and report higher levels of engagement in knowledge sharing (e.g., Cabrera et al., 2006; Lin, 2007). Participants with higher expertise are more likely to share useful knowledge when other participants asked. On the other hand, Bordia et. al. found that anxiety based on fear of negative evaluations has been found to be negatively related to knowledge sharing (Bordia et al., 2006).

Our model assumes that the role of resources embedded in network relationships somehow determines knowledge exchange and knowledge sharing activities.

The key factors in the process of knowledge sharing are presented through the model in the figure below (Figure 1).

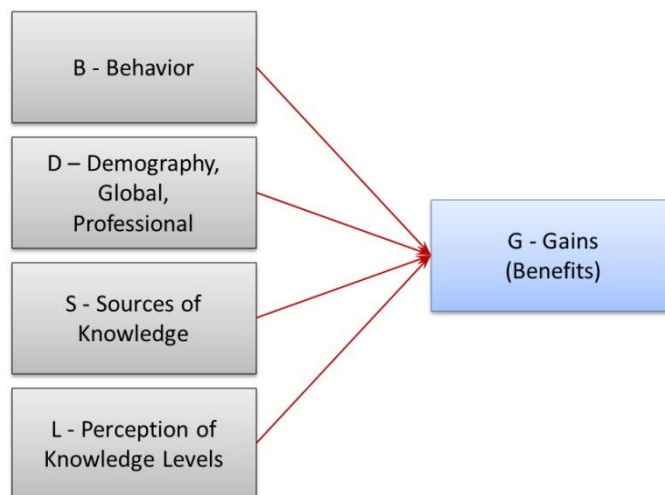


Figure 1. Research model: gain (benefits) dependency of the group of variables.

Figure 1 displays dependencies and relationship between key factors that influence gains (benefits) of knowledge sharing among members of professional social network.

According to the model presented in figure 1, gain (benefits) of knowledge (G) is assumed to be the function of the group of variables listed below with the following dependencies:

- Demography, global, professional (D)
- Behaviour(B)
- Sources of knowledge (S)
- Perception of knowledge levels(L)
- Gain (benefits), $G = g(D, B, S, L)$.

The group of variables include socio demographic, regional and professional characteristics (Demography, global, professional - D), behaviour in social network groups (Behaviour- B), sources of knowledge used to learn and solve the problems (Sources of knowledge - S) and perception of personal and other member`s knowledge level (Perception of knowledge levels - L).

In table 1, particular variables, included in the model, are given with their affiliation to one of the aforementioned groups.

Table 1. Description and grouping of variables in the model.

Group of variables	Variable	Description
Demography, global, professional (D)	AGE	Age
	REGION	Geographical region
	LVL_EDUC	Level of education
	SOFT_EX	Experience in software development
	PRO_FIELD	Professional field
	EMP_PRIM	Primary line of business
	JOB_FUNC	Principal job function
Behaviour(B)	COMM_AVE	Communication intensity
	FOLLOW_TRENDS	Follow new trends
	SEARCH_FOR	Search for a job
	PROVE_MY	To prove myself
Perception of knowledge levels (L)	SHARE_KN	Share knowledge
	KL_PER	Personal knowledge
Sources of knowledge (S)	LEVL_OTH	Level of others knowledge
	GAIN_INT	Gaining knowledge on Internet
	GAIN_LOC	Gaining knowledge local
	GAIN_SEM	Gaining knowledge on seminars
	GAIN_SL	Gaining knowledge by self-learning
Total gain (G)	GAIN_LIB	Gaining knowledge in library
	GAIN_TOT	Total gain from sharing knowledge in social group

3 Research methodology

The research model, shown in figure 1, aims to identify the factors affecting gains on the professional social network. To test the proposed research model, we use data of an online survey conducted in October 2009 by the authors of this article. Most of the variables in the questionnaire were developed following phases of knowledge audit method (Cheung et al., 2011; Burnett, Illingworth, Webster, 2004; Perez-Soltero et al. 2006). Questionnaire is presented in table A of appendix. The survey URL was posted to the four groups found at the professional social network LinkedIn. Total population of social groups in which research was conducted are, according to the LinkedIn group statistics on 21st October of 2009: 1) J Architect with 16,119 members, 2) Java Developers with 49,889 members, 3) the Java EE Professionals with 29,588 members, 4) Java/JEE Enthusiasts with 9,167 members. These groups are overlapping (many members of one group belongs to some of other groups).

3.1 Sample

The respondents are individuals who have experience and have participated in projects to develop application programs. Respondents were qualified to make valid judgments in the questionnaire about professional social networks usage for the purpose of knowledge sharing on global level. Total sample of participants who completely filled out the questionnaire is $N_1=524$, reduced to sample $N = 448$ in the process of data preparation. This later data sample, $N = 448$, is used for descriptive and data mining analysis, described later.

Participants were asked ten general questions relating to their basic characteristics: age, country of origin, level of education, years of experience, years of experience in participating in the projects of development of application programs, issues of employment and their current position at the work. Furthermore, a set of twenty questions related to the motives for group membership and activities in the group, communication channels, assessment of knowledge in the group and its importance, identification of sources of knowledge were asked.

The aggregation of input variables is performed with the aim to reduce the dimensionality, to increase the interpretability of the model and to achieve more preferable statistical distributions important to the performance of analyses.

Considering high correlation between certain variables, confirmed by principal component analysis PCA, they were integrated into new, aggregated variables. Following aggregated variables were created:

- variable COMM_AVE indicates the intensity of communication within the group, is obtained as follows:

$$\text{COMM_AVE} = (\text{QA_PART2} + \text{IM2} + \text{MAIL2} + \text{DISCUSS2})/4.$$

COMM_AVE thus indicates intensity of communication in the interval of 1 (low) to 5 (high), aggregated from intensity to other group members via *questions & answers* (QA_PART2), *instant messages* (IM2), *email* (MAIL2) and *discussions* (DISCUSS2).

- variable KL_PER indicates average perceived level of personal knowledge (perceived for KL_SDK and KL_SPMK), is obtained as follows:

$$\text{KL_PER} = (\text{KL_SDK} + \text{KL_SPMK})/2.$$

KL_PER thus indicate personal knowledge level in the interval of 1 (low) to 5 (high), aggregated from *software design knowledge* (KL_SDK) and *software project management knowledge* (KL_SPMK).

- variable LEVL_OTH, indicates perceived level of knowledge of others, is obtained as follows:

$$\text{LEVL_OTH} = (\text{EXPER3} + \text{KNOW3} + \text{LEVL_SDK} + \text{LEVL_SPMK})/4.$$

LEVL_OTH thus indicate knowledge level of other members, in the interval of 1 (low) to 5 (high), aggregated from *experience* (EXPER3), *knowledge* (KNOW3), *software design knowledge* (LEVL_SDK) and *software project management knowledge* (LEVL_SPMK).

- variable GAIN_TOT, indicates total gain is obtained as follows:

$$\text{GAIN_TOT} = (\text{GAIN_SDK} + \text{GAIN_SPMK} + \text{MEMB_PROBL} + \text{MEMB_QUICK} + \text{MEMB_PERF} + \text{MEMB_USEF} + \text{MEMB_REACT} + \text{MEMB_DECS})/8$$

GAIN_TOT thus indicate total gain for a person obtained from these professional social groups in the interval of 1 (low) to 5 (high), aggregated from *software design knowledge* (GAIN_SDK), *software project management knowledge* (GAIN_SPMK), *helped me solve problems* (MEMB_PROBL), *enabled me to accomplish tasks more quickly* (MEMB_QUICK), *improved my job performance*(MEMB_PERF), *is useful in my job overall* (MEMB_USEF), *enabled me to react more quickly to changes in business* (MEMB_REACT) and *improve decision making* (MEMB_DECS).

The aim of this study is to determine if the exchange of knowledge in the professional social network LinkedIn group for Java affects the overall knowledge gain for professional work, depending on the socio-demographic and professional characteristics of respondents, regional affiliation and professional requirements, motivation and frequency of use of the network and the way they perceive the amount of their knowledge and knowledge to exchange on the social network.

By means of a decision tree, model of dependencies was tested, described above:

$$G = g(D, S, L, B).$$

By applying this model we want to establish the influence of individual variables to knowledge gain in social networks and achieve high-quality models that will explain with sufficient reliability these phenomena.

4 Data analysis

Respondents answered questions about age, country, level of education, and obtained information on current employment.

The average age of members of the groups was 34.65 years, with 23 as youngest and 64 as oldest participants.

Most of the respondents are from India 37,70%, following 30,89% from North America (USA and Canada) and 18,59% from Europe. Other regions together make up less than 13% of the sample. Qualifications-wise, most respondents have a Master's degree 50.67%, followed by 4-year study 36.55%, 5.41% of the respondents have initiated studies and 2.51% of them had a completed 2-year university programme. Other groups of respondents according to education are represented about 2% or less. According to years of professional experience most of the respondents (34.35% of them) has 2-5 years of experience, then the respondents with 6-10 years of experience (31.87% of them), followed by respondents with less than 2 years of experience, (12.98% of them). There were 11.07% respondents with 11-15 years of experience, and 9.73% with more than 15 years of working experience.

Table 2. Descriptive statistics for variables included in the model.

Variable	Min-Max value (continuous) Values (nominal or ordinal)	Mean/stddev Distribution (Probability)
AGE	23-64	34.39 ±7.58
REGION	AF (Africa) AS (Asia/without India)	0,01116 0,05580

	EU (Europe)	0,18973
	IN (India)	0,36830
	LA (Latin America)	0,05804
	NA (North America)	0,31696
LVL_EDUC	2 Some College	0,05416
	3 2-Year College (Associates)	0,02515
	4 4-Year College (BA,BS)	0,36557
	5 Master's Degree	0,50677
	6 Doctoral Degree	0,01934
	7 Professional Degree(MD,JD)	0,02128
SOFT_EX	1 - less than 2 years	0,10491
	2 - 2-5 years	0,33036
	3 - 6-10 years	0,39286
	4 - 11-15 years	0,09152
	5 - more than 15 years	0,08036
PRO_FIELD	CIT – CS and IT	0,83259
	ENG - Engineering	0,09375
	Other	0,01786
	SC - science	0,05580
EMP_PRIM	EQ - Equipment	0,07353
	HW – Computer hardware	0,15196
	NS – Not specified	0,01471
	SE - Services	0,10539
	SW - Software	0,60539
	UR – University, Education	0,04902
JOB_FUNC	EDUC - Education /Teaching	0,04241
	ENG - Engineering	0,08036
	MGM - Management	0,08259
	NS - Not specified	0,01116
	SCI - Science	0,08036
	SWDD - Software Design/Dev	0,70313
FOLLOW_TRENDS	0 (No)	0,22768
	1 (Yes)	0,77232
SEARCH_FOR	0 (No)	0,59152
	1 (Yes)	0,40848
PROVE_MY	0 (No)	0,68973
	1 (Yes)	0,31027
SHARE_KN	0 (No)	0,27232
	1 (Yes)	0,72768
COMM_AVE	1 (min) – 5 (max)	3,29 ± 0,83
KL_PER	1 (min) – 5 (max)	2,18 ± 1,04
LEVL_OTH	1 (min) – 5 (max)	2,53 ± 0,55
GAIN_INT	0 (min) – 1 (max)	0,75 ± 0,29
GAIN_LOC	0 (min) – 1 (max)	0,43 ± 0,44
GAIN_SEM	0 (min) – 1 (max)	0,25 ± 0,33
GAIN_SL	0 (min) – 1 (max)	0,7 ± 0,35
GAIN_LIB	0 (min) – 1 (max)	0,21 ± 0,41
GAIN_TOT	1 (min) – 5 (max)	3,18 ± 0,70

In the second part of the questionnaire, group members were asked about the culture of knowledge sharing, motives for knowledge sharing, communication channels and barriers to the communication.

When asked about motives for knowledge sharing, respondents expressed two most influential motivators: monitoring trends and knowledge sharing. Respondents stated that the acceptance of their knowledge and experience played an important part in communication with other members of the group. They also expressed their perception of knowledge of other group members. Most of them ranked other members as possessing above average knowledge.

When analysing the answers regarding climate and communication in the group we can conclude that there is a high awareness of knowledge sharing.

Communication in the group is "one to many". Respondents positively evaluated the accessibility of the group's shared pool of knowledge, good communication, and enthusiasm of the group members and help in solving problems.

Third part of the questionnaire was focused on two basic skills that are needed in the development of application programs. The main conclusion drawn from the analysis of this part of the questionnaire is: Internet is the first stop when in search for knowledge.

Furthermore, respondents ranked their knowledge contribution to the group. The entire population has an average level of knowledge gained in the design of application programs. Group members gain a part of the rest of member's knowledge, which directly contributes to the personal knowledge of each member. The following table gives descriptive statistics for variables included in the decision tree model.

4 Research methodology

Previous research studies engaged in identifying principles in knowledge sharing process have used traditional methods such as descriptive statistics (e.g. Dahl and Pedersen, 2004.), correlation analysis (Michailova and Minbaeva, 2012) and regression analysis (Yang, 2008, Michailova and Minbaeva, 2012). In both regression models, coefficient of determination R^2 (R squared) was used as an indicator of success. Coefficient of determination R^2 is a measure of the proportion of the total variance explained by the fitting model. Yang presented a model of individual attitudes and organisational knowledge sharing with R^2 value of 0,54 (Yang, 2008), whereas Michailova and Minbaeva achieved R^2 of 0,22 for their model of organizational values and knowledge sharing (Michailova and Minbaeva, 2012.). This paper seeks to achieve more reliable models and get better explanation of knowledge sharing process by applying decision trees.

4.1 Decision tree modelling

Decision trees are very powerful and popular techniques for modelling classification and prediction problems. The attractiveness of decision trees lies in the fact that they offer data models in a 'readable', comprehensible form.

Decision trees are models based on a recursive partition method. Their goal is to divide the data set using a single variable at each level (Mantas and Abellan, 2014.). Their knowledge representation has a simple tree structure. It can be interpreted as a compact set of rules in which each tree node is labelled with an attribute variable that produces branches for each value. Decision trees are built using a set of data referred to as the training data set. A different set, called the test data set, is used to check the model. When we obtain a new sample or instance of the test data set, we can make a decision or prediction on the state of the class variable by following the path in the tree from the root to a leaf node, using the sample values and tree structure (Mantas and Abellan, 2014).

Data is partitioned according to a relationship between the dependent and independent variable values, creating a tree of partitions. Sets of cuts or groupings of independent variables that best predict a dependant variable are then found. This is achieved by exhaustively searching all possible cuts or groupings. These splits (or partitions) of data are done recursively forming a tree of decision rules until the desired fit is reached. This is a powerful platform, because it chooses the optimal splits from a large number of possible splits. A precise mathematical description of the algorithm can be found in SAS JMP 11 help.

In order to determine the explanatory power of the model, coefficient of determination R^2 was used: larger value of R^2 indicates better explanatory power (Wixom and Watson, 2001.).

In our analysis, the SAS JMP 11 data mining tool was used, and algorithms applied in this analysis are described in the tool's manual, so we will only mention parameters of analysis.

This study hypothesizes that the differences in benefits of knowledge sharing between social network members exists due to their socio-demographic and professional characteristics and behaviour, the perception of level of knowledge they possess and sources of their knowledge.

According to the model described in the table 1, and shown in the figure 1, a decision tree to predict total social network member gain (benefits) from knowledge sharing was

developed by total gain (GAIN_TOT) as a dependent variable and 19 characteristics as predictor variables. By using a decision tree, it is possible to examine the relationship among variables and to pick the most important variables for predicting a knowledge gain, because these variables are chosen for splitting high in the tree. N=448 valid responses were applied to train the decision tree.

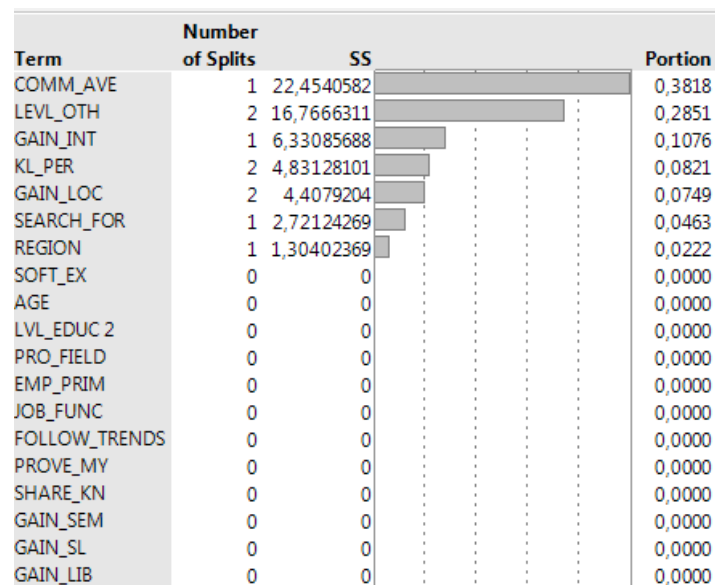


Figure 2. Variable contribution in decision tree model

The analysis shows that in the decision tree model, by far the most important variable is COMM_AVE (average communication in social group), followed by: LEVL_OTH (knowledge level of others), GAIN_INT (knowledge gain through internet) and KL_PER (perception of personal knowledge).

The following are the rules extracted from the decision tree with the aim to explain the profiles of social network members with the highest and the lowest benefits of knowledge sharing. The rules of the tree are formed as:

If A then GAIN_TOT (R).

This means that the samples which satisfy condition A, have total gain of R.

Here we list the main rules of the tree, sorted in a descending order by knowledge gain.

Leaf Label	Mean	Count
COMM_AVE>=3,75&LEVL_OTH>=3,25	4,29333333	15
COMM_AVE<3,75&GAIN_INT>=1&LEVL_OTH>=3&KL_PER<25	3,59090909	11
COMM_AVE<3,75&GAIN_INT<1&SEARCH_FOR(0)&GAIN_LOC<1&GAIN_LOC>=0,5	3,45833333	12
COMM_AVE<3,75&GAIN_INT<1&SEARCH_FOR(1)	3,41724138	29
COMM_AVE>=3,75&LEVL_OTH<3,25	3,40681818	88
COMM_AVE<3,75&GAIN_INT<1&SEARCH_FOR(0)&GAIN_LOC<1&GAIN_LOC<0,5&KL_PER<1,5	3,3	21
COMM_AVE<3,75&GAIN_INT>=1&LEVL_OTH>=3&KL_PER>=2,5®ION(IN, EU)	3,16111111	18
COMM_AVE<3,75&GAIN_INT<1&SEARCH_FOR(0)&GAIN_LOC<1&GAIN_LOC<0,5&KL_PER>=1,5	2,8	10
COMM_AVE<3,75&GAIN_INT>=1&LEVL_OTH>=3&KL_PER>=2,5®ION(AS, NA)	2,76875	16
COMM_AVE<3,75&GAIN_INT<1&SEARCH_FOR(0)&GAIN_LOC>=1	2,76153846	26
COMM_AVE<3,75&GAIN_INT>=1&LEVL_OTH<3	2,64230769	78

Figure 3. Rules extracted from the tree, describing GAIN_TOT as a function of input variables.

According to the above rules, we can see COMM_AVE, LEVL_OTH, and KL_PER are the most powerful variables. COMM_AVE reflects average intensity of communication in social group. The higher this value, the more probable higher value of total gain of shared knowledge. LEVL_OTH is the perceived level of knowledge of other members of social group. The benefit of each member of a professional group depends on the knowledge which is in the group. KL_PER indicates personal knowledge level.

The decision tree model indicates the profile of the social network participant with a higher knowledge gain (GAIN_TOT = 4,29) thus: a participant who communicates very often (COMM_AVE > 3,75), perceives knowledge shared by others in the network as high quality knowledge (LVL_OTH >= 3,25). The profile of the social network participant with the lowest gain is as follows: low level of communication with others, use of other knowledge sources (Internet) and low perceived knowledge in the group (LVL_OTH < 3) and according to that, no need to use the social group as source of knowledge (GAIN_TOT = 2,64).

Most of these rules are consistent with fact. The model reflects real professional knowledge sharing process objectively. These results will not only help individuals to improve their knowledge through communication in a social group but also develop company strategies. For example, an organization knows those individuals using intensively social group for communication with groups or individuals of high level of knowledge will help them improve their business. The rules also tell us that the more other sources the social network member uses, the less willing he is to seek and give knowledge in a social group.

Table3. Model verification

	RSquare	RMSE	N	Number of Splits	AICc
Training	0.414	0.5073958	324	10	504.831
Validation	0.342	0.584507	124		

The best model based on the decision tree is the model with reliability of 0.414 for training data, and 0.342 for validation data. It indicates that 41.4% of the variability is explained by the model.

4.2. Linear regression

Conducting a sensitivity analysis and an analysis of significance of variables enables further enhancement of both models in a way that would only conserve significant variables, and leave out the less significant. Thus, linear regression is performed on significant variables to identify direction and intensity of their relationship with gained knowledge.

Linear regression, which is a widely used statistical modelling technique, could be used to build a model with a continuous outcome and has been proven as a powerful algorithm (Lee et al., 2006). In order to find the power of different variables, we build models with 8 most important (continuous!) variables from the decision tree model.

We build a model with most significant variables to examine the power of a different kind of information. The result of the model is displayed in Table 2. Beginning with the univariate analysis for each of the predictor variables, table 4 shows the statistics and the corresponding *p*-values of the likelihood ratio tests for each predictor variable.

Due to their very low *p*-values, the variables COMM_AVE and LEVL_OTH were recognized as variables with the greatest weight effect on the output variable in the model. Furthermore, there were significant differences in the knowledge gain between the social network member persistor for the variable SOFT_NUM, KL_PER, GAIN_SEM and GAIN_INT at the 0.05 significance level.

Table 4. Regression analysis results

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	1.4399959	0.178535	8.07	<.0001*
COMM_AVE	0.3324329	0.032976	10.08	<.0001*
KL_PER	-0.06162	0.027702	-2.22	0.0266*
LEVL_OTH	0.3817212	0.050151	7.61	<.0001*
GAIN_INT	-0.300292	0.058876	-3.20	0.0015*
GAIN_LOC	0.0446043	0.068545	0.70	0.4831

The selected variables have shown that the socio-demographic information makes little contribution to knowledge prediction. The behaviour information, the knowledge source and the knowledge level information work very well in the model.

Since the values of variables are not normalized we cannot make conclusions about differences in weight of the impact, although we can see direction of the impact. Variables COMM_AVE, LEVL_OTH and SOFT_NUM have a positive impact on knowledge gain, whereas KL_PER, GAIN_SEM and GAIN_INT have a negative effect on knowledge gain.

At the 0.05 significance level, variables from every group identified in our research model were not dropped without sacrificing a significant amount of variance explained by the model.

4.3. Results discussion

Participant's openness to experience and willingness to communicate was found to be positively related to an individuals' knowledge gain. These participants are more likely to use knowledge sharing as an opportunity to deepen their own understanding and find a better way to organize and explain the knowledge before they share it. Results suggest that individuals with high ratings in openness and frequency of communication with other members of group tend to have a high level of motivation resulting in knowledge benefits.

The fact that the variable concerning prior software experience of the social group member, SOFT_NUM, has a positive influence on knowledge gain, corresponds to the fact that employees with longer work experience and higher number of projects are more likely to share their expertise, have positive attitudes toward sharing and have more benefits from it. Individuals with higher absorptive capacity are more likely to experience the benefits of knowledge sharing resulting in more positive attitudes toward knowledge sharing.

Different sources of knowledge have been suggested to be related to knowledge sharing. Results of our research indicated that both seminars and self-learning contribute negatively to knowledge gain in communication in a social group. The extent to which an individual uses different types of channels to learn and obtain knowledge contributes to the extent to which an individual gains knowledge. The abundance of sources for

knowledge gain, as competitive sources of knowledge, has a negative influence on an individual's benefit from knowledge sharing.

Furthermore, the variable that indicates perception of personal knowledge level was shown to be important. Perceived knowledge level is important because social network member`s level of knowledge is influenced by the extent to which knowledge sharing occurs between members.

The benefit of each member of a professional group depends on perception of the quality of knowledge that is contained in the group. Perceptions of the quality of their personal knowledge and the intensity of use of other, competing sources of knowledge, negatively affect knowledge gain. Thereby, the benefit it is not only in the accumulated knowledge, but also in improving other competencies of group members and usefulness for business. The above stated benefits significantly distinguish them from other sources of knowledge on the internet (articles, encyclopaedias).

Although there has been only a small number of cross-cultural studies conducted to date, the results suggest that we need to pay close attention to cultural characteristics in knowledge sharing practices that will facilitate knowledge flow, i.e., there is not a single, universal set of practices that can be used to facilitate knowledge sharing in global. For example, we need to make adjustments to the type of incentives provided to fit the cultural contexts (Voelpel et al. 2005). Contrary to that research, the variable in our model, which indicates affiliation to certain region (Europe, United States of America, India, and others), was revealed as not significant for knowledge gain. We can conclude that globalization has been achieved and there are not any great differences, detected by our model, regarding the way the process of knowledge sharing works and the total gain from professional social network among different regions.

7 Conclusion

In this paper, we have addressed the issue of knowledge gain and knowledge flow in social networks in a novel manner. Our study focuses on the factors affecting total gain in a social group within a global professional social network. We developed a decision tree model for predicting whether or not benefits from knowledge sharing would be successful for a specific type of participant. The prediction accuracy and reliability of the suggested model was found to be on a high level, which brings us to conclude that the decision tree is quite a valuable approach. Furthermore, linear regression was performed with the aim

to identify which of the variables identified as important in the decision tree affect knowledge gain positively and which ones affect it negatively.

This study is one of the first empirical investigations that deal with knowledge and total gain in the knowledge sharing process. It is also the preliminary study investigating the success of data mining methods in this field. Hence, this study provides several meaningful insights into the characteristics that increase the gain in knowledge sharing in professional social networks. The results show that communication frequency, perceived quality of group knowledge and participants experiences are key factors for knowledge gain to be achieved. Besides the above three factors, sources of knowledge (e.g. seminars, self-learning from different sources) and perception of own level of knowledge are also factors that are selected as criteria when determining benefits. The findings provide a guide for those who want to gain knowledge in social network group. Besides, decision tree model is suggested from the findings and can be used for predicting knowledge gain.

The information provided in this paper is significant in that it gives researchers and online service providers a better understanding of knowledge sharing process in professional social networks and benefits it produces.

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APPENDIX

Table A. Questionnaire used to collect data.

Question	Answer	Code
Age		AGE
Region		REGION
What is the highest level of education you have completed? (optional)		LVL_EDUC
<i>Professional Field</i>		PRO_FIELD
<i>My employer's primary line of business is</i>		EMP_PRIM
<i>My principal job function is</i>		JOB_FUNC
<i>My principal responsibility is</i>		PRIN_RESPON
<i>My title of current position is</i>		CURR_POS
<i>I am a member of the following group/s (multiple answers possible)</i>	<i>J Architect</i>	<i>J_ARHI</i>
	<i>Java Developers</i>	<i>JAVA_DEV</i>
	<i>Java EE Professionals</i>	<i>JAVA_EE</i>
	<i>Java Enthusiasts</i>	<i>JAVA_ENTH</i>
<i>I am interested to be a member because the group/s allow(s) me to (multiple answers possible)</i>	<i>Follow new trends</i>	<i>FOLLOW_TRENDS</i>
	<i>Search for a job</i>	<i>SEARCH_FOR</i>
	<i>To prove myself</i>	<i>PROVE_MY</i>
	<i>Share knowledge</i>	<i>SHARE_KN</i>
<i>With other members of group/s (multiple answers possible)</i>	<i>I share knowledge</i>	<i>SHARE_KNOW</i>
	<i>I only answer to their questions</i>	<i>ANSW_Q</i>
	<i>I only ask questions (in Q&A part)</i>	<i>ASK_Q</i>
	<i>I don't share knowledge</i>	<i>DONT_SHARE</i>
	<i>I invite people to comment on topic that interests me (post to group)</i>	<i>INVITE_COMM</i>
<i>In my group/s I communicate with others through</i>	<i>Questions & Answers part</i>	<i>QA_PART1</i>

<i>(multiple answers possible)</i>	<i>Instant messaging</i>	<i>IM</i>
	<i>Outside group through private mail</i>	<i>MAIL</i>
	<i>Discussions</i>	<i>DISCUSS</i>
<i>How often do you communicate with other group members via Questions & Answers, Instant messages or Email</i>	<i>Questions & Answers</i>	<i>QA_PART2</i>
	<i>Instant messages</i>	<i>IM2</i>
	<i>Email</i>	<i>MAIL2</i>
	<i>Discussions</i>	<i>DISCUSS2</i>
<i>In my opinion, other group members have</i>	<i>Experience</i>	<i>EXPER3</i>
	<i>Knowledge</i>	<i>KNOW3</i>
<i>Which obstacles did you notice in communication with group/s members (multiple answers possible)</i>	<i>Lack of Knowledge</i>	<i>LACK_KNOW</i>
	<i>Lack of Experience</i>	<i>LACK_EXP</i>
	<i>Lack of Interest</i>	<i>LACK_INTR</i>
<i>What are good sides of communication with other group/s members (multiple answers possible)</i>	<i>Easy communication</i>	<i>EASY_COMM</i>
	<i>Accessibility</i>	<i>ACESSIB</i>
<i>Were You involved in any software project (one answer possible)</i>		<i>SOFT_PROJ</i>
<i>How many years of experience have you in software development</i>		<i>SOFT_EX</i>
<i>In how many software projects were you involved</i>		<i>SOFT_NUM</i>
<i>When you were involved in a software project you have noticed GAPS in or LACK OF</i>	<i>SOFTWARE DESIGN knowledge</i>	<i>GAPS_SDK</i>
	<i>SOFTWARE PROJECT MANAGEMENT knowledge</i>	<i>GAPS_SPMK</i>
<i>What knowledge by your opinion is important in a software project</i>	<i>SOFTWARE DESIGN knowledge</i>	<i>IMPORT_SDK</i>
	<i>SOFTWARE PROJECT MANAGEMENT knowledge</i>	<i>IMPORT_SPMK</i>
<i>How would you assess your knowledge level</i>	<i>SOFTWARE DESIGN knowledge</i>	<i>KL_SDK</i>
	<i>SOFTWARE PROJECT MANAGEMENT knowledge</i>	<i>KL_SPMK</i>

<i>How would you assess knowledge level of other group members</i>	<i>SOFTWARE DESIGN knowledge</i>	<i>LEVL_SDK</i>
	<i>SOFTWARE PROJECT MANAGEMENT knowledge</i>	<i>LEVL_SPMK</i>
<i>Where did you gain SOFTWARE DESIGN knowledge (multiple answers possible)</i>	<i>Internet</i>	<i>GAIN_SDK_INT</i>
	<i>Local company</i>	<i>GAIN_SDK_LOC</i>
	<i>Self-learning or learning by doing</i>	<i>GAIN_SDK_SL</i>
	<i>Software seminars (organized)</i>	<i>GAIN_SDK_SEM</i>
<i>Where did you gain SOFTWARE PROJECT MANAGEMENT knowledge (multiple answers possible)</i>	<i>Internet</i>	<i>GAIN_SPMK_INT</i>
	<i>Local company</i>	<i>GAIN_SPMK_LOC</i>
	<i>Self-learning or learning by doing</i>	<i>GAIN_SPMK_SL</i>
	<i>Seminar (organized)</i>	<i>GAIN_SPMK_SEM</i>
<i>When wanting to gain knowledge required for software projects you usually go to</i>	<i>Internet</i>	<i>WHERE_GAIN_INT</i>
	<i>Library</i>	<i>WHERE_GAIN_LIB</i>
	<i>Learn at home/at work</i>	<i>WHERE_GAIN_HOM</i>
	<i>Special trainings or seminars</i>	<i>WHERE_GAIN_SEM</i>
<i>Due to your membership in group/s you have gained more</i>	<i>SOFTWARE DESIGN knowledge</i>	<i>GAIN_SDK</i>
	<i>SOFTWARE PROJECT MANAGEMENT knowledge</i>	<i>GAIN_SPMK</i>
<i>Membership in group/s</i>	<i>helped me solve problems</i>	<i>MEMB_PROBL</i>
	<i>enabled me to accomplish tasks more quickly</i>	<i>MEMB_QUICK</i>
	<i>improved my job performance</i>	<i>MEMB_PERF</i>
	<i>is useful in my job overall</i>	<i>MEMB_USEF</i>
	<i>enabled me to react more quickly to changes in business</i>	<i>MEMB_REACT</i>
	<i>improved decision making</i>	<i>MEMB_DECS</i>
<i>Are You willing to learn more (one answer possible)</i>		<i>LEARN_MORE</i>

Characterizing collaborative organization models in the tourism sector

Salvatore Ammirato, Alberto Michele Felicetti *,
Marco Della Gala

Department of Mechanical, Energy and Management Engineering,
University of Calabria
via P. Bucci, 42/C, 87036 Rende (CS), ITALY

* *Corresponding author*

Structured Abstract

Purpose Tourism is one of the largest industries in the world subject to strong innovations in the last years essentially due to globalization and availability of new ICTs. In a tourism destination operate autonomous entities whose business is related to the sector and whose aim is the tourism destination growth. We introduce the *Collaborative Network Organization (CNO)* model to reach both competitiveness for the destination and sustainable development for the territory and local operators. In particular, we propose:

- a model to highlight forms of collaboration in the tourism sector;
- a characterization of supporting ICT services and mobile applications.

Design/methodology/approach – After identified two kinds of short term CNOs in a Tourism Destination: the *TEE -Tourism Extended Enterprise*, and the *TVO - Tourism Virtual Organization*, we use a methodology made of 3 steps:

- Characterization of the CNOs in a TBE: the TEE and TVO models;
- modelling the coalition's types that can be recognized within a CNO on the basis of the different levels of integration among members
- characterization of the ICTs that support each coalition type, with a focus on different functional classes of networking information services and mobile applications that are currently adopted in a CNOs

Originality/value – Scholars approach the issue of collaboration in tourism from different points of view: social benefits and sustainable development (Graci, 2013; Jamal and Stronza, 2009), organizational supports for collaboration (March & Wilkinson, 2009), characteristics of ICTs tools (Buhalis & Law, 2008; Zach et al., 2008; Ndou & Petti, 2007). The originality of this study consists in composing different perspectives in literature to propose an original framework to characterize forms of CNOs in tourism, taking into account the effects of ICT in reengineering the sector.

Practical implications – First results of the study highlights the importance of setting CNOs within a tourism destination in order both to answer to the new demand of personalized tourism, and to give local tourism players an opportunity to reach economy of scale, competitiveness and sustainable development in the effort to overcome limits of

touristic organization's size and contrast big players power. The original framework we propose aims to support the operationalization of the collaboration concept in the tourism sector and the setting up of CNOs in a tourism destination at different level of collaboration

Keywords – Tourism breeding environment, Collaborative Networks, Tourism Extended Enterprise, Tourism Virtual Organization, ICT.

Paper type – Academic Research Paper

1 Introduction

Tourism is one of the largest industries in the world subject to strong innovations in the last years (Craig Wight, 2013; Wan Lee & Brahmasrene, 2013; Mihajlović, 2012). Main changes are due to the availability of new technologies and in particular to the spreading of the mobile ones, which directly connect tourists among them and with service providers, and to the always more personalized supply of tourism experience (Polo Peña et al., 2013; Buhalis & Law, 2008; Zanker et al., 2008).

Since nineties, several case studies and conceptual models highlight the increasing importance of partnerships in many industrial sectors, assessing new organizational forms and identifying key factors in successfully initiating of sustainable development (Volpentesta & Ammirato, 2013; Lerro & Schiuma, 2009; Romero et al., 2009).

Scholars highlight that such innovations can be exploited as drivers of development by local tourism operators only if they are able to reorganize the tourism offer around structured patterns of collaboration (Erkus-Otzurk & Eraydin, 2010; Jackson & Murphy, 2006; Plummer et al., 2006). In the tourism sector, the diffusion of collaborative network models is often related to the marketing of alternative forms of tourism experiences (Cabiddu et al., 2013; Vainikka, 2013; Wang & Fesenmaier, 2007; Selin & Myers, 1998). In many regions characterized by niche tourism vocation (e.g.: historical, business, sport, cultural, rural, religious etc.), or localized in developing countries, or simply where some organizations decided to create “alternative” development paths, local tourism operators have started organizing themselves spontaneously in tourism networks in order to create aggregate tourism offers able to compete with big tourism operators thus transforming regions with potential and vocation in real tourism destinations (Robinson et al., 2013; Brown, 2010; Gursoy et al., 2010).

Recent years have been characterized by an extensive transformation of the tourism sector, due also to evolution in ICT industry (Ndou and Petti 2007). In fact, ICTs have

innovated considerably Tourism Sector in operational workflows, management and marketing of tourism packages and new paradigms in tourism experiences (Polo Peña, Frías Jamilena and Rodríguez Molina 2013). From the business side, ICTs provide significant opportunities for internal business process re-engineering (back-office systems, reservation systems, etc.) and e-business (B2B and B2C), at the company level, while, at the supply chains level, ICTs allow communication and information exchange with partners, integration of information flows from a wide spectrum of suppliers, and new patterns for the customer care (Stamboulis and Skayannis 2003). Changes are also evident at the industry level; indeed the Internet is changing the tourism industry structure by altering barriers to entry, minimizing switching costs, revolutionizing distribution channels, facilitating price transparency and competition, as well as enhancing production efficiency (Mills and Law 2004). From the tourist side, the breakdown of geographical and cultural barriers is a result of international cooperation/exchange agreements and fast advances in transportation and electronic communication. New and cheap transportation marketing policies, reductions in custom duties and on limitations to cross-countries tourism, allow people to easy consuming tourism products (Cabiddu, Tsz-Wai and Piccoli 2013). E-commerce developments enable tourist to interact directly with tourism services providers, allowing travelers to retrieve reliable and accurate information in a fraction of the time, cost and inconvenience required by traditional tools, moreover disintermediating players of tourism market such as travel agencies and tour operators (O'Connor 1999) (Mihajlović 2012). Tourists are becoming increasingly selective using the web to choose tourist operators offering services that more closely match their needs. Furthermore, the customer insights and reviews, provided by people through social media, represent important sources of information for travelers in helping choose tourism services (Volpentesta and Felicetti 2012).

In this paper, we propose an original cross-sector analysis of the scientific literature on the topics of sustainable tourism, organizational models for sustainability and ICT evolution in order to introduce:

- a model to highlight forms of collaboration in the tourism sector;
- a characterization of supporting ICT services and mobile applications.

The paper is organized as follows. In section two, a characterization of the typologies of collaborative networks within a tourism destination is proposed followed, in section 4, by a discussion about the evolution of ICT for tourism sector. A classification of the different

levels of integration among networked members of a tourism destination and supporting ICT is presented in section 5. Section 6 holds the conclusion of the study.

2 Collaborative Networks in a tourism destination

In a tourism destination, live and operate autonomous entities whose business is related to the sector. While these entities can be heterogeneous in terms of their operating environment, culture and goals, they all aim to achieve the common goal of local tourism development and to increase the general competitiveness respect to other geographical areas and global competition (Akoumianakis, 2014).

The service providers operating in a tourism destination can be grouped into the following categories:

- *Hospitality Services Enterprises*: companies that offer overnight accommodation (e.g. hotels, B&B) and meal provision (e.g. restaurant).
- *Transportation Services providers*: public and private companies that provide services of people transportation (i.e. buses, taxis, airplanes, trains, etc).
- *Event Management Services*: public and private companies dealing with the organization of events (e.g.: conferences, concerts, exhibitions, sport events).
- *Tourism complementary goods and services providers*: e.g. local shops, museums, excursion services, sport & leisure facilities, handicrafts.
- *Destination Marketing Organizations*: that promote incoming tourism and Tour operators that purchase/book services to combine and resell them.

When some of the service providers decide to reinforce collaboration, they can set stable agreements in the forms of Touristic Associations or Touristic Districts, adhering to a base long term cooperation agreement, and adopting common operating principles and infrastructures. Each agreement is characterized by an own organizational form in terms of structure of membership, activities, definition of roles of the participants, governance principles and rules (Ammirato and Felicetti, 2014). We name each of such agreements as a ***Tourism Breeding Environment (TBE)*** (Zach et al., 2008) i.e. a Breeding Environment in tourism sector whose members share values, culture and infrastructures and have the potential and the will to cooperate in order to pursue the general long-term objectives of territory development and competitiveness (Volpentesta et al., 2013). In a TBE, each member competes with the others and with players outside the TBE in searching for new business opportunities in the global market. When a business opportunity is identified, a

subset of the TBE members can be rapidly selected to become part of a short term *Collaborative Networked Organizations, CNOs*, oriented to catch the opportunity. Two kinds of short term CNOs are most evident in a TBE:

- ***Tourism Extended Enterprise (TEE)***: it refers to a tourism operator that “extends” its business boundaries by involving all or some of its suppliers in the product packaging and delivery in order to offer customers possibilities to a more complete tourism experience.
- ***Tourism Virtual Organization (TVO)***: It represents a temporary alliance of private and public organizations that come together to share skills or core competencies and resources in order to better respond to business opportunities, and whose collaboration is supported by computer networks. A TVO is established in a short time to respond to a competitive market opportunity; it has a short life cycle dissolving when the short-term purpose of the TVO is accomplished (Volpentesta and Ammirato, 2013). ICT advances enable tourists in customizing services on the basis of their own specific tastes (Ammirato 2010). Availability of systems for tourism packaging enable tourist to (self) compose a personalized tourism product choosing a subset of services provided by TBE members.

3 The ICT revolution and the *augmented tourism experience*

The rise and diffusion of CN models all around the world is strictly related to the availability of networking ICT, web based and mobile, which enable operators to develop original ways to manage the tourism supply chains, the destination marketing and relations with customers. Actually, ICTs have been transforming tourism globally; their developments have undoubtedly changed both business practices and strategies as well as industry structures (M. E. Porter 2001). E-tourism is part of the electronic trade, which encompasses the fastest developing technologies, such as communication and information industry, hospitality and management/marketing of strategic planning industry. The specific activities of e-tourism must rely on tourism operators, tourism agencies and other organisms directly interested in virtual tourism using a specialized website. The e-tourism concept includes all business functions (i.e., e-commerce, e-marketing, efinance and e-accounting, eHRM, e-procurement, eR&D, e-production) as well as e-strategy, e-planning and e-management for all sectors of the tourism industry, including tourism, travel, transport, leisure, hospitality, principals, intermediaries and public sector organisations.

Hence, e-tourism bundles together three distinctive disciplines: business management, information systems and management, and tourism (Buhalis and Law, 2008).

From a business perspective, since the mid-nineties, the tourism sector adopted the Internet as a advertising medium as well as new distribution channel, providing the basis for the development of new systems linking consumers and CRSs/GDSs, leading to a lowering of entry barriers (Werthner Klein, 1999). ICTs improved the efficiency and effectiveness of tourism organizations and the way to manage businesses within the marketplace, as well as how consumers interact with broker organizations (Buhalis and Law, 2008), facilitating operations, business transaction and networking with partners among operators in the tourism industry (Hjalager, 2010).

From a tourist perspective, e-tourism provides specialized websites and software applications able to reduce time and costs of the tourist preparatory activities, making easier the process of booking or renting a car or help planning the trip and making a decision. Tools such as fare aggregators and meta search engines, enabling users to compare prices, further transformed the role of ICTs in Tourism (Kracht and Wang, 2010). The emergence of social networking platforms have profoundly influenced the way tourist interact with other tourists. The "social web environment" enables new mechanisms of interaction, cooperation and "social experience" among tourists (Volpentesta and Felicetti, 2012), fostering the spread of electronic word-of-mouth communication, opinions about places, services and tourism operators. The possibility to taste in advance a trip (thanks to videos, photos, opinions and storytelling of other users), the opportunity to compare thousands of offers from around the world, the immediate delivery of a set of tourism services (e.g. reservation or booking, payment, etc...) are among the features that make the Internet&tourism an absolutely winning combination.

The provision of new informative services supporting all tourist activities, always available through mobile technologies, made the conventional tourism experience enriched in each phase of it. Given its suitability with ICT, tourism has emerged as one of the most well suited sectors for mobile applications. Today's tourists expect to get personalized access to tourism information at anytime, from anywhere with any media. Mobile technologies have challenged existing theoretical frames of information access and use by transforming the spatial and temporal context by providing users with an ubiquitous access. Ubiquity offers new opportunities and challenges in terms of *time-aware*, *location-aware*, *device-aware* and *personalized services* which can be achieved by

using *customization*, i.e., adapting an application towards the current context (Schwinger, et al. 2005). Mobile applications are capable of enhancing the tourist experience at every stage of the tourism experience life cycle, creating a paradigm shift in how information is accessed and digested, and transactions performed. (Karanasios, Burgess e Sellitto 2011). Travel mobile applications are the seventh most popular category of apps being downloaded. According to TripAdvisor, 60 percent of smart phone users have downloaded travel apps and of those individuals, 45 percent plan to use the apps in the firsts phases of the tourism experience life cycle for research and travel planning. Furthermore, 55 percent of travel apps are purchased within 3 days of travel or while travellers are at the destination, which helps demonstrate how important mobile apps are in influencing tourists' decision-making along all the tourism experience life cycle. (Kennedy-Eden e Gretzel 2012). We can name this paradigm shift as *augmented tourism experience*.

4 Levels of collaboration in a Tourism Breeding Environment

Tourism operators may interact in different way in a TBE. Four coalition's types can be recognized within a TBE, each of them represents a different level of integration among considered groups of actors: *networking*, *coordination*, *cooperation*, *collaboration*; "as we move along the continuum from networking to collaboration, we increase the amounts of common goal-oriented risk taking, commitment, and resources that participants must invest into the joint endeavor" (Camarinha-Matos and Afsarmanesh, 2006). In what follows we propose the four levels highlighting, for each of them, goals and characteristics of interactions and of supporting technologies.

Level 1 - Networking. It involves communication and information exchange for mutual benefit of TBE. Each TBE actor involved in the relationship can benefit from the information shared but there is not necessarily a common goal influencing individual contributions as well as there is no common generation of value. At this level, it's not possible to highlight the presence of CNOs within the TBE. A TBE offer to each tourism operator a way to grasp opportunities that current demand of tourist flows is producing. In particular, individual actors may benefits from integrate communication and promotion activities performed by the TBE. It represents a local brand that propose a diversified tourism offer, contributing to local tourism development and to increase the local

competitiveness respect to other geographical areas. This is the case of a Touristic Associations that aim to promote tourism activities in a specific territory and offer to tourism operator a “showcase” in order to promote their own services. While a TBE promotes a common brand, a slogan, a symbol, etc., individual operators are responsible for the accuracy and the correctness of the information provided about offered services.

At Networking level, it is possible to identify a set of ICT solutions representing a valid support for promoting a tourist destination and give the right services to customers for an authentic augmented tourism experience:

- *Inspiration Portals*: websites promoting the sharing of multimedia content among users by allowing them to get a preview of territories, places, cultures and type of vacation that will inspire potential tourists.
- *Tourism services comparators*: web portals that allow travelers to compare tourism services offered by different providers. Travelers have the possibility to compare services providers and chose the offer that best suits their needs.
- *Tourism social networks*: collection of individuals who share information, opinions and contents about tourism in an online setting over the internet.
- *Mobile and immersive technologies*: technologies that harness the potential of mobile devices to provide information, geolocation, and augmented reality services; information about the surrounding real world becomes interactive and digitally manipulable.

Level 2 - Coordination. In addition to communication and information exchange, more organizational commitment is evident at this level. Coordination involves aligning/altering activities so that more efficient results are achieved; nevertheless each networks member might have a different goal and use its own resources. At the coordination level, ICTs are intended to support automation of inter-organizational business process. In addition to the tools typical of the networking level, at this level technologies need to support tourist to take advantage of integrated offerings. Examples of such technologies are the *Destination Management Systems (DMSs)*, i.e. systems that gather into a single portal a variety of tourism services provided by heterogeneous tourism operators and related to a specific geographical area. DMS attempt to utilize a customer centric approach in order to manage and market the destination providing strong destination related information, real-time reservations, destination management tools and paying particular attention to supporting small and independent tourism suppliers.

Level 3 - Cooperation. In addition to level 2, it involves knowledge and resources' sharing for achieving compatible goals of TBE. In this case the aggregated value is the result of the addition of individual "components" of value generated by the various participants in a quasi-independent manner. A common plan exists which in most cases is not defined jointly but rather designed by a single entity. Participants' goals are compatible in the sense that their results can be added or composed in a value chain leading to the end-product or service. At this level it is desirable to use web and mobile based systems which enable consumers to build their own tourism package made of flights, accommodation, and other tourism services instead of purchasing a predefined package from a catalogue. This kind of technologies are known as *Tourism Dynamic Packaging Systems, TDPS*, whose characteristics are: full automation through online applications; real-time update of travel product information; single price for an entire tourism package. From a process automation point of view, distributed business processes management tools are required in order to allow integration and communication processes between individual information systems adopted by tourism each operator.

Level 4 - Collaboration. At this level, all entities share information, knowledge, resources and responsibilities to jointly plan, implement and evaluate a program of activities to achieve a common goal. It implies sharing risks, resources, responsibilities, and rewards. Tourist operators committed in collective decision process have common values and visions. The TVO becomes a self-organizing system with global properties that cannot be predicted from the properties of the economic actors who are directly involved in it. At this level the inter-organization process planning and management regards many operative and supporting processes which are managed in a common way. The CNOs can be supported by a form of *Enterprise Resource Planning* technologies for tourism networked organizations also known as a *Cloud-Based Business Network* that connects and coordinates the ERP of each networked tourism operator on a common platform.

5 Conclusions

The importance of setting a TBE is related both to the necessity to answer to the request of personalized tourism offer, in line with the new demand trends, and to the possibility to give sustainable development to local tourism players in the effort to

overcome limits of touristic organization's size and reach economy of scale and competitiveness in contrast to big players. The availability of organizational models and ICT supporting solutions make possible the operationalization of the collaboration concept in the tourism sector and the setting up of CNOs in a TBE at different level of collaboration, in line with the territorial development strategies and tourism operators' propensity to risk taking.

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Enhancing Business Value Creation Capacity through relationships with Culture and Creative Organizations

Giovanni Schiuma

Innovation Insights Hub, University of the Arts London
Granary Building, 1 Granary Square, London N1C 4AA, UK
Department of Mathematics, Computer Sciences and Economics
University of Basilicata, Viale dell'Ateneo Lucano
85100 Potenza (Italy)

Antonio Lerro *

Department of Engineering University of Roma 3
Via della Vasca Navale 79, 00176 Roma (Italy)

** Corresponding author*

Structured Abstract

Purpose – In the time of globalization, growing uncertainty, ambiguity and change, traditional ways of doing business are no longer sufficient for sustainable competitive advantages. Nowadays, it is more and more important to consider non-conventional collaborations, methods, approaches and initiatives to release and apply creativity in order to facilitate and develop organizational innovation capacity. Cultural and Creative Industries (CCI) in this prospect can represent a source and resource of critical and creative thinking as well as a set of processes to be deployed in order to foster and support innovation. In this view, the collaboration between CCI and traditional businesses can represent a strategic and operational approach to develop cross-innovations enhancing organizational value creation capacity.

Sharing the assumption that the adoption and the integration of creative processes can produce positive impacts on organizational processes and business performance, this paper provides the results of a scoping study exploring how traditional businesses can engage or deploy culture and creativity in order to support the development of their innovation capacity. Focusing on a sample of Italian companies, we have investigated the forms and practices of collaborations between CCI and traditional businesses as well as the scope of these collaborations.

Design/methodology/approach – The paper is based on a practical exploration of projects, practices, initiatives aimed to improve innovation capacity of the organizations addressing collaboration between creative and culture industries and traditional business in the Italian context. Using a sample of Italian organizations, we draw first insights about their awareness, perception and orientation to identify, adopt and integrate creativity-based processes and collaboration with the creative and culture organizations to foster their innovation capacity, and to qualitatively identify a feasible set of new approaches

and practices potentially driving performance improvement. In particular, the empirical research aimed to find Italian companies within the manufacturing and service areas whose primary business is not to provide experience products and services, but who could benefit from adopting and integrating creative and experience economy in their traditional business activities. In order to derive and test theories, trace causal pathways, explore hypotheses generated by research, researchers have designed and implemented qualitative research methods and conducted investigation mainly based on web-available data, archives and interview-based information.

Originality/value – This paper represents one of the first attempts to investigate at practical level the collaboration of CCI and traditional business. The case examples of relevant Italian companies – such as Illy, Unicredit, Furla, Zegna – effectively provide evidences of the impact and modalities of adopting initiatives to shape a creative environment capable of sparking, fostering and developing human potentials and innovation capacity.

Practical implications – The investigation of a sample of Italian companies suggests that the focus is mainly on the adoption of creative processes as a way to support the performance achievements of one or more dimensions of the organisational value chain. It appears that most of the attention is focused on collaborations aimed to reinforce company image and reputation, to develop corporate social responsibility and to improve brand recognition. Particularly, great attention is paid on the deployment of creative- and culture-based activities and/or relationships as a marketing and communication approach as well as a way to add intangible value into products and services; while, there is a lack of attention and understanding on the use of the relationships with CCI as an instrument to support organisational development and learning.

Keywords – Cultural and Creative Industries; Traditional Business; Innovation Capacity; Management Models; Italy

Paper type – Academic Research Paper

1. Introduction

Nowadays different global trends are transforming the competitive environment and forcing organisations to develop new capabilities. Increasingly, organisational value creation capacity is not only linked to the definition of efficient and consistent organisational systems, as traditionally postulated by modern management, but it is increasingly tied to the establishment of adaptable and resilient systems that are able to meet changing market demands and continuously emergent business problems (Hamel, 2007). In the new business age, companies need to be more and more flexible, agile, intuitive, imaginative, resilient, and creative in order to face the increasing complexity, turbulence, and pace of change of the competitive environment (Schiuma, 2011).

These dynamics are connected with the increasing organizations' needs to do business in different ways. In fact, nowadays, the traditional rational- and efficient-based way of managing business is no longer sufficient to guarantee profits and sustainable competitive advantages: it is more and more important to consider the ability to use creativity for supporting innovation capacity and performance improvements as well as the capacity of catching and anticipating emerging needs in the society. In this prospect, in order to get access to creative processes business organisations can build relationships of various natures with CCI. Specifically, although CCI can be considered as part of the business economy, they are distinguished from traditional business sector by the products and services they offer.

In order to foster innovation capacity and performance improvements, change and transformation, businesses can collaborate and learn from CCI. For this reason, this paper presents the results of a scoping study exploring the feasibility of fostering innovation capacity through collaboration between CCI and traditional businesses. This involves the understanding of the potential benefits and impacts that could be generated from such collaborations as well as a practical exploration of projects, practices, and initiatives aimed to improve organizational innovation capacity by deploying creativity and culture. The focus of the explorative fieldwork is the Italian business context.

First, the conceptual background of this scoping study is presented. Second, a brief overview of the creative industries is introduced, highlighting specifically the different sectors and related peculiarities and their main challenges. Then, the insights collected from a qualitative empirical investigation are discussed. The on field investigation has been based on the selection of a sample of Italian firms. They have been investigated using a combination of semi-structured interviews and information gathered through desk analysis. Finally, some final remarks are outlined.

2. Background

The twenty-first century business landscape appears more and more scattered with ambiguities, uncertainties, dynamism, and unpredictability, that call for a renew interpretative perspective of the organisation and management systems (for an in-depth understanding of the conceptual pillars of this paper see "The Value of the Arts for Business" by G. Schiuma Cambridge University Press). In today's new business age,

organisational success cannot be considered as the mere ability to define and manage technical efficiency. Organisations are challenged to develop a continuous tension for change and innovation and acquire new capabilities to survive and prosper. In particular, they have to become agile, intuitive, imaginative and resilient to changes. This requires an interpretation of the organisation as a living-based system and an understanding of the employees within the organisation as innovation actors fully engaged to give the best of them and to exercise their creativity in order to solve existing problems, promote changes and generate new valuable business opportunities. Creativity has been traditionally recognized as relevant source for innovation and fundamentally as a precondition of innovation processes. For this reason some researchers and practitioners have argued about the role of *creativity-based innovation* as a driver for innovation and performance improvements, highlighting the potential impacts of the adoption and integration of creativity-based processes in the competitive strategies of businesses

For the scope of this paper we see cultural- and creative-based processes related to CCI as a potential catalyst and leverage or driver to enhance organisational innovation capacity. In other words, they can be seen as an instrument for improving organisational business performance. In this view, we approach cultural- and creativity-based processes as devises for cross-innovation, i.e. as mechanisms that using the creative and cultural contents and practices can inspire and support managers to develop management innovation, frame new organisational and business models, and draw on new approaches and instruments to tackle emergent business challenges.

In particular, we see the culture and creativity as cross-innovation devises, i.e. as an instrument to impact on people's engagement and commitment in organizational issues as well as a way to transform organizational infrastructure both tangible and intangible in nature. So, cultural- and creativity-based processes can be adopted, for example, for shaping workplaces, for communicating culture, identity and image of the organisation, for emotional-driven design of facilities, equipments and products, and so on.

The power of the cross-innovation devises can be analysed through their twofold role. On one hand, they represent vectors to shape and influence organizations' dimensions. This first perspective considers creativity and culture as an instrument to support individual and organizational learning mechanisms both by transferring or developing creative skills that are useful in the business context and/or by shaping an experiential and igniting organizational atmosphere which can spur critical and innovative thinking and

engage people with their emotions and energy. In this perspective creativity-based processes can be deployed as a learning platform aimed to transform human capital.

The activated learning mechanisms support the competence development of employees both at individual and group level. This may also produce a positive impact on the internal and external organizational relationships dynamics as well as on the development of organizational and business models valuing emergent coordination, distributed wisdom, full engagement of people and distributed authority.

On the other hand cross-innovation devices can be used as managerial vectors to transform business dimensions and properties, in particular, influencing and transforming tangible and intangible organisational infrastructures and products. This is the case of the use of cultural- and creative-based processes as a way to shape workplaces that can be inspiring and capable of affecting people's mindsets of absorbing external changes in accordance with an adaptive approach as well as by nourishing internal transformational processes in order to proactively project and induce changes in the firms' operations and in the external environment. The cross-innovation devices as instruments to enhance organisational innovation capacity are particularly relevant for transforming intangible elements of an organisational capital such as culture, values, identity and image. These dimensions can be made visible, more understandable and emotive through the use of cultural- and creativity-based means that represent and communicate them.

The adoption of culture and creativity - either as a learning platform or as a managerial vector to influence organisational dimensions create a frame of references in which emotive and rational organizational characteristics are put in conversation and are integrated to foster organizational innovation capacity. Taking into account the above rational it is important to acknowledge the fundamental role that culture and creativity can play in order to foster and support the development of organisational innovation capacity. This calls for the understanding of the forms and contents of collaborations and partnerships between CCI and traditional business sectors as a new fruitful strategy to develop organisational innovation processes.

3. The creative industries

The term "creative industries" has relatively recent origin. While there are obvious connections to and continuities with cultural industries, the designation marks a historical

shift in approach to potential commercial activities that until recently were regarded purely or predominantly in non-economic terms (Andersen et al., 2000; Smagina and Lindemanis, 2012). The concept emerged in Australia in the early 1990s, but was much wider exposure by policy makers in the United Kingdom (UK) in the late 1990s, when the Department for Culture, Media and Sport (DCMS) set up its Creative Industries Unit and Task Force. In the process, the DCMS moved the understanding of the concept of creativity a long way from its common association with activities having a strong artistic component, to any activity producing symbolic products with a heavy reliance on intellectual property (UNCTAD, 2004).

Defining “creative industries” is a matter of considerable inconsistency and disagreement in the academic literature and policy circles as well as among practitioners, especially in relation to the parallel concept of culture and cultural industries. Sometimes, a distinction is made between the creative and the cultural industries; sometimes the two terms are used interchangeably.

Despite some criticism concerning definition of the creative industries, the most widely accepted are the ones set by UK DCMS and UNCTAD. UK DCMS in its “Creative Industries Mapping Document” (1998, revised 2001) define creative industries as *“those industries which have their origin in individual creativity, skill and talent and which have a potential for wealth and job creation through the generation and exploitation of economic property”*. In the “Creative Economy Report”, UNCTAD (2008) defines creative industries as *“the cycle of creation, production and distribution of goods and services that use creativity and intellectual capital as primary inputs. They comprise a set of knowledge-based activities that produce tangible goods and intangible intellectual or artistic services with creative content, economic value and market objectives”*.

The structure of creative industries is continually evolving and differs country by country. However, they traditionally include four main domains identified as: *Heritage, Arts, Media, and Functional Creations* (UNCTAD, 2008). Heritage domain has as subgroups: *Traditional Cultural Expressions* (arts and crafts, etc.) and *Cultural Sites* (cultural and recreational services, library services, archives services, museum services, botanical and zoological garden services, amusement parks). Arts domain comprises *Visual Arts* (antiques, painting, photography, sculpture, collages and decorative materials), *Performing Arts* and *Music*. The Media domain has as subgroups *Publishing*

and *Printed Media* (books, newspapers, other printed matters, publishing services), *Audiovisual* (cinematographic film, radio and television related services) and *New Media* (recorded media, video games, business and creative software, interactive leisure software, digitalized creative contents). Finally, the domain of the Functional Creations has as subgroups *Design* (interiors, fashion, toys, graphic, jewellery), and *Creative Service* (advertising, market research and public opinion services, architectural and other technical services, trade fair and exhibition organization services, cultural and recreational services).

The specific interest of this scoping study is the notion of cross-innovation, i.e. how culture-based and creative-based processes can contribute and foster the development of an organisation innovation capacity particularly in the context of traditional business sectors. Our basic proposition is that the intersection of culture and creativity with traditional businesses can trigger and support the development of new innovation processes. Thus, we envisage the collaboration and integration of culture and creativity into organisational life and the exploration, identification and definition of new approaches, frameworks and tools that can drive the deployment of culture and creativity as instruments for enriching the value creation capacity of an organisation. Then, we are interested to understand the possible relationships between the CCI and traditional business sectors.

Our fundamental assumption is that traditional businesses can potentially collaborate with CCI with the scope of deploying what we see as the 4Ps of culture and creativity for innovation capacity: ‘people’, ‘practices’, ‘principles’ and ‘products’. Traditional businesses can enhance their innovation capacity by deploying the 4Ps and exploiting them as catalysts and drivers for change and transformation.

In Figure 1 it is presented the conceptual framework explaining the contribution of the 4Ps for enhancing the innovation creation capacity of an organisation and in turn its ability to deliver better performance and higher value propositions for stakeholders. Adopting a knowledge-based view of the innovation processes, organisation can produce innovations by developing their competence domains that affect how organisational processes are executed and then how business performance achieved. Knowledge assets represent the building blocks of an organisation’s capacity of being innovative. In order to enhance an organisational innovation capacity it is relevant to develop, renew and manage the knowledge base of an organisation.

The 4Ps provide mechanisms to support such mechanisms. In particular, people coming from the CCI can bring into organisations and share with employees their skills and knowledge in order to support the refinement and development of the organisational soft competences. This equals to consider the people as vector of new knowledge tapped from the culture- and creative-based domains. Practices denote all those methods and processes that are typical of the cultural and creative world and that can be useful for traditional businesses in order to do ‘things’ in a different way in comparison to what they normally do. Principles are related to the human-centric view that usually distinguishes CCI as a driver for sustainable value creation focusing in particular on experiential and emotive-base economic features. Finally, products denote the use of the outputs of the CCI as a way to increase the value added of traditional businesses as well as a way to shape working environments as symbols and vectors of meanings.

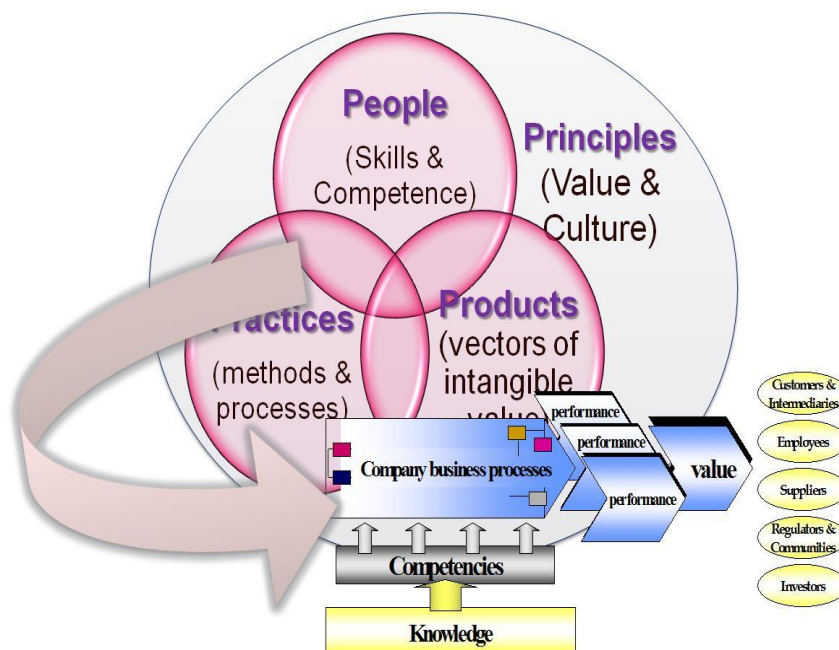


Figure 1. How the culture and creative industry can support organisational innovation capacity and business performance improvements by providing the 4Ps.

4. The empirical research

4.1 Data and methods

This section presents a series of concrete business results and elements of innovation and competitive advantages focused on the collaboration between cultural and creative industries and traditional business sectors. The attention is paid on the Italian business context with the scope to extract some relevant insights from the Italian state of the art of the use of culture and creativity in the organisational business models in order to support innovation capacity and value creation. In particular, the empirical research has been carried out with the aim to identify some possible trends of Italian companies in terms of adoption and/or integration of culture and creativity in the organisations' value creation chain.

The key investigated question is: *How do Italian firms operating mainly in traditional businesses engage with culture and creativity in order to enhance innovation processes and get competitive advantages?*

This is a scoping study with the aim of identifying the benefits related to the adoption and integration of creative- and cultural-based processes in traditional businesses. In order to derive and test concepts, trace causal pathways and define new hypotheses, we have designed and implemented a qualitative investigation combining semi-structured interviews enriched with the collection of available secondary data. Specifically, we solicited more than thirty Italian companies and sent emails to these companies describing the research project and inviting senior managers to participate in the explorative study. Out of the population, 24 companies have been included in the sample that we have analysed. In Table 1 the list of the investigated companies building the sample are listed together with the indication of the sectors that they overall represent.

<i>Companies building the investigated sample</i>

Benetton Group; Brem; Brunello Cucinelli – Fondazione Cucinelli; Cartiere del Garda; Ceretto Vini; Diesel; Elica; ENI; Favero-Milan Ingegneria; Ferrero – Fondazione Ferrero; Furla – Fondazione Furla; Gobetto Resine Speciali; Gruppo Euromobil; Gruppo Industriale; Tosoni; Illy; Italcementi Group; Ridea – Heating Design; Santa Sofia Vini; Telecom Italia; Teseco – Fondazione Teseco per l'arte; Trussardi – Fondazione Trussardi; Unicredit Group; Zegna – Fondazione Zegna
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<i>Sector of activities of selected companies</i>
Construction/ Materials for the construction – n. 3
Engineering – n. 2
Food – n. 4
Furniture – n. 2
Paper production - n. 1
Services/Commodities & Waste Management – n. 1
Textile/Dressing/ /Shoes/Fashion – n. 7
Services/Banking – n. 1
Utilities (oil&gas, telecom) – n.2

Table 1. Italian companies included in the investigated sample.

The empirical research has investigated some relevant issues with the aim to collect information about the kind of relationships Italian companies are engaging with the CCI. In particular, below the main investigated matters are outlined.

- The existence of collaborations with the companies and organizations operating in the cultural and creative sectors;
- The sentiment/feelings of Italian companies about these collaborations;
- The strategic objectives that the companies wish to achieve through the collaboration with organizations operating in CCI;
- The main projects and specific initiatives that have been developed in the last few years;
- The business areas, departments and processes more interested and involved in shaping collaborations with cultural and creative organisations;
- The main obtained or expected results and/or impacts derived from such collaborations;
- The main enabling and hampering factors and obstacles for the development and the effectiveness of such collaborations.

4.2 Main evidences

The fieldwork investigation has revealed different and interesting insights about the collaborations between traditional businesses and CCI. The first evidence shows a limited but increasing awareness of the relevance to develop collaborations with the creative industries as well as of adopting cultural-based and creativity-based processes for

improving innovation dynamics and competitiveness in the traditional businesses. However, Italian companies have not structured connections with creative organizations. Most of the relationships tend to be stand-alone and not structured but rather emergent in nature. There is a general interest and feeling of the role and relevance that culture and creativity can play for company competitiveness. In other words executives have the intuition that organisations could benefit and tap into CCI as a way to enhance innovation capacity and deliver better value to stakeholders. Nevertheless, they lack of frameworks and clear understanding of how this can be achieved and governed in practice. In addition, the actual economic recession, which is strongly affecting the economic performance of Italian firms puts managers in the difficult position of experimenting new approaches and tools that could turn into failures without generating return on investments. In this prospect a structured investments in the relationships with culture and creativity is seen highly risky and not capable of producing clear benefits for firms' bottom line results.

The main declared objectives to be reached through the collaboration with CCI are mostly related to reinforce company image, brand and reputation and to develop corporate social responsibility. Further dimensions of benefits are: product differentiation; the contribution to add intangible value to traditional products and services; the capacity of driving product innovation mechanisms. While, little attention is associated to the role that culture and creativity can play as drivers for organizational development and particularly as managerial approaches to support human resource development and engagement.

From the empirical analysis it is possible to infer the nature of the relationships that can be established by businesses with CCI. In particular, it is possible to discern three fundamental profiles of companies corresponding to three archetypes of relationships that describe the approaches adopted by businesses in engaging with culture and creativity: Observer, Adopter and Integrator. They respond to a different strategic view of the position of culture and creativity as a resource and source of business performance.

The Observer considers culture and creativity as a 'diverse world' from business, something very much distant from the everyday business challenges and needs. Then, accordingly the fundamental view is that CCI has not really much to offer for company competitiveness and the kind of relationship to be established is mainly aimed at supporting the cultural and creative sectors. This view is predominant in very traditional

sectors that have not experimented and explored the benefits that culture and creativity can offer for business-related purposes.

The Adopter represents the profile of those businesses that clearly identify the potential contribution that CCI can provide to support, improve and develop organisational value chain and in turn business performance. Accordingly, businesses engage with some specific dimensions of the CCI looking for extending, completing or enhancing one or more components of their value creation chain. Thus, the fundamental idea is to plug in some competences and value creation capacity from CCI. This is the position of most of the Italian companies considered in the investigated sample. They acknowledge that culture and creativity can enrich and enhance their value creation capacity and for this reason they adopt some specific cultural and creative dimensions.

From the empirical investigation has emerged that Italian companies establish relationship with CCI in order to respond to three fundamental purposes as listed below.

- Corporate social responsibility (CSR);
- Marketing, branding and communication;
- New value for products and services.

Many Italian organisations are developing relationships with CCI as part of their CSR strategy. The focus is on delivering value propositions for stakeholders and particularly to create value for communities, society at large and indirectly for environment by deploying cultural-based and/or creative-based activities and projects. The fundamental mechanism through which organisations operate to build a relationship with CCI and deliver their CSR initiatives is the sponsorship

Actually, sponsorship is the traditional and quite common approach of interaction between culture/the arts and business. Through sponsorship the companies assume the role of patron to an artist, an artwork and/or an artistic process and even art and cultural institutions such as museums and galleries. This is done for multiple reasons, including ethical and cultural motivations, getting the attention of institutions, strengthening ties with the local community, creating an opinion and an identity of the organisation both internally and externally, and for increasing brand awareness and enhancing reputation. Cultural sponsorship and co-sponsorship can take different formats. Usually, organisations sponsoring cultural and arts productions and events get marketing benefits, such as credit on television and print advertising as well as credit on all cultural event

related materials including banners, posters, performance programmes, and ticketing options.

Corporate social responsibility, marketing, branding and communication involve all the delivering of a company's "message" to its customers and stakeholders in a renewed way. *Unicredit* represents a good example of Italian company that have shaped its relationship with CCI as a CSR initiative. Unicredit is an international banking group which is successfully exploiting sponsorship as a way to create and deliver socio-cultural value to stakeholders. The basic idea moving *Unicredit* sponsorship is to support talents to emerge and to have success through the reinforcement of the relationships among artists, arts lovers, galleries, critics and specialized magazines. Specifically, *Unicredit* has established relationships with: "Castello di Rivoli" a contemporary art museum, the MACRO - contemporary art museum based in Rome, the MAMbo - contemporary art museum based in Bologna, the MART - contemporary art museum based in Trento and Rovereto, the Museum der Moderne of Salzburg. In addition, *Unicredit* is greatly involved in sponsoring music and opera. It actively promotes, through the support of orchestras, the attention and the promotion of the classic music engaging audience at large. It is partner of the "Teatro alla Scala" of Milan, the "Arena di Verona", the "Filarmonica '900" of the "Teatro Regio" of Turin, the "Teatro Massimo" in Palermo, the "Teatro dell'Opera" of Rome. At international level, through its controlled banks such as Bank Austria and HypoVereinsbank (HVB), *Unicredit* also supports respectively the Filarmonical of Wien in Austria, and the Opera of the Bayern in Germany as well as it promotes relevant regional events in Bayern such as the Rheingau Music Festival, the Mozart Festival at Würzburg the Richard Strauss Festival at Garmisch-Partenkirchen., the Opera Academy at Gut Immling and its programme "Jugend Kulturell". A further case example of Italian company pursuing CSR through the development of relationships with CCI is *Telecom Italia*: a company operating in the telecommunication sector. They are supporting culture as part of their CSR strategy by partnering with "Galleria Borghese" based in Rome, the "Accademia Nazionale di Santa Cecilia" of Rome as well as sponsoring the "Mostra Internazionale di Architettura" of Venice and the MAXXI Museum of Rome. In addition, they are partner of the "Salone Internazionale del Libro" of Turin, and of the RomaEuropa WebFactory - the web community dedicated to multimedia artists. Along the same approach stands *ENI*, one of the major Italian oil and gas corporations. ENI supports actively the cultural life of the territories in which

operates, particularly through the support of artistic initiatives and by sponsoring renovation projects of heritage assets.

It is worth to point out that the main way of establishing and managing the relationships with CCI is performed by means Foundations. Indeed, the analysis of the relationship developed by the Italian companies with CCI has revealed that most of the organisations have created a Foundation, see for example, *Fondazione Ermenegildo Zegna*, *Fondazione Nicola Trussardi*, *Fondazione Cucinelli* and *Fondazione Ferrero*. It is important to note that the attention to establish relationships with CCI for CSR purposes is not a prerogative of Italian multinationals, but it characterises also SMEs. In particular, *Favero-Milan Ingegneria*, operating in the engineering field, and *Cartiere del Garda*, operating in the paper production, support cultural initiatives in region of Trentino and collaborate effectively with cultural associations, institutions and foundations.

Marketing, branding and communication denote the second fundamental strand of collaboration between Italian businesses and CCI. In this case, the fundamental purpose of establishing a relationship with CCI is aimed at creating, communicating and protecting company's identity, brand and reputation. The scope of this kind of relationship is mainly to impact on customers and intermediaries, but also more generally affect the perception of a company from the point of view of its different stakeholders. One of the key example of Italian company that has traditionally used creativity and culture as a way to build its brand and reputation is *Benetton*. Among others, it is worth to mention the initiative named "Fabrica". Fabrica - founded in 1994 - is the Benetton Group's communication research centre in which a group of creative young people of various nationalities work together with the aim of developing ideas and potential inspirational creative-based projects that can be valuable for promoting and marketing the company worldwide.

Other examples of Italian companies that are deploying and exploiting the relationships with CCI for marketing and branding purposes are: *Gruppo Euromobil* (home furniture), *Teseo* (facilities and waste management), *Diesel* (fashion), *RossiModa* (textile), *Gobetto Resine* (materials for the construction sector), *Gruppo Tosoni* (engineering) and *Santa Sofia Vini* (wine production).

The attempt to provide new value for products and services is the third strand of collaboration between Italian traditional businesses and CCI. The basic idea grounding this approach is that creative partners can contribute to the idea and development of new

products. Product and/or service experience can be strengthened by working with its sensuous qualities, aesthetics and design, or by involving the consumer in the development process. Accordingly, design, culture, arts represent important 'value added vectors' to increase the value incorporated into products and services. From a business perspective, the idea is to infuse the artful energy into products and services. The attention is focused on increasing the economic value of a product by incorporating aesthetic dimensions.

At practical level, creative collaborations can contribute to product and service innovations in various ways. In this perspective Italian companies have been traditionally particularly effective in differentiating themselves and their products in the market by embodying cultural and creative features into products and services with the result of creating embedded intangible value. For example, *Ridea* and *Brem*, two Italian leader companies in the design and production of heating products have linked their market success to the ability to offer heating systems and solutions that incorporates aesthetic and design features. The focus is on finding a continuous advanced balance between functionality and elegance, utility and aesthetic, high technology and environmental sustainability. The value proposition is to deliver to the market not only an object that heats but also real furnishings objects that can be integrated perfectly in the home atmosphere contributing to create a living house.

Furla represents a further example. Giovanna Furlanetto, owner of Furla, has stated: "*The arts have delivered to the world a very different perception of my company*". Furla is an interesting case example since it experiments on its core-products (i.e. the female bags) the work of young creative people sponsored by the Furla Foundation as well as it exploits the talents of young filmmakers to reinvent communication through new "stories" in which the bag becomes input, fetish object to be transformed and even destroyed and desecrated. For example, the project "*#candycool*" has been an open laboratory in which creatives have been invited to re-interpret the Candybag playing with fantasy and unusual components such as chains, textiles pieces and even biscuits. More recently, on 2007, this approach has been institutionalized through the so-called Furla Talent Hub, a centre for the promotion of the new young talents of the fashion design that offers to them the chance to design a complete collection. A further Italian case example of a company that is using the relationship with CCI as a way to create intangible value embedded into products is *Italcementi Group*. This company represent one of the major

actors in the cement industry at international level. Nowadays, the cement offers high performance very difficult even to think till some years ago and this determines the great relevance of the deep collaborations that *Italcementi* develops with customers, designers, architects and building community. Among these dimensions great attention is paid to the architecture as a means to impact on the sustainable transformation of territories. This feeds collaborations with architects in order to develop relevant projects able to be symbols of innovative and sustainable use of cement. This view is resulted in the development of projects with famous architects such as Nervi, Ponti, Meier, Perrault, and Cucinella. In order to make this kind of collaboration more stable and structured, *Italcementi Group* has launched since the end of '90s an initiative named "Incontri Millenium" which is aimed at developing conversations with Italian faculties of architecture through workshops and events.

An Italian company that has been able to leverage on cultural and creative dimensions to transform a commodity such as coffee into a product with high value-added is *Illy Caffè*. Among the different initiatives put in place by *Illy*, one of the most significant is the so-called "Illy Art Collection": it is a series of 70 little cups for coffee limited in number, designed by famous artists, such as Michelangelo Pistoletto, Marina Abramović, Sandro Chia, Julian Schnabel, Robert Rauschenberg, Jeff Koons, Kiki Smith, Joseph Kosuth, James Rosenquist and a lot of young emergent talents. This was one of the very first examples of collaborations with the CCI launched by the company. As result of this project the little cups for coffee became real porcelain sets through which the arts and the aesthetic dimensions were linked to the sensorial pleasure of the coffee, promoting at the same time brand management and enriching customers' experiences.

Since 2006 *Illy* largely adopted the idea of using art as a means to enrich the value incorporated into products with the vision of making art accessible and applied to common objects. In this perspective, a further example of application of creativity and culture is the creation of another iconic *Illy's* product: the "250g" box of the coffee named "Barattoli d'Autore" (authored coffee boxes). According to a number of famous contemporary artists, such as James Rosenquist, Michael Lin, Michelangelo Pistoletto, Tobias Rehberger, and Sebastião Salgado, the box provides a new symbolic message interpreting the surface of a box and transforming it in a circular and infinite picture. To underline the relevance and the exclusivity of the artistic boxes, they are limited in number and available only twice in a year. The above are examples of how culture and

creativity can be deployed to increase the value added of products and differentiate them in the market. Apart the use of culture and creativity as a way to enrich the value incorporated into products another important use of the relationship with CCI as a way to generate intangible value is represented by the deployment of CCI as an instrument for shaping better workplace.

Among others companies, this is the vision that has inspired *Ceretto Vini* which has established a collaboration with the creative industries with the aim to 'beautify' the work environments. They see the workplace design as one of the major factors affecting the performance of workers and of the overall organisation. Their fundamental assumption is that the physical setting and the workplace environment have measurable effects on building relational capital, social life and organisational context, which in turn influence work. Workers are more productive when working within a positive, stimulating and enjoyable environment. Accordingly, arts are used as an instrumental means to create a space and an intangible aura within and around the organisation, with a positive impact on people, by stimulating a constructive emotional and energetic state. They have designed and built facilities in a such a way that they embed symbolic meanings so that they positively shape and affect the workplace.

The integrator depicts the third archetype of relationship between the traditional business sectors and CCI. The Integrators are those companies that fully recognised the value of the relevance of culture and creativity and pursue an integration of such dimensions into the 'DNA' of the organisation.

In this case, the companies are keen in adopting culture and creativity as an instrument that permeates the overall organisation rather than been just an added dimensions as in the case of adopters. A key success example of Italian company that act as an integrator is *Elica Group*. Elica is a world leader in the kitchen hoods business and represents a benchmark for understanding how collaborations with creative industries can drive a real transformation of the organization, opening up the organization and its people to a new consciousness and supporting continuous organisational changes and evolution.

5. Final remarks

Increasingly 21st century business landscape will challenge organisations to exploit new forms of innovation to guarantee sustainable value creation capacity. The traditional view of the organisation as an efficient system to be steered towards planned and

designed directions fails to meet these requirements. For this reason, the collaborations between the creative world and the traditional business acquire great relevance. In this perspective the collaboration with CCI can be seen as a managerial approach to shape new organisation's competences and capabilities. The empirical scoping study about a sample of Italian companies has pointed out that there is an interest on developing collaborations with the creative industries and understand how to better integrate culture and creativity into business models; however there is still a lack of strategic understanding about how this can be carried out. The existing collaborations with creative industries do not respond to a structured strategy and are mainly the result of emergent relationships generally driven by the personal interest of the entrepreneur and its family or in other cases of the top management. From a practical point of view, the collaborations tend to be developed with single professionals/artists and consultants (for example curators) rather than to be based on structured relationships or partnerships with cultural and/or creative organisations. It is also worth to mention that there is a lack of attention on the assessment of the impacts/benefits produced by the relationships with the cultural and creative sectors.

Finally, the study has allowed to show that the most important enabling factor for the development of effective relationships between businesses and CCI is represented by the commitment of the entrepreneur and/or top management. While, the most significant barriers for the engagements of culture and creativity into the business models are: the reluctance of employees to be engaged into cultural- and creative-based processes; the difficulty in forecasting the benefits that such kind of relationships can generate for business; the lack of structured offer from cultural and creative providers of potential services cultural- and creative-based to enhance company competitiveness.

We call for more in-depth and extensive research investigations that could shed light both on the empirical practices and on the conceptual frameworks of how cultural- and creative-based processes can generate cross-innovation and benefit organisational value creation capacity.

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The organization of eco-industrial parks and their environmental and social practices

Nicola Bellantuono*, Nunzia Carbonara, Pierpaolo Pontrandolfo

Department of Mechanics, Mathematics, and Management
Politecnico di Bari
viale Japigia 182, 70126 Bari - Italy

* *Corresponding author*

Structured Abstract

Purpose – Eco-Industrial Parks (EIPs) are defined as industrial clusters wherein a community of firms linked in a network of collaborative relationships exploit new business opportunities so as to increase their economic performance, by minimizing the environmental impact and creating benefits for the local community (Côté and Cohen-Rosenthal, 1998). A number of EIPs have recently spread in both developed and developing countries, with specific features and various degrees of success. Despite such a variety, the common driver for these initiatives is the awareness that industrial symbiosis on materials and energy may be beneficial for both the companies and the environment (Yang and Lay, 2004). The aim of this paper is to characterize EIPs and identify specific typologies for them. For this purpose we propose a framework based on relevant literature and articulated in three dimensions, namely organizational, environmental, and social.

Design/methodology/approach – To apply the framework, we consider a number of heterogeneous initiatives of EIPs, located in Europe, North America, and developing countries, and characterize them in accordance with the developed framework. In particular, assessing the variables of the framework we describe the organizational structure of EIPs as well as the adoption of practices related to the environmental sustainability and social responsibility. Once we have characterized these cases, we apply the cluster analysis to group them according to the organizational dimension: we identify the emerging clusters as specific types of EIPs. Then, we repeat the cluster analysis on the other dimensions to assess the way environmental and social practices are implemented.

Originality/value – Although there are several examples of EIPs in developed countries as well as in emerging economies, and the attendant literature provides some guidelines for the establishment of EIPs, to our knowledge there is a lack of studies that aim at assessing possible linkages between the organizational structure of an EIP and its environmental and social practices. This study is a first attempt to address this issue.

Practical implications – The research findings can support the policy makers in defining the organizational characteristics of EIPs that allow to foster the environmental and social performance of EIPs.

Keywords – Eco-industrial parks, industrial symbiosis, industrial ecology, organizational structure, cluster analysis.

Paper type – Academic Research Paper

1 Introduction

Since the seminal paper of Frosch and Gallopulos (1989) an extensive body of research has flourished, leveraging on the analogies between natural and industrial ecosystems. As industrial ecosystem we mean “a community or network of companies and other organizations in a region who chose to interact by exchanging or making use of byproducts and/or energy” (Gertler, 1995) so as to get benefits from the systemic reduction in the use of virgin resources and in the waste to be disposed, as well as from the increase in variety and amount of outputs that have market value.

Ayres and Ayres (2002) remark that several aspects of industrial networks mimic distinctive phenomena of biological systems, such as the cycling of materials, nutrients, and energy, or the interactions among individuals playing the role of producers, consumers, or decomposers (Liwarska-Bizukojc *et al.*, 2009). According to this research stream, which is usually called industrial ecology (Allenby and Graedel, 1993; Ehrenfeld, 2004; Gibbs and Deutz, 2007), rather than emphasize the independence and competitiveness of companies studies should stress their collaborations and interdependence (Côté and Cohen-Rosenthal, 1998). These characteristics, indeed, move the focus from monadic individuals to their interconnectedness, which is considered crucial in assuring the resilience of industrial ecosystems and giving them efficiency and persistency over time.

Moreover, in the last decades studies on industrial ecology have been also spread due to the increasing prominence gained by the concept of sustainability: scholars and strategic consultants have stressed that greening production processes is a key factor for single companies and local networks of firms to gain competitive advantage (Shrivastava, 1995; Tudor *et al.*, 2007). In addition, the promotion of sustainable development has been the focus of many governmental policies and international initiatives. In 2012, the United Nations Conference on Sustainable Development “Rio+20” have reaffirmed the interlinkages between environmental and social goals in building an economically, socially and environmentally sustainable future (United Nations, 2012).

Several researchers (Roberts, 2004; Korhonen *et al.*, 2004) have pointed out that unsustainable industrial systems might turn to sustainability by borrowing the nature's model of material recycling and energy cascading, wherein there is little or no waste. Nonetheless, some other observe that the character of most of the research on industrial ecology is speculative: rather than "offering concrete solutions and practical measures for policy makers and business managers" (Korhonen *et al.*, 2004) to promote a disruptive innovation in production processes (Hawken *et al.*, 1999), its main contribution seems to be, sadly, the mere description of materials and energy flows. Therefore, Gibbs and Deutz (2007) question whether the approach commonly adopted by scholars for addressing the topic of industrial ecology is effective for moving traditional industries toward the principles of industrial ecology and helping them to build synergies that mutually improve their effectiveness in a win-win scenario.

At the opposite, the concrete realization of industrial ecology principles is more frequently referred to as industrial symbiosis. Chertow (2000) defines it as "engaging traditionally separate industries in a collective approach to competitive advantage involving physical exchange of material, energy, water, and by-products". She claims also that symbiotic relationships are more complex than the usual two-side exchanges occurring between companies (Chertow, 2007); as a rule of thumb, she proposed to define industrial symbioses only those relationships that involve at least three different actors sharing at least two different resources. According to her, the pillars that underpin the establishment of fruitful industrial symbioses are geographical proximity and the existence of a collaborative approach among business actors. Both pillars, indeed, enhance the opportunities for companies to reuse by-products, share utilities and infrastructures, and arranging a common provision of services.

Roberts (2004) stresses that "the clustering of firms with similar waste and by-product streams create opportunities [to] encourage the co-location of firms that can reprocess waste material", to promote new synergies and efficiency gains and, ultimately, to create "value for individual firms and collective industry business". This is the basic intuition of eco-industrial parks (EIPs). The latter can be defined as industrial clusters wherein a community of firms linked in a network of collaborative relationships exploit new business opportunities so as to increase their economic performance, by minimizing the environmental impact and creating benefits for the local community (Côté and Hall, 1995; Martin *et al.*, 1996; Côté and Cohen-Rosenthal, 1998). As pointed out by Roberts (2004),

industrial symbiosis can be implemented at different scales, and EIPs are just one of them, namely the intermediate level between the micro-level of single plants and the macro-level of a global network of companies and regional clusters applying the principles of circular economy (Andersen, 2007; Su et al., 2013). Compared to them, however, at the same time EIPs can reach the economies of scale that cannot be obtained at a firm-level and exploit geographical proximities which are difficult to exploit in dispersed networks.

A number of EIPs have recently spread in both developed and developing countries, with specific features and various degrees of success (Shi *et al.*, 2010; Sakr *et al.*, 2011; Bai *et al.*, 2014). Some of them have been promoted as governmental initiatives, whereas other have resulted from spontaneous processes carried out by companies (Behera *et al.*, 2012). Despite such a variety, the common driver for these initiatives is the awareness that improvements in circulation of materials and energy may be beneficial for both the companies and the environment (Yang and Lay, 2004). Simultaneously, the topic of EIPs has received a growing attention by scholars, who slightly have moved from individual case studies and assessments of single EIP programs, to cross-country analyses of EIPs as well as of governmental policies aimed at promoting their establishment (Shi *et al.*, 2010).

Although the literature provides guidelines for the establishment of EIPs, to our knowledge there is a lack of studies that aim at assessing possible linkages between the organizational structure of an EIP and its environmental and social practices. The goal of this paper is to characterize EIPs and identify specific features for them. To this aim, we first develop a framework based on three dimensions, namely organizational, environmental, and social. For each dimension a number of variables are identified from literature. This framework is then applied to a number of heterogeneous initiatives of EIPs, located in Europe, in North America, and in selected emerging economies (China, India, and Brazil). Such initiatives are then characterized and a value associated to each variable included in the framework. Finally, data are combined to derive some insights.

The framework is described in the next Section: three dimensions of analysis, and the attendant variables, will be considered, derived from a desk analysis of the extant literature (Sections 3 to 5). In Section 6 we will present the set of EIPs and characterize them in accordance with the developed framework. By cluster analysis, these EIPs are grouped with reference to each dimension so as to identify specific types/common

patterns of EIPs and investigate the relationships among the three dimensions (Section 7). Finally, Section 8 summarizes result and present limitations and suggestions for further research.

2 Framework

To address the goal of this paper, a framework to investigate the features of EIPs is proposed, based on an extensive literature review on EIPs and related concepts, such as industrial ecology and industrial symbiosis. Peer-review scientific journals in English with management focus have been scrutinized, so as to identify the features that describe EIPs. The framework, that is extensively presented in the following Sections, is composed by three dimensions, namely organizational, environmental, and social. For each dimension, a number of variable are provided, each related to a peculiar aspect of EIPs.

The first dimension investigates the organizational features and uses nine variables to describe how they are formed and managed. Specifically, as to the origin of the EIP this dimension discusses whether it emerges spontaneously or is intentionally promoted by an initiator, if it grows around an anchor tenant and if it counts on governmental support. Heterogeneity of companies that participate to the EIP is also considered to characterize the organizational structure of EIPs, as well as the existence of cooperation with external subjects, such as companies, research centers, and governmental agencies. Other variables explore the existence of shared information systems and the commonality of support services among the EIP participants.

Table 1. Dimensions and attendant variables included in the framework.

Dimension	Variable
Organizational	– Top-down development process
	– Existence of an anchor tenant
	– Governmental support
	– Heterogeneity
	– Cooperation among companies
	– Cooperation with universities and research centers
	– Cooperation with governmental agencies
	– Shared information system
	– Commonality of support services
Environmental	– By-products exchange
	– Sustainable use of resources
	– Adoption of Best Available Techniques

	<ul style="list-style-type: none"> – Eco-design – Environmental management systems – Green procurement – Sustainable goods transportation management – Sustainable people transportation management – Landscape protection
Social	<ul style="list-style-type: none"> – Service provision – Human resource training – Public awareness and stakeholder participation – Promotional events and symposia

The second dimension relates to environmental aspects of EIPs, and is composed by two focal points, enucleated in nine variables. At first, the production processes adopted within the EIP have been investigated: these comprise the byproducts exchange, the sustainable use of resources, the adoption of Best Available Techniques, and the sustainable design of products. This dimension includes also other variables, dealing with the management practices that companies belonging to the EIP carry out to address the environmental goals: these variables explore the adoption of environmental management systems, the recourse to green procurement, the arrangement of sustainable transportation for goods and people, and the landscape protection.

Finally, the social dimension relates to the linkages existing between the EIP, or its single participants, and the local community wherein the park is located. Such linkages are detailed by four variables, namely the provision of services for workers and their families, the human resource training on sustainability, the elicitation of people's sustainability awareness and the stakeholder participation, and the organization of promotional events and symposia on these topics.

The dimensions, and their attendant variables, are listed in Table 1. In the following sections, all of them are described and positioned in the literature.

3 Organizational dimension

3.1 Development process

The literature mentions two different development processes for EIPs, namely spontaneous and planned. The former, which Chertow (2007) calls self-organizing symbiosis, is typical of EIPs arising from a spontaneous initiative of a company willing to achieve efficiency, cut costs, or expand its business by leveraging on resource exchange

with other organizations. In other terms, the intuition that, by promoting symbiosis among companies, win-win conditions can be obtained makes the EIP unintendedly emerge (Baas and Boons, 2004, Behera *et al.*, 2012). If such transactions prove to be effective in achieving the expected goals, they may become the core of a more complex network of exchanges that gradually will enlarge and involve further organizations. The spontaneous development of EIPs based on companies acting on their behalf mimics the way natural ecosystems arise: such a model is in fact considered the most frequent (Chertow, 2000; Jacobsen, 2006) and successful (Heeres *et al.*, 2004; Gibbs and Deutz, 2007).

Nonetheless, in several cases EIPs are developed thanks to an exogenous promoter, called initiator (Brand and de Bruijn, 1999). This can be a local or central government agency, as well as an association of companies or entrepreneurs, a trade union, or another player acting as institution *de facto* (Heeres *et al.*, 2004; Chertow *et al.*, 2007). The external stimulus for exogenously planning the development of an EIP can be the need to compel with stricter environmental regulations, reduce pollution, reconvert abandoned industrial estates, or support companies located in a given area in facing toward competitors from abroad (Seuring, 2001; Desrochers, 2004; Tudor *et al.*, 2007). This kind of genesis for EIPs is not necessarily in contrast with the metaphor of natural ecosystems, which suggests the spontaneous rise of EIPs: it has been claimed that the role of the promoter is to overcome market failures, which otherwise would impel the development of symbioses among business actors (Tudor *et al.*, 2007). By contrast, several analyses (Gibbs *et al.*, 2003; Chertow, 2007) on projects funded in 1996 within the U.S. President Council of Sustainable Development, have shown the low success rate of EIPs arisen through deliberate planning. Nonetheless, some positive exceptions exist, mostly located in the Far East wherein the governmental role in driving economics is prominent (Zhu *et al.*, 2007; Zhang *et al.*, 2010; Behera *et al.*, 2012). To reduce the risks of failure associated to a top-down development process, Costa and Ferrão (2010) describe a mixed approach that combines governmental directives and business initiatives.

3.2 Existence of an anchor tenant

In the context of regional studies, a major company located in a specific area, heavily committed in R&D activities, and having, at least a partial absorptive capacity in a given technological area (Agrawal and Cockburn, 2002) often plays a key role in promoting the emergence of self-organizing enterprise networks and, specifically, in sustaining the

establishment of an EIP. The benefits that such an organization – which scholars define anchor tenant (Lowe, 1997; Côté and Cohen-Rosenthal, 1998; Chertow, 1998; Korhonen, 2001; Heeres *et al.*, 2004), magnet (Tudor *et al.*, 2007), or initiator (Brand and de Bruijn, 1999) – gives to the EIP is twofold. First, the anchor tenant is a major manufacturer that either may ensure a continuous waste stream (which can be potentially used by third parties in their manufacturing processes), or it is able to turn information about the existence of some waste materials or by-products into business opportunities. Secondly, thanks to its reputation and capability (Lowe, 1997), the anchor tenant has many links with several satellite enterprises involved in treating wastes and supporting its production processes (Côté and Cohen-Rosenthal, 1998); therefore, it contributes to the EIP development by allowing new companies to arise or existing ones to move into the park. According to Behera *et al.* (2012), the anchor tenant may drive the development process of an EIP also by recruiting potential partners through a formal selection process.

3.3 Governmental support

Whatever is the EIP development process, namely spontaneous or planned, there is a general consensus on the importance of the role of institutions in favouring its growth and success (Heeres *et al.*, 2004; Park *et al.*, 2008). Often, bureaucracy is a strong obstacle for companies in arranging such exchanges of waste and by-products to build industrial symbioses. Rather, policies should be designed so as to provide political, coordinative, educational, and infrastructural support to EIPs (Chertow, 2007; Gibbs and Deutz, 2007; Taddeo *et al.*, 2012). Liu *et al.* (2012) stress that, even when the EIP moves from the spontaneous initiative of a company, government is crucial in breaking the sectorial boundaries, thus allowing the earlier spontaneous network to evolve in a regional cross-industry ecosystem. In some specific cases, the support offered by government includes the definition of appropriate coordination mechanisms to encourage companies to manage waste streams (Brent *et al.*, 2008), the dictation of prices for specific items or materials (Zhu *et al.*, 2007), or the rewarding of individual actions that generate environmental benefits (Shi *et al.*, 2010). More commonly, and in addition to possible specific initiatives, the governmental support includes direct or indirect subsidies to the companies that take part to the EIP formation.

In their extensive review, Jiao and Boons (2014) scrutinize the governmental policies to promote industrial symbiosis and assert that it is often difficult to distinguish whether

these policies have been the true initiator or just an influencing factor for the EIP development. Moreover, they outline that programs implemented and their evolution over time are country-specific, and observe that the nature of their impact, and specifically their effectiveness, differs per cases: as a guideline for policy makers, they emphasize the importance of taking the specific context into account.

3.4 Heterogeneity

Some EIPs include companies involved in diverse industries, other ones seem to be more focused on a single sector. This feature of the EIP is usually called diversity or heterogeneity (Côté and Smolenaars, 1997; Sterr and Ott, 2004; Taddeo et al, 2012). According to the technical memorandum by Martin *et al.* (1996), heterogeneity is considered key to distinguish an EIP from other kinds of businesses aggregations.

Heterogeneity may also involve the kinds of materials that flow among the companies within the EIP. According to Pellenbarg (2002), the existence of complementary materials may improve the chances of success for an EIP, whereas Cohen-Rosenthal (2004) stresses the need to examine all the material flows for ensuring the EIP success. Sterr and Ott (2004) argue that heterogeneity and the attendant redundancy in input-output relationships may facilitate the establishment of symbiotic transactions within an industrial site. In fact, several case studies on successful EIPs show their intrinsic heterogeneity (Elabras Veiga and Magrini, 2009; Shi *et al.* 2010; Sakr *et al.*, 2011; Behera *et al.*, 2012). At the opposite, a low level of diversity among firms in an EIP reduces the variety of material exchanges, thus it may cause instability of the park, which tends to be dependent on single flows (Côté and Smolenaars, 1997).

3.5 Cooperation

As other forms of businesses aggregations, EIPs imply a dense network of collaborations. These include, but are not limited to, linkages among the companies that are located in the EIP. In many cases, such inter-firm linkages are due to the existence of exchanges for goods and energy, either in form of wastes or by-products or not; in other cases, they are based on from the existence of an information exchange system that ensures a tight connection among all the companies belonging to the park. Different forms of collaborations should also be considered, and are specifically considered through this variable. For instance, a company belonging to an EIP usually collaborates with

several business entities outside the park boundaries, such as suppliers or customers, and exchanges information with universities and research centres, which often act as information sources to identify the possible use of by-products and the attendant synergistic relationships among companies. Another critical factor is the existence of relationships between companies in an EIP and governmental agencies. Finally, it should be emphasized the existence of relationships that single companies, or the EIP as a whole, have with stakeholders, such as institution, local communities, environmentalists, labour representatives, which are all interested in shaping the development of the park. Heeres *et al.* (2004) include the active participation of the above stakeholders among the success factors for EIPs.

According to Gibbs and Deutz (2007), trust and cooperative relations among EIP tenants are of key importance in the early phases because they reduce “the mental distance among companies”. Moreover, although such a positive approach is not enough to improve the companies’ environmental performance, it gives a guidance for changing their behaviour and promotes the necessary cultural change.

In the followings, this variable is investigated by distinguishing three sub-variables, namely: cooperation with companies, cooperation with universities and research centres, and cooperation with governmental agencies.

3.6 Shared information system

To effectively take part to an EIP, a company should share all information that is potentially relevant to other companies and, conversely, should have access to the one in the hands of its counterpart. This could be the case of the kind, the amount, the timeliness, the quality, and the other characteristics of wastes and by-products generated by a company, as well as its energy needs. Moreover, the existence of an EIP implies the activity of monitoring and managing data, inherent to that site, which cannot be directly associated to any of the actors (e.g. air pollution, traffic, etc.): the knowledge of these data, indeed, let companies to better arrange their needs by exploiting symbioses and identify possible rooms for improving their performance.

The importance of an information gathering for an EIP has been stressed by Heeres *et al.* (2004) and Tudor *et al.* (2007): according to them, a number of issues should be held, including products manufactured and services provided, material and energy streams,

actual and potential markets, purchases, companies' present resources and capabilities, their future plans, collaborations, and needs.

3.7 Commonality of support services

This variable encompasses the existence of a variety of services that the EIP tenants manage in common. Such services range from basic utilities (such as security, maintenance, or transportation) to more complex ones, e.g. energy management, waste treatment, or regulatory/legal consulting support. Chertow *et al.* (2007) enumerates the existence of such common services among the basic symbiotic transactions that occur in EIPs, the other ones being the exchange of by-products and the cooperation in training and sustainability planning. According to Heeres *et al.* (2004), the management of common services is a pre-requisite for other initiatives in an EIP.

4 Environmental dimension

4.1 By-products exchange

The most common way to develop an industrial symbiosis is to exchange by-products between two companies (Park and Behera, 2014). Such by-products can be in form of physical waste, energy, water, or air and, in default of symbiosis, would be disposed upon payment, or at least in change of some environmental cost. But when the symbiosis occurs, the company producing such by-products can give them to another company that is able to use them as raw materials or, more generally, as factors of production. This exchange opens a room for savings that are beneficial for both parties involved, therefore they are considered the "kernel" of EIPs (Chertow, 2007).

Several papers describe the nature of the exchanges that occur in EIPs, as well as the attendant economic and environmental benefits. For instance, with reference to the South-Korean EIP in Ulsan, Behera *et al.* (2012) enumerate 40 symbiotic relationships, thirteen of which being actually in operation and the remaining ones in negotiation stage or under feasibility investigation. Such relationships cover a wide spectrum of material and energy exchanges, ranging from recycling of waste oil to incineration of industrial or municipal waste supplying steam, from reuse of waste aluminium chips to conversion of high strength ammonia containing wastewater to a nutrient for microorganisms. Shi *et al.* (2010) address the TEDA EIP in Tianjin (China), isolating 81 symbiotic exchanges, 33 of

which among companies both located within the boundaries of the EIP, whereas the other ones involve an internal company with another that does not belong to the park: most of these transactions relate to materials, but there are several occurrences of symbiotic exchanges for water and energy. Liwarska-Bizukojc *et al.* (2009) conduct a similar analysis for the EIPs in Hartberg (Austria) and Schkopau (Germany).

4.2 Sustainable use of resources

This variable mainly relates to the quantity and the quality of natural resources involved in the production processes of the EIP. Within the scope of this assessment, natural resources are defined as: (1) non-renewable or slowly renewable resources that are available in nature in a limited amount and are adopted by the EIP as a whole, or any of its actors, for producing goods (e.g. soil, forest, oil, fish stocks, minerals, rare-earth elements); (2) resources that can be directly or indirectly derived from any of the previous ones (e.g. energy, wood, plastics); and (3) environmental compartments (e.g. air, soil, fertile ground, water basins) intentionally adopted as sinks to absorb emissions and dispose waste generated in the EIP processes, or depleted because of them.

To assess the amount of resources used by an EIP, it should be taken into account the existence of bilateral exchanges of materials and energy among the companies that belong to that EIP. Thanks to such interactions, the overall amount of resources is less than the sum of resources that each company uses in its production processes.

Park and Behera (2014) propose an indicator to measure the economic and environmental performance of industrial symbiosis in an EIP. It is based on the concept of eco-efficiency, namely the ratio between the product or service value and the environmental influence (Verfaillie and Bidwell, 2000). The latter is evaluated as weighted sum of raw material consumption, energy consumption and carbon dioxide emission.

4.3 Adoption of best available techniques

The concept of best available techniques (BATs) has been defined as “the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole”

(IPPC, 1996). Other organizations and country-specific laws and guidelines have adopted similar definitions of BATs, both referred to their general meaning and applied to specific contexts, e.g. as in the 2001 UNEP Stockholm Convention on Persistent Organic Pollutants (UNEP, 2001). In determining BATs, it should be considered: the consumption of natural resources, the use of less hazardous substances; the adoption of technologies able to minimize the amount and the dangerousness of waste and emissions, as well as to further recovery and recycling of wastes produced in other processes, and the prevention of accidents.

4.4 *Eco-design*

To comply with the sustainability goals, companies located in an EIP should re-think their products and services so as to reduce the attendant environmental impact along their entire life cycle. This principle can be adopted by adopting techniques and methodologies such as life cycle assessment (LCA) (Guinée and Heijungs, 2005) or, for manufacturing companies, design for disassembly (Bogue, 2007).

Mirata and Emtairah (2005) argue that, by establishing industrial symbioses, companies are oriented toward a collective definition of problems, promote an environmentally-oriented culture of inter-organizational collaboration and foster environmental innovation. Mattila *et al.* (2010) use LCA approaches to quantify the environmental impact of a Finnish forest industrial symbiosis and suggest priorities to make processes more sustainable. Liu *et al.* (2011) adopt LCA to assess the impact of an EIP in the Shanghai area.

4.5 *Environmental management systems*

In most countries and for many industries, companies must follow laws and regulations on emissions and pollution control, waste management, and other environmental issues. Beyond these compelling duties, companies may voluntarily adhere to standards, such as ISO14001 or EMAS (Eco-Management Audit Scheme) (Shi *et al.*, 2010; Taddeo *et al.*, 2012). These schemes help companies in building a comprehensive environmental management system that explicitly indicates goals, milestones, procedures and processes to be followed, as well as who is responsible for their fulfilment.

4.6 Green procurement

According to the Commission of the European Community, green procurement is the procurement of “goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured” (CEC, 2008). Several guidelines have been given for public institutions to promote procurement practices that take into account sustainability issues, in the European Union as well as in the USA (EPA, 1999). More recently, similar initiatives have been extended to companies and business organizations for specific sectors: Uttam *et al.* (2012), addressing the construction sector, analyse the ties between green procurement and environmental impact assessment. Routroy and Pradhan (2011) provide a framework for green procurement in manufacturing. Blome *et al.* (2014) investigate the impact of green procurement on supplier performance and show that the adoption of green procurement practices drives green supplier development (Bai and Sarkis, 2010) and is a pillar for green supply chain management (Srivastava, 2007; Diabat and Govindan, 2011).

4.7 Sustainable goods transportation management

Companies belonging to an EIP are typically interested in three types of material flows, i.e. incoming (e.g. for raw materials and components), outgoing (e.g. for finished products and wastes to be disposed outside the park), and internal to the EIP (e.g. flows of products, by-products, and waste materials that are processed by other companies within the EIP). To arrange these flows and make them more efficient, effective, and sustainable, various initiatives can be pursued in an EIP, such as building a shared transportation management system that coordinates the disperse transportation demand of the companies (Côte and Cohen-Rosenthal, 1998) and leverages on freight consolidation (Bellantuono *et al.*, 2013), or promoting the adoption of intermodality (Tudor *et al.*, 2007), so as to increase the adoption of means of transportation having a lower environmental impact.

4.8 Sustainable people transportation management

Another source of sustainability is the promotion of alternative means of transportation for people, especially for the workers' journey to work (Bakker *et al.*, 1999; Tudor *et al.*, 2007). By managing such programs at the park level, substantial economies of scale can be achieved.

To this aim, some initiatives that the EIP as a whole can promote are: building infrastructures for mass transportation means (e.g. a railway station) or sustainable transportation (e.g. bike lanes and tracks), subsidizing mass transportation networks (e.g. bus lanes within the park or between it and the nearest cities), arranging a car pooling management system, granting workers that switch to more sustainable means of transportation or imposing fees for the private vehicle entrance in the park area.

4.9 Landscape protection

Landscape protection is the combination of actions and initiatives aimed at preserving the natural environment and favouring the integration of human activities with it. The United Nations Environment Programme, in its technical report on industrial estates (Francis and Erkman, 2001), indicates the establishment of landscaping plans as crucial in designing new industrial parks and reconverting existing ones. The concept is relevant especially for EIPs, which are characterized by the strong leanings toward the environment.

However, for EIPs landscape protection does not consist in a mere attempt to disguise plants so as to not deface (or to limit the defacing of) the natural landscape: rather, based on the Forman's (1999) postulate of the existence of a dynamic relationship between landscape structure (namely the arrangement of natural and urban elements) and the landscape function (namely the ecological flows and processes), Yang and Lay (2004) suggest the adoption landscape ecology principles in designing EIPs to reduce the negative ecological effects of urban and industrial development. Often EIPs are the evolution of previously existing industrial parks, built with no regard to the environment, thus another key issue for them is the landscape regeneration, namely the definition of some targeted initiatives for restoring, at least partially, the natural ecosystem that has been already compromised .

5 Social dimension

5.1 Service provision

The existence of a EIP let companies to jointly provide some services – e.g. canteen, nurseries, sports facilities, language schools, dentistry, or tax consultancy offices – specifically addressed to workers in the EIP. The benefits arising from the existence of

such services, accessible for free or at discounted prices, goes beyond the economic advantage, and involves the people's quality of life. Co-locating such services nearby the work place, indeed, reduces their mobility needs, as well as the attendant time that is requested for making use of them. Moreover, it is possible to open the access to the above services to people who do not directly work for the companies belonging to the EIP, thus reinforcing the positive externalities that the park gives to the neighbour wherein it is located.

The above kind of initiatives goes beyond the usual practice to share utilities or access to common services, which Chertow *et al.* (2007) include among the symbiotic transaction and therefore consider a pillar in EIPs.

5.2 *Human resource training*

Sometimes, companies belonging to an EIP arrange conjoint human resource training about the topics that are not company-dependent, such as safety, or environmental protection. Beside the economies of scale assured by centralizing the training activities at a park level instead of at a company level (Roberts, 2004), the aim of these initiatives is twofold: at first, they contribute to the spread knowledge among workers about the importance of a sustainable behaviour, both at an individual and at an organizational level; in addition, they allow the shaping of a shared culture, a common language, and similar abilities. So doing, these initiatives strengthen the ties between companies, favour their mutual collaborations and foster the development of new strategies (Côte and Cohen-Rosenthal, 1998). In other terms, they provide a foundation to build business and social change. Lambert and Boons (2002), shaping a social science framework to scrutinize local industrial ecology, stress the importance of learning processes. As better pointed out by Boons *et al.* (2011), although the acceptance of a superficial social change is relatively easy for companies, in default of a genuine, deep change in their mind-sets, in the long term they tend to fall back to their old patterns of behaviour.

5.3 *Public awareness and stakeholder participation*

There is a common belief that dealing with waste, scraps, by-products, and recycling is always a source of problem for local communities, rather than an opportunity (Taddeo *et al.*, 2012): especially if people are informed on scandals that have involved such a kind of activities, they are reluctant to agree on the establishment of an EIP in their

surroundings. At the opposite, the change in value systems is beneficial for the establishment of an EIP (Roberts, 2004). The creation of a suitable cultural background among stakeholders is crucial especially in countries wherein citizen activists and non-governmental organizations can be effectively affect the strategic planning process of companies and institutions.

To bring about such a background, and in general to build good public relations (Pellenbarg, 2002), actors in the EIP should elicit public awareness by promoting initiatives aimed at disseminating information locally (Lowe, 1997; Shi *et al.*, 2010), and stimulate the participation of stakeholders in the decision making processes of the EIP (Heeres *et al.*, 2004; Mirata and Emtairah, 2005). Their participation is key especially in building a climate of trust and collaboration and in convincing on the technical and economic sustainability of the processes that companies belonging to the EIP carry on. Moreover, stakeholders can play as gatekeepers (Milchram and Hasler, 2002) in collecting information on the opportunities offered for supporting the EIP development.

On the other hand, in most cases discovering the real needs and worries of local communities and providing them with convincing answers is difficult for companies. Therefore, awareness and collaboration is promoted by establishing ad hoc agencies within the EIP (Schwarz and Steininger, 1997; Milchram and Hasler, 2002; Ashton, 2009; Taddeo *et al.*, 2012).

Table 2. List of the EIPs and their attendant descriptive features.

Name	Location	Year of constitution	References
Kalundborg	Copenhagen, Denmark	1972	Certow (2000); Baldwin <i>et al.</i> (2004); Jacobsen (2006)
National Industrial Symbiosis Programme (NISP)	various places, UK	2005	Desrochers (2001)
Crewe Business Park	Cheshire County, UK	1986	
Value Park	Schkopau, Germany	1998	Liwarska-Bizukojic <i>et al.</i> (2009)
Vreten Park	Stockholm, Sweden	1996	
Lopez Soriano	Saragoza, Spain	2002	
Hartberg Eco Park	Hartberg, Austria	1997	Baldwin <i>et al.</i> (2004); Liwarska-Bizukojic <i>et al.</i> (2009)
Arbois Mediterranée	Aix-en-Provence, France	1991	

Environment Park	Turin, Italy	1996	
Burnside	Halifax, Nova Scotia, Canada	1990	
Brownsville	Brownsville, TX, USA		Lowe (1997)
Cape Charles	Northampton County, VA, USA		
Fairfield	Baltimore, MD, USA		
Devens	Boston, MS, USA	2005	Baldwin <i>et al.</i> (2004)
Santa Cruz	Rio de Janeiro, Brazil	2002	Elabras Veiga and Magrini (2009)
TEDA	Tianjin, China	1996	Shi <i>et al.</i> (2010)
Naroda	Ahmedabad, India	1998	Singal and Kapur (2002)

5.4 Promotional events and symposia

To enhance the participation of local community, EIPs may organize seminars, meetings, and conferences, as well as training courses and similar public initiatives on environmental protection. Among these, a particular focus is given to educational programs addressed to schoolchildren or students. The effects of such a kind of initiatives is twofold: first, it spreads the sustainability concept among new generation and, through them, to their families; second, it shines a light on principles of EIPs and benefits that arise from their diffusion, and increases the community compliance toward them. This actions are also helpful in overcoming, or attenuating, the possible neighbours' objections or oppositions to the development of industrial areas, commonly considered a factor that negatively affects their quality of life.

6 Characterizing EIPs through the proposed framework

We applied the framework on a set of 17 well-known EIPs. The set has been defined so as to cover different experiences of EIPs variously located around the world: nine of them are in Europe, more specifically two in Scandinavian countries (Denmark and Sweden), two in UK, three in Central Europe (Austria, France, and Germany), and two in Southern Europe (Italy and Spain). Other five EIPs are located in North America (one in Canada and four in the United States) and the remaining 3 in developing countries, namely Brazil, China, and India. Table 2 lists the EIPs and summarizes their main features and the reference adopted for the analysis.

By desk analysis, we assess the characteristics of the EIPs included in our sample and retrieve the value that each variable assumes for each of them. The analysis has been mostly based on peer-review literature, and complemented with information retrieved by analyzing the EIPs' web-sites and other web sources. Tables 3, 4, and 5 relate to organizational, environmental, and social dimensions, respectively. The tables indicate if an EIP has or lacks the features described through the variables that are included in the proposed framework. For all the variables, indeed, we assumed two possible values only.

Table 3. Classification of the analyzed EIPs according to the organizational dimension.

Organizational dimension	Kalundborg	NISP	Crewe Business Park	Value Park	Vreten	Lopez Soriano	Hartberg Eco Park	Arbois Mediterranée	Environment Park	Burnside	Brownsville	Cape Charles	Fairfield	Devens	Santa Cruz	TEDA	Naroda
Top-down development process	✓	✓							✓					✓	✓	✓	
Existence of an anchor tenant				✓							✓	✓					
Governmental support	✓	✓			✓			✓	✓					✓		✓	
Heterogeneity				✓		✓	✓										
Cooperation among companies	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cooperation with universities and research centers	✓		✓	✓			✓	✓	✓				✓				✓
Cooperation with governmental agencies	✓	✓	✓					✓	✓	✓	✓			✓	✓	✓	
Shared information system				✓		✓			✓		✓						
Commonality of support services	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

7 Cluster analysis

With reference to each dimension of analysis, Tables 3 to 5 show the heterogeneity of EIPs. This evidence suggests to address the questions whether there exist different types, or models, of EIPs, each having its own characteristics and, in case, which are the characteristics that define these models.

To investigate the existence of homogeneous patterns, cluster analysis was adopted. It includes a family of techniques that use algorithms based on the concepts of similarity and dissimilarity to decompose a set of elements, each described by a number of variables, in two or more subsets mutually disjointed, named clusters. Basically, the underlying concept of this aggregation is to maximize the similarity among elements that are included in the same cluster, while maximizing the difference within every couple of them that belong to different clusters (Kaufman and Rousseeuw, 2009). Instead of other techniques (e.g. discriminant function analysis), in cluster analysis the features that define the clusters are not pre-determined, rather they emerge from the clustering itself. This requires to give an ex-post interpretation of the clusters obtained, which often urges scholars to trade-off between the number of clusters considered and the homogeneity among the elements included in the each of them.

Of the 17 EIPs instances, we did separate cluster analyses for organizational, environmental, and social dimension. We considered all the variables included in the framework, as listed in Table 1, and assumed two possible values for each of them, according to the binary scheme depicted in Tables 3, 4, and 5. The analysis has been conducted on IBM SPSS software, selecting the Euclidean quadratic distance as a measure of dissimilarity, and making use of a hierarchic aggregation method. The latter consists in aggregating elements into a progressively sloping number of clusters: at each step, the clusters obtained in the previous one are compared and the more similar of them amalgamated. To aggregate clusters, the unweighted pair-group average rules is adopted.

Table 4. Classification of the analyzed EIPs according to the environmental dimension.

Environmental dimension	Kalundborg	NISP	Crewe Business Park	Value Park	Vreten	Lopez Soriano	Hartberg Eco Park	Arbois Mediterranée	Environment Park	Burnside	Brownsville	Cape Charles	Fairfield	Devens	Santa Cruz	TEDA	Naroda
By-products exchange	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sustainable use of resources	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Adoption of Best Available Techniques	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Eco-design			✓	✓					✓	✓				✓	✓	✓	
Environmental management systems			✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	
Green procurement		✓							✓						✓	✓	
Sustainable goods transportation management	✓	✓	✓	✓	✓				✓					✓	✓		
Sustainable people transportation management		✓	✓	✓					✓					✓			
Landscape protection			✓	✓					✓	✓		✓	✓	✓	✓		

Table 5. Classification of the analyzed EIPs according to the social dimension.

Social dimension	Kalundborg	NISP	Crewe Business Park	Value Park	Vreten	Lopez Soriano	Hartberg Eco Park	Arbois Mediterranée	Environment Park	Burnside	Brownsville	Cape Charles	Fairfield	Devens	Santa Cruz	TEDA	Naroda
Service provision						✓	✓			✓				✓	✓		
Human resource training	✓	✓	✓			✓			✓			✓		✓			
Public awareness and stakeholder participation	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓		
Promotional events and symposia			✓	✓		✓	✓	✓	✓	✓				✓			

Table 6 summarizes the results of the cluster analyses that have been separately conducted on the three dimensions. For each dimension, two clusters have been assumed.

Table 6. The resulting clusters for each dimension of analysis.

Organizational dimension	Environmental dimension	Social dimension
<i>Cluster ORG-1</i> – Kalundborg – NISP – Crewe – Arbois Mediterranée – Environment Park – Burnside – Devens – Santa Cruz – TEDA <i>Cluster ORG-2</i> – Value Park – Vreten – Lopez Soriano – Hartberg – Brownsville – Cape Charles – Fairfield – Naroda	<i>Cluster ENV-1</i> – Kalundborg – NISP – Value Park – Vreten – Lopez Soriano – Hartberg – Arbois Mediterranée – Brownsville – Cape Charles – Fairfield – Devens – Naroda <i>Cluster ENV-2</i> – Crewe – Environment Park – Burnside – Santa Cruz – TEDA	<i>Cluster SOC-1</i> – Kalundborg – NISP – Value Park – Vreten – Lopez Soriano – Hartberg – Environment Park – Burnside – Cape Charles – Fairfield – Devens – Santa Cruz <i>Cluster SOC-2</i> – Crewe – Arbois Mediterranée – Brownsville – TEDA – Naroda

As for the organizational dimension, it should be preliminarily observed that in all the EIPs common support services are provided, and cooperation with companies exists: therefore both these variables are not suitable to distinguish the clusters. At the opposite, cooperation with governmental agencies is observed in all the EIPs included in the former cluster (which we call ORG-1), and in none of them included in the latter one (named ORG-2). The patterns for the development process of the EIP and the governmental support are, to some extent, similar: as to the former, a top-down development process is identified in six EIPs, all included in the cluster 1; as to the latter, the institutions give support to the EIP in seven cases, six of which are included in the cluster ORG-1 and only one in the cluster ORG-2. Vice versa, all the EIPs wherein the heterogeneity among firms is attested are included in the cluster ORG-2. These results let us label the cluster ORG-1 as composed by EIPs whose development has been planned by institutions, that collaborate and are strongly supported by them, and the cluster ORG-2 as composed by spontaneous, self-organized EIPs, possibly driven by an anchor tenant that is able to aggregate heterogeneous companies.

As for the environmental dimension, the sustainable use of resources is common to all the EIPs, and the adoption of best available technologies as well as the byproducts

exchange are carried out in 15 of 17 parks. These variables, all pertaining to the sub-dimension that describe the production processes, are thus ineffective to classify EIPs in two clusters. According to the results of the analysis, the main difference between the two clusters ENV-1 and ENV-2 is in the extent to which EIPs recur to the management practices for the environment protection: namely, the 5 parks included in the cluster ENV-2 adopt these practices more extensively than the ones included in the cluster ENV-1; the unique exception is the existence of sustainable transportation management systems for goods and people, which are slightly more frequent among the EIPs belonging to the cluster ENV-1.

Finally, from the cluster analysis applied to the third dimension it is possible to distinguish a group of EIPs, wherein the adoption of initiatives in the social field is quite common (cluster SOC-1), from another smaller group (cluster SOC-2) that is formed by EIPs that seldom implement this kind of initiatives. Moreover, within the former cluster, the most common variable is the elicitation of public awareness and stakeholder participation: it seems to be the first and most important step that EIPs should accomplish to take initiatives in the social field.

Table 7. Organizational and environmental dimensions.

		Environmental clusters	
		ENV-1	ENV-2
Organizational clusters	ORG-1	4	5
	ORG-2	8	0

Table 8. Organizational and social dimensions.

		Social clusters	
		SOC-1	SOC-2
Organizational clusters	ORG-1	6	3
	ORG-2	6	2

Furthermore, we have investigated whether a relation exists between the organizational structure of EIPs and the adoption of environmental or social practices.

At first, we have analyzed the clusters comparing the organizational against the environmental dimensions (Table 7): this comparison shows that all the elements belonging to the cluster ORG-2 also belong to the cluster ENV-1. It means that the self-organized EIPs are less likely to adopt the management practices in the field of environmental protection than EIPs developed thanks to top-down initiatives. This insight is consistent with the different organizational nature of the two kinds of EIPs and the peculiarity of these practices: the adoption of environmental management practices relate to the EIP as a whole rather than a single company, which is more likely to require a higher coordination effort. We believe that this is hardly achievable without the presence of an “external” actor, e.g. an institution or an association of companies or entrepreneurs. Such an actor can play a key role for the EIP coordination, e.g. by prompting the park establishment itself, or by subsidizing activities, arranging a framework of norms.

We have then compared the organizational and social dimensions: data in Table 8 do not show any correlation between the two dimensions.

8 Conclusions

This paper has investigated Eco-Industrial Parks (EIPs), namely networks of companies and other actors located in the same area, which establish collaborations and exchange byproducts to exploit new business opportunities and increase their economic performance, by minimizing the environmental impact and creating benefits for the local community. Even though this topic has been extensively addressed in the literature, to our knowledge there is a lack of studies that aim at assessing possible linkages between the organizational structure of an EIP and its environmental and social practices. This paper is a first attempt to cover this gap.

We have proposed a framework that characterizes EIPs along three dimensions of analysis, namely organizational, environmental, and social. Every dimension has in turn been decomposed into several variables. We have then applied our framework to a set of EIPs located in diverse geographic areas. A cluster analysis has been carried out based on the value assigned to all variables characterizing any EIP: for each dimension, two

clusters have been obtained and described according to the identified features. The analysis shows that some variables (organizational features as well as environmental practices) are common to all the considered EIPs, or at least to the majority of them. Such a set of variables could then be considered as fundamental for the EIP's establishment. On the other hand, the remaining variables (organizational features and practices that occur less frequently) could be used to assess the differences among existing EIPs. Finally, the clusters related to the analyzed dimensions have been compared so as to investigate the existence of possible patterns. We have compared the EIP organization against (i) environmental and (ii) social practices. In particular, EIPs promoted or supported by governmental initiatives apply environmental practices more extensively than EIPs which emerge as spontaneous initiatives and have limited public support. This result suggests that even for self-emerging EIPs, an "external" actor playing a coordination role might help adopt the environmental practices not strictly related with production processes.

Though our study is exploratory, we stress some possible limitations. First, in our analysis we consider a limited set of existing EIPs. Second, data have been retrieved by desk analysis (based on previous literature and complemented by the website analysis), which, being based on indirect information, might involve some inaccuracy. Further research would then move from the preliminary insights to formulate research hypotheses and test them by means of an extensive survey.

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A Maturity Assessment Model to Benchmark Virtual Communities of Practice: A Study in the Oil and Gas Industry

Alejandro Germán Frank *

Department of Industrial Engineering
Federal University of Rio Grande do Sul
Av. Osvaldo Aranha, 99 – 90035190, Porto Alegre (Brasil)

Luca Gastaldi, Emanuele Madini, Mariano Corso

Department of Management, Economics and Industrial Engineering
Politecnico di Milano
Via Lambruschini, 4b (Building 26b) – 20156, Milan (Italy)

** Corresponding author*

Structured Abstract

Purpose – The aim of this paper is to propose a model to assess the maturity level of companies' organisational, managerial and technological levers for Virtual communities of practices (VCoP). The proposed model serves as a benchmarking tool in order to analyse an industry sector performance in the management activities of VCoP.

Design/methodology/approach – The methodological approach was divided into two main stages: (i) the development of the VCoP Maturity Assessment Model, and (ii) an application of such model to different realities (benchmarking). The model proposes the assessment of eight key elements to measure the company's organisational, managerial and technological maturity in order to find a correlation with the performance and business impact of the VCoPs. On the other hand, the performance of the VCoP is evaluated based on four main criteria: utility, trust, contribution and sense of belonging. After the development of the model, we carried out an application of it in a benchmarking study of six of the major Oil & Gas global companies focusing on the Exploration & Production sector of such companies.

Originality/value – The main contribution of this paper is that an assessment carried out by the proposed model provides an overview of the strengths and weaknesses of the VCoP management system, and the opportunity for comparison with other organisations. Moreover, the assessment also enables the identification of a series of potential actions that can be undertaken in order to improve the current status of the virtual communities.

Practical implications – Our benchmarking study put in evidence the usefulness of the proposed model. Companies were compared and ranked in terms of the performance of VCoP management. Such results helped companies to have a clear vision of their own state in management practices. Moreover, the assessment helped in identifying the best

practices to be shared in order to improve the overall usage of VCoPs within the Oil and Gas industry.

Keywords – Communities of Practice, maturity assessment model, Oil & Gas industry

Paper type – Academic Research Paper

1 Introduction

The concept of Communities of Practice (CoP) was introduced by Wenger and Leave in the early years of 1990 (Leave and Wenger, 1991). Basically, it consists on group of people that share knowledge, problems, solutions, information and news about a specific issue, helping to extend the group learning by means of people interaction (Wenger et al., 2002).

At the beginning, CoP used to be built by means of a personnel interaction among members, but this changed with the advance of technologies. Today, there are also Virtual CoP (VCoP), which is referring to a group of people who interact, learn together and build relationships through specific social media, potentially crossing geographical and political boundaries in order to pursue mutual interests or goals, developing a sense of membership and reciprocal commitment (Leave and Wenger, 1991; Kowch and Schwier, 1997; Wenger et al., 2002; Jeon et al., 2011). VCoP is the community approach that is attracting more interest in the business environment, mainly in large companies. This is because it helps to bring near experts from different sectors and regions, enabling them to build a common base of knowledge among people dispersed in different places (Song et al., 2007; Montoya et al., 2009).

Following such approach, VCoP have become a common knowledge management practice in Oil & Gas companies. In this sector, VCoP are seen as one of the most powerful knowledge management tool (Corso et al., 2009), since the teams and the experts are frequently dispersed in other units from other countries that need to be integrated. Thus, VCoP are a way to reduce displacement costs of experts that traditionally should be physically present in order to help solving a specific problem. Moreover, VCoP are considered a way to share best practices adopted by some experts that achieved a successful result, aiming to standardize the organisational processes based on the most successful practices and tools used. In the Oil & Gas industry there are different approaches for VCoP. Some companies have adopted models oriented toward individual initiatives, without a centrality of the VCoP management functions. Other companies have adopted

structured models for VCoP, in which member activities are coordinated by a central management team. Consequently, there is not a single strategy to address VCoP in this sector, which changes according to the company's characteristics (Corso et al., 2012). Some prior research have studied the particularities of the VCoP in this sector (e.g. Edmonds, 2002; Scarso et al., 2009) and it is noted that there is a lack of standardization and systematization of the best practices used for VCoP in this industrial sector. Moreover, such a lack of systematization of best practices drives to another problem, which consists in measuring the maturity level of VCoP management in a specific company of this sector when compared with its competitors.

Thus, the aim of this paper is to propose a model to measure the maturity level of companies' organisational, managerial and technological levers for virtual communities of practices (CoP), based on best practices proposed for VCoP management. The proposed model serves as a benchmarking tool in order to analyse an industry sector performance in the management activities of VCoP. The main contribution of this paper is that an assessment carried out by the proposed model provides an overview of the strengths and weaknesses of the VCoP management system, and the opportunity for comparison with other organisations. Moreover, the assessment also enables the identification of a series of potential actions that can be undertaken to improve the current status of the VCoP.

2 Models to evaluate VCoP

There are several perspectives in which the CoP are evaluated. The academic literature has proposed some models, frameworks and domains that should be considered for a community evaluation. Basically, Wenger et al. (2002) identify three common characteristics of CoP that should be considered: (i) Domain (the area of interest); (ii) Community (relationships and the development of a sense of membership and reciprocal commitment; and (iii) Practice (the shared repertory of competences and common resources that members have developed). Based on these principles, some authors have developed different models for CoP evaluation. For instance, Kim et al. (2012) developed a diagnosis framework that help identifying the current knowledge sharing activity status in a CoP. Lee et al. (2010) proposed an evaluation of CoP based in an evolutionary process. Bertone et al. (2013) presented a conceptual framework for CoP assessment in health policy; while Loyarte and Rivera (2007) proposed a model for CoP cultivation. Chu and Khosla (2007)

proposed index evaluations for CoP. Probst and Brozillo (2008) studied the success and fails of CoP, aiming at identifying best practices for CoP management. Such works help to identify several factors and characteristics that should be considered in order to provide a clear understanding of weaknesses and strengths of a CoP. These models present different perspectives, since some of them look at CoP assessment from a perspective of growing, and others from a perspective of index that should be implemented. Both point of views help us to build an assessment framework that help for a benchmarking in the Oil & Gas industry, aiming at evaluating companies' best practices and performances in the use of VCoPs.

3 Research Method

The methodological approach was divided into two main stages: (i) the development of the VCoP Maturity Assessment Model, and (ii) an application of such model to different realities (benchmarking).

First, the maturity model was developed based on the study of international literature and the analysis of implementations of knowledge management systems and communities. Several CoP characteristics and best practices were analysed from Kim et al. (2012), Lee et al. (2010), Bertone et al. (2013), Loyarte and Rivera (2007), Chu and Khosla (2007) and Probst and Brozillo (2008), Corso et al. (2009). Based on these characteristics for CoP assessment, we developed a model based on the main common issues mentioned in such works. Complementary practices and characteristics cited only by few works were also added. The model proposes the assessment of eight key elements to measure the company's organisational, managerial and technological maturity in order to find a correlation with the performance and business impact of the VCoPs. These eight VCoPs' key elements are: culture, sponsorship, architecture alignment, development, management, policy, technology and community assessment. On the other hand, the performance of the VCoP is evaluated based on four main criteria: utility, trust, contribution and sense of belonging.

After the development of the model, we carried out an application of it in a benchmarking study of six of the major Oil & Gas global companies focusing on the Exploration & Production sector of such companies. In order to meet the benchmarking objectives, the collection and analysis of data were conducted using different methodologies: (i) an online survey of 22 multiple-choice questions addressed to 14 KM Managers with

the aim of assessing the VCoP maturity level considering the above mentioned key elements; (ii) an in-depth interview to validate the data collected and to identify the most relevant initiatives supporting the VCoPs management; and (iii) a collection of documents and presentations describing the Knowledge & Community Management System. The benchmarking panel includes some of the major global companies, comparable in terms of size (number of employees) and internationalization level. In particular, the analysis is focused on the use of Knowledge & Community management in the Exploration & Production Unit of Oil & Gas companies.

4 Results

3.1 A model to assess the maturity of VCoP

Our model (Figure 1) proposes the assessment of eight key elements to measure the company's organisational, managerial and technological maturity in order to find a correlation with the performance and business impact of the VCoPs. These eight VCoPs' key elements are: culture, sponsorship, architecture alignment, development, management, policy, technology and community assessment. On the other hand, the performance of the VCoP is evaluated based on four main criteria: utility, trust, contribution and sense of belonging. Following, we describe these elements showed in Figure 1.

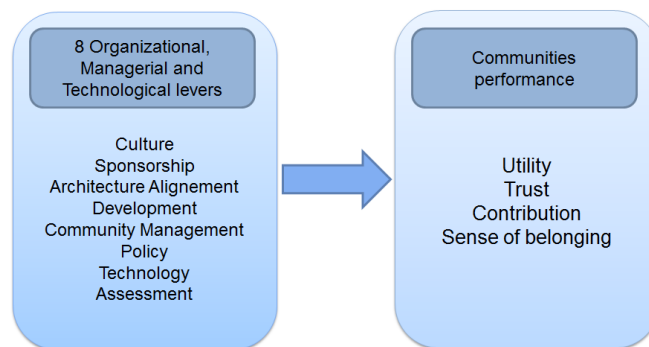


Figure 1 – VCoP assessment model

Assessment of VCoP performance

The performance of the VCoP is evaluated through 4 variables: (i) Utility: users believe in the utility and effectiveness of the communities for their own activities; (ii) Trust: there is strong sense of trust between the members of a community; (iii) Sense of belonging: members have offline relationships and connections among themselves, and a strong

sense of belonging to the community; (iv) Contribution: members participate in the community in a continuous and systematic manner.

Assessment of VCoP Levers

The KM Maturity Assessment Model considers 8 variables in order to evaluate the company's organisational, managerial and technological maturity:

(i) Culture: attitude of top management, middle management and employee towards knowledge sharing behaviours. The analysis of the "culture" evaluates the attitude of top management, middle management and the employee towards the following organisational behaviors that support Knowledge & Community Management: a) *Emerging collaboration* (cross-functional and independent of predefined hierarchies) between people and internal experts; b) *Openness* to knowledge-sharing with actors in the company's extended network (customers, partners, suppliers, consultants, etc.); c) *Co-creation*, creation of broad participatory content and knowledge by people to foster widespread innovation; d) *Sociality*, enhancement of interpersonal relationships and stimulation of the creation and management of extended networks of contacts; e) *Transparency* and opportunity to communicate freely in a climate of trust and belonging to the organisation; f) *Flexibility to change*, capacity and speed of process and activity changes in response to shifts in business needs and context.

(ii) Sponsorship: management, countries and business units support in development and use of the communities. Regarding the management's sponsorship of the VCoP, the analysis considers two different dimensions: a) *Top and Middle Management Involvement* (i.e. sponsorship toward the development and use of communities); and b) *Top and Middle Management Commitment in Communities* (i.e. whether there is or not a widespread participation by managers in the launch, promotion and change management activities; and in contributing to the communities).

(iii) Architecture alignment: definition of objectives and long-term development plans for the communities, and analysis of the target needs and methods of interaction. The analysis in this category considers two different dimensions: a) *Target-needs alignment*, i.e. domain of the VCoP (common themes and problems, expertise of potential members, tools and language to be used, etc.), the needs of the target users, the methods of interaction and the informal networks of the target users (e.g. organisational network analysis); the company objectives and the needs of community members, identifying shared goals;

b) *Business alignment*, i.e. long term development plans with objectives that are aligned with corporate strategy; a clear mission for each community defined and communicated (e.g. technical improvement, process innovation, training, etc.); top and middle management involvement in the community concept definition (goals, scope, domain, etc.).

(iv) Development: approach for the development of the communities in terms of design, activities, roles, people and country involvement, technology tools and change management. Regarding this construct, the analysis considers two different dimensions: a) *Open and cross-organisational participation*, including people with expertise in communications, organisational and business process, in addition to technical roles; identification and involvement of internal “champions” in the development phase of the community (i.e. users with some experience in the use of community tools and promoters of change); collection and acceptance of independent initiatives by employees for the creation of new communities; and various countries involved in the definition and design of the communities. b) *Structured roles and activities* defined with a team dedicated to the technical development of community tools and a launch and change management plan for each community established.

(v) Community management: regarding the management of the communities, the analysis considers two different dimensions: a) *Animation and Incentive activities*, like strategies to promote the community (promotional videos, communication campaigns), activities to involve the community members and to stimulate contributions (editorial plans, contests), specific communication and engagement activities defined for the various countries, offline Meetings and events organised for community members (workshops, conventions, etc.), open and free policies of use are established (free access to community, contributions without moderation, etc.), activities for training and support on community tools; economic incentives tied to user participation and contribution in the communities (e.g. bonuses, benefits, MBO); formal recognition tied to participation and contribution in the communities (e.g. awards, contests, visibility in the community, etc), organisational policies and procedures to increase user participation (ex. evaluation workflow of business application, request; b) *Structured roles and activities*, like community manager and/or a central team (KM Team) that coordinates the various initiatives, the roles and the coordination mechanisms that regulate the management of the community (e.g. community leaders, facilitators, process owners, KM champions and area experts), adequate training and enough time to dedicate to VCoP management activities, use of

tools and initiatives for sharing best practices among the people who manage the communities, and monitoring of the evolution of the community over time.

(vi) Policy: regarding community use policies, the analysis considers two different dimensions: a) *Accessibility*, i.e. all employees can obtain access to any community through a simple registration process; and b) *Trasparency*, i.e. users may freely express their own opinions within the boundaries of corporate etiquette.

(vii) Technology: the technological assessment considers 3 main categories of IT tools: a) *Social Network & Community (SN&C)*, which supports in managing and creating relationships between individuals through tools promoting discussion, the exchange of ideas and involvement in networks of extended acquaintances, including those beyond company borders (blogs, forums, social network tools, expert research, advanced user profiles, etc.); b) *Unified Communication & Collaboration (UC&C)*, which supports in managing each type of communication and collaboration both within and outside the company, uniformly and independently of the media adopted to transmit contents (web, landlines, mobile, TV) through specific infrastructures and tools audio/web/videoconferencing, instant messaging, VoIP, etc); c) *Enterprise Content Management (ECM)*, which provides support in managing contents and documents within and outside an organisation through tools that improve accuracy, accessibility and integrity.

(viii) Assessment: regarding the monitoring of community activities, the analysis considers two different dimensions: a) *Monitoring, which considers the use of a measure of community access and use* in a systematic way; an appropriate KPIs and success metrics; executive reporting carried out in a systematic manner; and an analysis of utilisation levels for the redefinition of the strategy for the development of the communities. b) *Analysis of the benefits and business impact*, which considers standard organisational tools and mechanisms established to identify the benefits and the business impact of the community system; benefits and business impact of the community system identified in qualitative terms (e.g. qualitative descriptions, indicators, etc.); benefits and business impact of the community system identified in quantitative/economic terms (time/cost reduction, increased quality, increased production); and evidence of the benefits and success stories provided to community stakeholders.

3.1 Applying the VCoP maturity assessment model in the Oil & Gas industry

Our proposed model was applied in four leading Oil & Gas companies in order to evaluate their VCoP management performance. First, Figure 2 presents the results of VCoP performance, which was measured by utility, trust, contribution and sense of belonging through the answer provided to an electronic survey confirmed by a set of case studies.

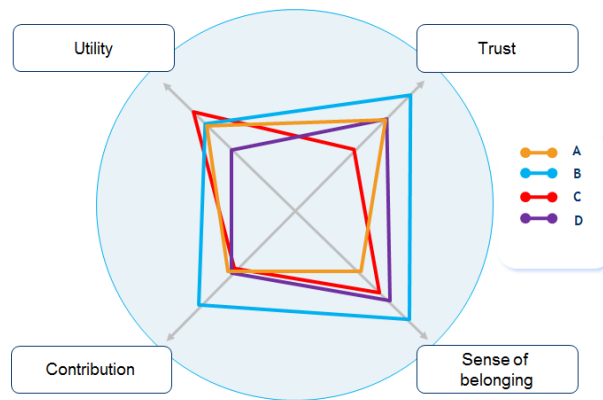


Figure 2 – Assessment of VCoP performance

After evaluating VCoP performance, the eight VCoP management levers were also evaluated, based on the items presented in previous section. Figure 3 shows the main result about such levers.

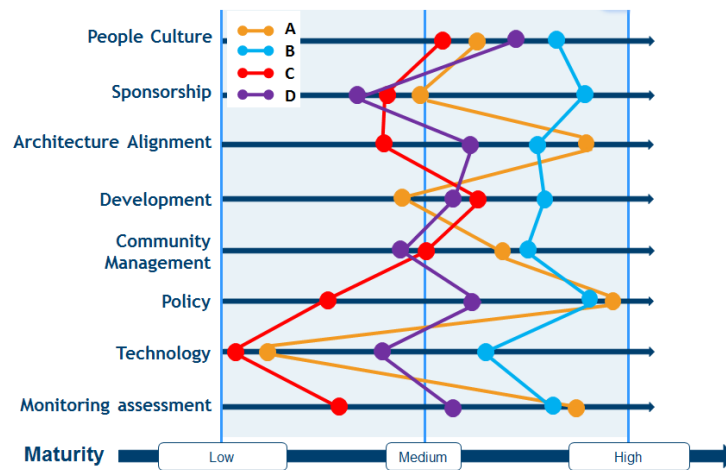


Figure 3 – Assessment of VCoP levers of maturity

As expected by our maturity assessment model, the company that presented the best performance in results showed in Figure 2 (Company B) was the same that showed the best condition in terms of levers maturity in Figure 3. The same happens with the company with the worst VCoP performance in Figure 2 (Company C), which is the company that presented the lowest maturity in the evaluated levers (Figure 3), especially in policy, technology and assessment monitoring.

It is also worth to note that all companies presented higher scores to the utility and sense of belonging of VCoP, and that the most important problems associated to VCoP performance are related to the lack of contribution of the members and the lack of trust among communities members (Figure 2). On the other hand, when considering the levers (Figure 3), technology appears as the most critical lever in which VCoP are still in a very low maturity stage. In this sense, we collected information about the most used technologies in the companies analysed. Figure 4 presents such results.

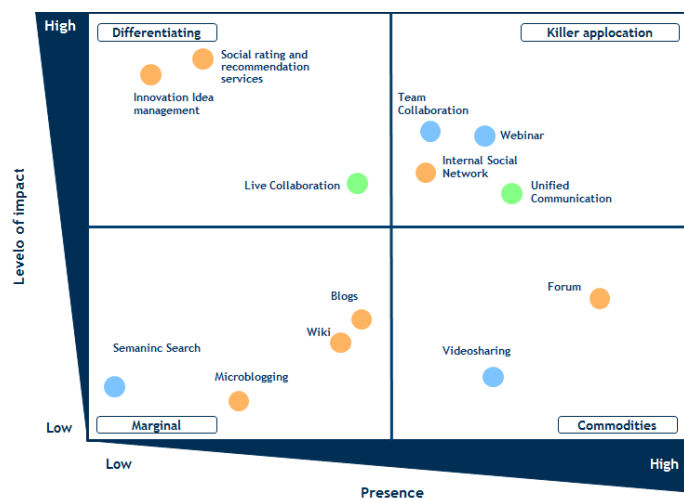


Figure 4 – Technological tools used in VCoP of the Oil & Gas companies

Based on the in-depth interviews we carried out with KM managers, we classified VCoP technologies using two axis of scores (Figure 4). The first axis shows the level of presence or use of a specific technology in the VCoP studied. The second axis shows the level of contribution or impact of such a technology for VCoP in the Oil & Gas sector. We classified these technologies based on the two axes in four quadrant: marginal, commodities, differentiating and killer applications. The first two quadrants have a low con-

tribution for VCoP, according to the interviewees. On the other hand the differentiating and killer applications are the most powerful technological tools for VCoP in this industrial sector. Technologies in blue colour are those related to enterprise content management, in orange are those related to social network, and in green color the related to unified communication and collaboration. The differentiating quadrant of Figure 4 presents tools that are used few in such communities but have a high potential of contribution for VCoP.

5 Conclusions

This paper presented a model to measure the maturity level of companies' organisational, managerial and technological levers for virtual communities of practices (CoP). The proposed model serves as a benchmarking tool in order to analyse an industry sector performance in the management activities of VCoP. The main contribution of this paper is that an assessment carried out by the proposed model provides an overview of the strengths and weaknesses of the VCoP management system, and the opportunity for comparison with other organisations. Moreover, the assessment also enables the identification of a series of potential actions that can be undertaken to improve the current status of the virtual communities.

Our benchmarking study put in evidence the usefulness of the proposed model. Companies were compared and ranked in terms of the performance of VCoP management. Such results helped companies to have a clear vision of their own state in management practices. Moreover, the assessment helped in identifying the best practices to be shared in order to improve the overall usage of VCoPs within the Oil and Gas industry.

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Regional Economic Renewal through Structured Knowledge Development within an Agglomeration Economic Framework: The case of the cellulose fibre value chain in the Mt. Gambier region of South Australia

Göran Roos, *

Entrepreneurship Commercialisation and Innovation Centre
Level 5, Nexus 10 Building
Cnr Pulteney St and North Terrace
The University of Adelaide, AUSTRALIA 5005

Toni Ahlqvist, Mikko Dufva, John Kettle, Nafty Vanderhoek, Eemeli Hytönen, Klaus Niemelä, Antti Kivimaa, Ville Valovirta, Torsti Loikkanen

VTT Technical Research Centre of Finland
P.O. Box 1000,
FI-02044 VTT, Finland

** Corresponding author*

Structured Abstract

This paper discuss how regional economic renewal can be achieved within a region that is highly dependent on a traditional low value added industry with relatively low technology level and the competitiveness of which has declined, over a short period of time, to a level where economic viability is questionable. The approach is built around government intervention to reduce the information asymmetry between local players and global state-of-the-art whilst simultaneously instigating a culture shift enabling cluster development for the implementation of identified transformation pathways.

The project involved the establishment of a policy framework with a balanced supply side tool, information provision and demand side tool portfolio. This was then followed by a mapping of the local value network and its participating actors to identify their present status as compared to world best practice. Following on from this, there was construction of alternative strategic technology roadmaps which differed on the raw material lenses used, time lines, competence levels and investments. In parallel with this there was communication and engagement processes to enable a self-organised cultural

shift towards a situation conducive to initiating industry led clusters. The early successes are identified as well as indicators for the desired trajectory being followed.

Purpose – The purpose of the research is to capture a novel approach to regional economic renewal through the application and synthesis of approaches from several different domains. The theoretical lens, the tools, the process and the outcomes are described.

Design/methodology/approach – The approach taken was descriptive with the roadmaps adding prescriptive conclusions, and hence the studied project is in its own right was both descriptive and prescriptive. The methodology is a triangulation of theory and literature review, empirical data collection, qualitative and quantitative analysis as well as observation of outcomes.

Originality/value – This methodology puts in evidence of integrating methodologies from foresight, strategy, social science, policy science, innovation studies, cluster studies and Schumpeterian economics¹. The combination of methods adds to the current innovation management and industry renewal theory.

Practical implications

The main outcomes of the project are (a) the changed attitude among the value chain participants, (b) the identified renewal trajectories, (c) the identified and verified balance of policy tools for economic renewal, and (d) the acceptance of cluster development as an industry led route to success.

The combination of these methods adds to the current innovation management and industry renewal theory and generates, at least, three implications. Firstly, the integration of company assessment, value chain analysis and identified renewal trajectories created new opportunities, but also new challenges, on both the micro and meso levels. Secondly, the future-oriented, lens specific, global view was a new approach among the regional players that formed a cornerstone in raising awareness about the needs to collaborate and form a joint strategy and it also provided an educational input for policy makers dealing with regional industrial development in a new way. Thirdly, the project also had a strong policy perspective that focused on the interaction between path dependency and path creation in a technologically very dynamic domain and within an agglomeration economic and Schumpeterian framework.

The project had both practical and managerial implications: Firstly, the company assessment identified domains where individual firms had weaknesses as well as where the group as a whole lagged global best practice. Secondly, the value chain analysis showed strengths and weaknesses of the present industrial structure in the region, but also delineated the necessary components to be developed in order to move towards higher

¹ Schumpeter, 1934.

value added production. Thirdly, the renewal trajectories identified the present and future operational frontiers in advanced cellulose fibre-based industries, and made possible a successful positioning of the Green Triangle region, the regional industry and the individual firms for future success. Fourthly, the project has generated a high level of international interest resulting in several high-value adding cellulose fibre related firms approaching the region for potential relocation.

The study contributed to the creation of a future-oriented strategic agenda for the Green Triangle region on the macro, meso and micro levels. The integrated approach created in the project will also benefit innovation, industry and innovation policy, and industry and regional transformation and renewal scholars. Individual companies can apply the assessment framework and key transformation trajectory findings in their own strategy work.

It can be concluded, as evidenced in the main text, that the project is a clear success at this point in time but it remains to be seen what trajectories the path creation in the Green Triangle will take into the future.

Keywords - policy, industrial renewal, cluster, value chain

Paper type – Academic Research Paper

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1 Introduction

Australia has a long period behind it as a relatively low cost environment to operate in, especially in domains of low value adding to local raw materials where Australia has a traditional comparative advantage on the primary industry side e.g. mining, natural gas, agriculture, forestry and marine. This changed very rapidly around 2008 when the mining boom created a Dutch disease problem for Australia and the industries linked to the above areas suddenly found that they operated in a high cost environment where they could no longer compete on price doing what they did and they had no tradition in developing their

business into producing high value for money offerings at a relatively high cost (Prime Minister's Manufacturing Taskforce, 2012; Roos, 2012; 2013b; Roos & Kennedy, 2014).

Being exposed to this rapid shift resulting in very poor financial performance combined with a lack of experience and capability around how to move to a more successful basis for competing in a high cost environment many of these firms were rapidly facing a risk of going under (see e.g. Kettle et al., 2012). Many of these firms were stuck with low value add products, outdated production technology and eroding competitiveness. With insufficient capacity to innovate and adopt new technologies firms, sectors and entire regions can fall into a vicious circle of economic decline having negative effect also on other firm's profitability, their supplier industries, local employment and all of the local communities.

At this point policy makers can chose between three options: Firstly, they can allow the force of creative destruction to take its toll by letting uncompetitive sectors dwindle and hope more productive and competitive operations will grow to replace them. This laissez-faire approach, favoured in the neoclassical view of the world, has a high short term economic and social cost. In spite of what the neoclassical economic theory states, it provides no guarantee that more productive and competitive businesses will emerge to replace the disappearing ones, especially if the industrial commons¹ surrounding a key natural resource is being reduced. As a consequence, large stocks of local natural and human capital may become redundant. Secondly, they can start providing economic support to the threatened sector in order to improve its viability and its ability to maintaining its current operations. While this option might be politically attractive in order to save jobs, a key objective in the neo-Keynesian view of the world, it is very expensive and holds no guarantee for success in the long run. If anything, it delays the necessary transformation thus making it even harder to deal with the inevitable changes at a later stage. Numerous examples e.g. the ship building crisis in Europe during the 1970s, illustrates the futility in pursuing this approach. Thirdly, they can take an active role in instigating and facilitating transformation towards a new technological trajectory with a view to developing higher value add products for emerging markets. This is a challenging

¹ *The industrial commons is normally defined as the embedded knowledge, technology capabilities, specialised equipment and specific co-specialised assets that enhance the efficiency, effectiveness and productivity of the proprietary capital and labour that use it. This industrial commons does not reside in one organisation but is spread out over a large group of organisations and individuals but normally within a limited geographic domain (Pisano & Shih, 2009).*

task for policy makers. Governments are notoriously ill equipped to identify opportunities with long term prospects. They are also not in a favourable position to direct industry towards new pathways. Nonetheless, correctly executed so that information is presented for industry to act upon and in that an environment can be created in which winners can emerge, as identified in the neo-Schumpeterian and evolutionary world view, this option tends to provide better outcomes than the other two options.

In this paper, we present an approach taken to achieve regional economic renewal through structured knowledge development using a combined foresighting and roadmapping approach to identify future development trajectories (see e.g. Kostoff et al., 2001; Phaal et al., 2001; Petrick et al., 2004; Phaal et al., 2004; Walsh, 2004; ICS Ltd., 2009b; Phaal & Muller, 2009; ICS Ltd., 2010a; 2010b; Walsh & Linton, 2011; Bok et al., 2012; Kerr et al., 2012; Voros et al. 2012). These trajectories are aimed at higher value added activities and will require innovation. Innovation will have to encompass both value creating innovations and value appropriating innovations (see e.g. Roos & Pike, 2009; Chung et al., 2010; Roos, 2011a; 2011b; 2011c; 2013c; Burton et al., 2013; Roos et al., 2013). The approach also facilitates a cultural shift (see e.g. Valdivielso, 2010) aimed at enabling collaborative activities such as cluster formation to benefit from the agglomeration economic effects when a whole industrial commons is moved to this new level.

The paper looks at the case of the forestry processing industry located in the South Australian part of the “Green Triangle”. The forest and wood products industry and associated value chain have experienced a very difficult time due to the issues outlined above. This development combined with internal factors such as a lack of investment, aging equipment and poor management decisions have resulted in a significant reduction in industry profitability and a loss of employment opportunities that have combined to create an atmosphere of doom and gloom in the crisis situation that existed when the process was initiated in the second half of 2012.

The Regional Development Australia Limestone Coast has met this challenging situation by pursuing an agenda of economic diversification to broaden the economic base of the South East through the initiative of The Limestone Coast Economic Diversification Forum. The South Australian government based on both the findings and recommendations of the 2012 Adelaide Thinker in Residence “*Manufacturing into the Future*” report and the Department for Manufacturing, Innovation, Trade , Resources and

Energy's "*Manufacturing Works*" strategy where the cellulose fibre domain was identified as one of the priority areas for smart specialisation requiring forward thinking and the acquisition of knowledge about new markets and opportunities, emerging technologies and partnerships between industry, government and the research sector turn (DMITRE, 2012, p. 9 & pp. 42-44), acted by implemented these recommendations. The implementation included both a fund providing investment grants to industry as well as the project discussed in this paper.

A central tenet of the smart specialisation argument is that governments should focus their knowledge investments in activities– not in sectors in per se – that reflect areas where a region or country has some comparative advantage (specialisation) or emerging areas where entrepreneurs could develop new activities (diversification). This connection between specialisation and technological diversification in the context of regional development and growth has been highly influential as it demonstrated that the smart specialisation as policy framework is very well suited for dealing with the problems of place-based growth (McCann, P. & Ortega-Argiles, R., 2013a; 2013b; 2013c; 2013d; 2013e).

Smart specialisation differs from traditional innovation and industry policy in that it is focused on the 'entrepreneurial discovery process' or 'self-discovery' which is the process through which an entrepreneur realises that a good or activity, that may or may not already exist in other regions, can be produced locally, with some variations and possibly at lower cost (Rodrik D., 2004). The entrepreneur is able to identify new activities by combining existing scientific and technical knowledge with the industrial resources and capacities in the region that can lead to new economic opportunities. This new process of identification will also hopefully lead away from imitation and me-too strategies that characterised many regional innovation strategies in the past decade. In order to do so the firm must have a large stock of intellectual capital and the entrepreneur must be able to combine these stocks into an effective transformation system (see e.g. Marr & Roos, 2005; Roos, 2005; Roos et al., 2005; Roos & Roos, 1997; Peng et al., 2008; Pike & Roos, 2008; Peng et al., 2011; Roos & Pike, 2011; Peng et al., 2012; Roos et al. 2012a), including access to appropriate research results (Roos et al. 2012b). Furthermore, empirical evidence shows that despite similar endowments, countries and regions may specialise (through the identification process – for example by applying the same technology to the local conditions) in very different activities (Sabel Charles et al. 2010).

It is clear that strategic roadmapping plays a key role in enabling the entrepreneurial identification process which is core to the smart specialisation strategy. Table 1 outlines the rationale for a smart specialisation strategy (OECD, 2013).

Table 1: Rationales for smart specialisation (OECD, 2013, pp. 24-25)

		Policy intervention	Examples of existing and new policies/initiatives
	<ul style="list-style-type: none"> • Low ‘self-discovery’ activity • Low information exchange flows. • Lack of <i>intra-</i> and <i>inter-</i> regional interactions that restrict the knowledge spillovers. 	<ul style="list-style-type: none"> • Incentives to reward entrepreneurs who discover new domains. • Incentives to involve non-traditional actors. • Creation of platforms and mechanisms to facilitate – <i>intra</i> and –<i>inter</i> regional interactions. • Public policies can assist further this process by providing key infrastructures (e.g. information about emerging technological and commercial opportunities and constraints, product and process safety standards for domestic and export markets, and external sources of finance) 	<ul style="list-style-type: none"> • Prizes for inventions and discoveries, fiscal incentives, IPRs • Incentives for public sector innovation (e.g. procurement) • Public web consultations • Regional workshops • Innovation Vouchers • Internationalisation support services
Coordination externalities	<ul style="list-style-type: none"> • Low ‘self-discovery’ activity due to the high fixed costs and large-scale investments required by some projects. • Prevention of emerging trends for regional economic growth. 	<ul style="list-style-type: none"> • Coordination of investments and decisions of different entrepreneurs. • Coordination among many economic agents throughout the value chain suppliers, producers, users, specialised services, banks, basic research and training institutions. • Support to technologies which have scale or agglomeration economies. 	<ul style="list-style-type: none"> • Cluster policies • Technology banks • Public-private partnerships • Innovation-oriented procurement • Sectoral platforms • SME support organisations • Demonstration projects, technology extension services

The project discussed in this paper was implemented with the assistance of VTT Technical Research Centre of Finland, as experts in the forest product value chain, who developed grounded pathways for the renewal of the sector, both in the short (3–5 years), medium (5–10 years) and long-term (greater than 10 years), through a roadmap exercise. The objective of this roadmap project was to provide the region with a information input underpinning a strategy to renew the cellulose fibre value chain and its associated industrial commons. The project was funded by Department of Manufacturing, Innovation, Trade, Resources and Energy (DMITRE) and led by VTT Technical Research Centre of Finland (Ahlqvist et al., 2013a, 2013b).

2 Sector transformation policies and Strategic roadmapping

2.1 Foresight based policy change

Foresight has increasingly been identified as a practice and process for enabling industry transformation and associated policies. Foresight is an ability, a process and a set of tools to anticipate future developments, manage uncertainty and come up with responses to identified future challenges (see e.g. Rohrbeck, 2011; Slaughter, 1997; Miles et al., 2008). It is used in identifying opportunities and challenges, exploring alternative futures, gaining a better understanding of the current situation and its development and creating strategies and plans for coping with changing environment (Martin, 1995; Rohrbeck & Schwarz, 2013; Day & Schoemaker, 2004). In the context of strategic management, foresight contributes to different value creation forms (Rohrbeck, 2012, p. 441) and it has also been deployed to develop new business fields for companies (e.g. Heger & Rohrbeck, 2012; Rohrbeck et al., 2013; Battistella et al., 2012; Kraatz et al., 2012).

Foresight studies can be executed with different time scales, different spatial scales, different sector focus, different technology width and depth. On the micro level it could e.g. focus on the strategic options for one firm and the development and implications of one technology. On the meso-level it could e.g. focus on strategic options for groups of firms or whole sectors and the development of related technology portfolios. On the macro level it could focus on strategic options for complete innovation systems and their development given trajectories in complete technology portfolios.

This project involves foresighting on the meso level and on this level there are two important aspects: stimulation of systemic capacities and anticipation of potential system failures. Foresighting stimulates systemic capacities through providing actors with information and signals originating outside the actor's immediate environment and therefore help actors to identify potential opportunities and threats. Foresighting also facilitates new linkages that both facilitates the flow of information as well as the value add to this information which in turn enables the formation of new social structures (see Ahlqvist et al., 2012a). Foresighting assists in anticipating potential system failures by identifying and preventing rigidities and mistakes of innovation agents" and "a lack of linkages and fragmentation between innovation actors" (Georghiou & Keenan, 2006, p. 763), which otherwise lead to system failures.

The policy practice is of course influence by the policy process and Weber et al. (2009, p. 955) argue that policy processes have gone through a conceptual shift in which a linear model of policy-making has been replaced with a more learning based cyclical model. Here, foresighting is a process that aligns expectations and builds a "self-fulfilling prophecy". Foresighting can thus be viewed as "an integral element of networked and distributed policy making". This is realized through three functions of foresighting: informing, strategic counselling and facilitating (Weber et al., 2009, p. 956).

There are different reasons for using foresighting in policy making. Georghiou & Keenan (2006, p. 766) distinguish three rationales: Firstly, the provision of policy advice by accentuating the long-term perspective; Secondly, the building of advocacy coalitions. This outcome is achieved by foresighting creating an "interaction space" through enabling new networks and communities to form around a common vision; Thirdly, foresighting provides a "hybrid forum" between public and private actors enabling strategic reflection that broadens the range of participation on policy issues.

The policy process relating to a complex system, like a complex sector with its associated and underpinning industrial commons, becomes very much a question of policy design. Policy design, as the adaptive and experimental approach in which a portfolio of selected policy instruments are implemented in some simultaneous or sequential combination. The specific instruments selected and the specific way in which they are combined and implemented is a function of the complex system that the policy is to operate on. The most common characteristics of the system that impacts these choices are: the volume, variety and type of actors in the system; the relevant technologies; the

relevant infrastructure; the time horizon of the system, the change velocity of the system; the spatial coverage of the system; the cultural and behavioural characteristics of the system.

Foresighting is strengthening policy design in providing six functions: Generating grounded views on potential futures i.e. informing policy design; Increasing the capacity for change in the policy community i.e. facilitating policy implementation; Make policy-making more participatory; Converting foresighting insights into policy practice i.e. assisting in the definition of policy; Re-orienting the policy system towards a more long-term perspective; Creating a co-created ground for policy (Da Costa et al., 2008, p. 369). This augmentation of the policy design with a foresighting process generates a forward-looking policy design (Ahlqvist et al., 2012b).

2.2 Meso-level foresighting using strategic roadmapping to generate forward looking sectoral policy design

Strategic roadmapping can be considered both as a strategic thinking approach and as a collaborative process methodology. Teece et al. (1997) defined “dynamic capability” as: “the firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Teece et al., 1997, p. 516). Dynamic capabilities are linked to managerial processes, strategic position and organisational path. Thus, the notion of dynamic capability provides a theoretical basis for organisational transformation by linking the transition to a contextual historical understanding. From a strategic management perspective, foresight contributes to different value creation forms (Rohrbeck, 2012, p. 441). This can be exemplified by the different roles (initiator, strategist, opponent) foresight can have within innovation management (Rohrbeck, 2012, p. 442). An extension of the initiator role is when foresight is deployed to develop new business domains within firms (e.g. Heger & Rohrbeck, 2012). The literature within organisational strategy crafting (e.g. Whittington & Cailluet 2008; Heracleous & Jacobs, 2008), argues that strategies should not be viewed as locked-in paths to some pre-determined goal, but rather as organic schemes that are always partially open and available for alternative options, multiple instruments and “side-schemes”.

Roadmapping is a continuous and transparent process that can be used as a foresighting practice. Part of its methodological strength rests in that it combines different modes of knowledge with specific activity layers (Kostoff & Schaller, 2001; Phaal et al.,

2004). Roadmaps also allows for combining and synthesising organisational knowledge that may be difficult to combine or synthesise using other strategic methods (see e.g. Petrick & Echols, 2004, Phaal et al., 2006). Roadmaps are used in two different ways: Firstly, as a normative instrument to identify relevant emerging technologies and to align them with explicit product plans and related action steps (see e.g. Phaal et al., 2001). Secondly, as a dynamic and iterative process that produces weighed visual narratives of an organisation's long-term vision, and short- to medium-term strategies to realise this vision, using the roadmap's ability to convey the most critical paths of future developments (Phaal & Muller, 2009). The visual form of roadmaps enables formulation of strategies and visions¹ with explicit linkages across time scales (present, medium term, long terms) and within and across key layers (e.g. drivers, markets, actors, technologies) as illustrated in Figures 10-13. This enables the use of roadmaps as strategy charts that open simultaneous macro- and micro perspectives (see Blackwell et al., 2008), especially since roadmapping is an adaptive process-based methodology well suited for systemic context (see Ahlqvist et al., 2012b).

Knowledge spillovers, shared input markets, and other linkages that form part of the industrial commons exist and have an impact on the performance and location of companies (Lindqvist et al., 2013). There is also agreement that locations do significantly differ in their specialisation profiles, and that individual groups of related industries tend to be concentrated in a narrow set of locations (Chatterji et al., 2013). Specific groups of interlinked players underpinned by an industrial commons tend to be called clusters and exist at all levels of economic development and work largely as a multiplier that enhances the benefits of business environment conditions rather than being a substitute for weaknesses (Lindqvist et al., 2013). While the direct effect of co-location in clusters might thus be limited – many estimates suggest an elasticity of cluster wages to specialization at around 2-3% - there leverage effect can be substantial (Lindqvist et al., 2013). Given this, a vision of a single firm that is shared between geographically bounded economic and political actors may provide a risk reducing mechanism for the firm by aligning development activities of interdependent organisations. Given the existence of local externalities, there is an in principle case for policy to address the market failures

¹ *Visions should be understood as objectives that are systematically verified and re-formulated, either based on the outcomes of the organisation's strategy cycle or when an unanticipated event takes place that impacts the existing objectives.*

that these externalities create (Lindqvist et al., 2013). Cluster policies thus fit as one policy in the group of New Industrial Policies (Rodrik, 2008), and from the above it can be seen that strategic roadmapping as a foresighting tool can provide useful insight into the formulation of such a cluster policy.

Strategic roadmapping has both a cognitive and collaborative component. The cognitive element provides a method for producing and analysing insight grounded in information pertaining to the current economic situation, foresight on markets and technologies, and policy options in a temporally sequenced representation with systemic linkages between the elements. The collaborative element provides a process for mobilising relevant stakeholders to initiate transformation processes. Information alone is a weak tool for initiating change, but when combined with collaborative processes involving the sector, its underpinning industrial commons and other key participants of the regional innovation this information becomes a powerful instrument to assist participants in arriving at a shared understanding of potential future pathways.

Strategic roadmapping can be applied towards creating a common vision which contributes to embedding the long-term objectives and enhances the commitment of the participants towards achieving this long-term goal. Strategic roadmapping can also be applied towards identifying existing or emerging societal needs (frequently termed “grand challenges”), consumer and business needs that create a potential demand for new products and services and hence can underpin a systemic change. This role is important when working with sectors where large cumulative investments have been made in existing technologies and infrastructures leading to the sector risking to become locked into technological solutions which are suboptimal from an emerging need point of view. This lock in is frequently evidenced by the sector rejecting demand signals from the marketplace. Under these conditions a transformation process can be set in motion by a well grounded public policy implemented with high precision. Strategic roadmapping can play an important role in grounding this public policy as well as in preparing the sector and its underpinning industrial commons for the necessary change envisioned by the public policy. Strategic roadmapping can also link the identified needs with specific policy instruments (Wieczorek & Hekkert 2012).

Strategic roadmapping can also play a role in identifying when and how demand could develop in conjunction with the emergence of a new market. There are many reasons why a market for new offerings cannot be taken for granted: Adopting new

technologies can be very slow due to high switching costs (David 1985, Arthur 1989); The market may not develop due to pricing mechanism for any benefits being absent (Faber & Frenken 2009). A well executed strategic roadmap can capture purchasers' and suppliers' common understanding of future societal and market needs (Georghiou & Cassingena Harper 2011). A strategic roadmap also enables insights into the required boundary conditions and likely time lines for technology push and demand pull to match. This allows for the development and implementation of an appropriate portfolio of policy tools in response to the opportunity created by this match. A strategic roadmap can also be used to identify specific innovation objectives relating to a specific technology or to a specific development over time. When the economic logic of the business environment adheres to that of a value network rather than that of a value chain or value shop (see Stabell & Fjeldstad, 1998 for a discussion of the three logics and Roos et al., 2012 for a detailed discussion of their drivers and their managerial implications) it is important that all elements and linkages are identified (Adner & Kapoor, 2010) and hence the inclusion of the industrial commons that underpins the sector to ensure that potential partners for achieving the identified innovation objectives. Value networks consist of organisations that cooperate with each other to benefit of all network members (Valkokari et al., 2011). Value network describes the competitive environment: the power structures, alliances and conflicts (Heger & Rohrbeck, 2012). Value network analysis aims at generating a comprehensive picture of how value is generated in the network (Peppard & Rylander, 2006). The main focus is on the present situation, although it can be and has been applied in exploring possible future value chains (e.g. Ahokangas et al., 2012; Wessberg et al., 2013). The analysis focuses on the roles or functions of the nodes of the network (e.g. saw mills) and not in specific organisations; therefore it does not explicitly assess the competences of individual companies.

Dufva et al. (2013) states that there are two major challenges when applying roadmapping in the context of a regional industry sector. The first is the tension between the local and the global, which roadmapping does not explicitly address. There is a risk that roadmaps focus too much on the local present situation and therefore are not able to create a compelling picture of a radically different desired future and the path towards it. On the other hand, focusing only on the global developments and available technology may lead to the results being unconnected from the reality of the region. Therefore it might be useful to distinguish explicitly between the local situation and the global state-

of-the-art. The second, challenge is that roadmaps are seldom able to capture the dynamics of the actors in the region. This is usually postponed to the more detailed action planning phase that is based on the roadmapping. However, understanding the actors, their interactions and the value creation dynamics might be useful already when exploring the strategic pathways or the desired future (see e.g. ICS Ltd., 2009a; 2009b; 2010a; 2010b).

2.3 *Regional Economic Renewal or Transformation*

Spoehr (2014) in his review of economic renewal finds that industrial rejuvenation and urban/regional regeneration are intimately linked and when intelligently integrated they are mutually reinforcing with the potential to significantly improve both the social and economic prospects of areas experiencing industrial decline, closures and a legacy of underinvestment in social and physical infrastructure. The key elements of a complete approach are found to include (Spoehr, 2014, pYY):

- integration of economic, industry, workforce, social and urban policy and program agendas
- responsiveness to place, economic, political, historical and cultural needs and circumstances
- agile and responsive collaboration, governance processes and structures
- developing high quality leaders and diffusing leadership
- authentic engagement, trust building and collaboration
- effective communication of vision, strategic responses and progress
- new trans-disciplinary institutional spaces for design thinking, problem solving and action
- early assessment of the full range of potential impacts of sectoral decline or disinvestments and closures to provide an evidence base prior to them occurring
- economic, workforce and social modelling of potential and actual impacts
- scenario planning of alternative responses to large scale retrenchments with particular attention to short and medium term demand side solutions
- ensuring that the social and economic costs of industry adjustment are mitigated or minimised for employees, families and communities through early intensive

assistance appropriate support or pathways to appropriate employment made available to all those affected by restructuring, retrenchment or closure

- building and sustaining a robust regional innovation system
- developing viable pathways for transitioning from mass production to knowledge intensive, high value goods and services
- transforming existing industries and enterprises to make them more resilient in the face of domestic and global pressures
- fostering and supporting the growth of new and more resilient firms/sectors to respond to the decline of others
- investing in high performance workplace systems
- facilitating and sustaining robust and outward looking industry clusters and networks
- fostering and investing in a culture of creativity and innovation sustained by design thinking processes and institutions
- identifying early infrastructure development priorities that help to boost employment in the short term and productivity over the medium term
- improving the quality of civic amenity as a foundation for improving morale, well-being, population/workforce attraction and retention
- modernising housing and transport infrastructure to improve well-being and reduce travel to work times
- Ongoing monitoring, evaluation and adjustment as appropriate of response strategies.

This aligns well with the actions found by Power et al. (2010) to be taken by cities that are successfully recovering from having suffered multiple problems caused by profound economic restructuring. On the meta-level these cities have been found to take actions aimed at (Power et al., 2010, p. 271):

- overcoming their structural problems;
- adapting to the requirements of changing political and economic conditions;
- alleviating the worst consequences of the crisis;
- implementing successful regeneration strategies;
- improving the overall quality of life;
- creating a path towards a sustainable future.

The specific actions taken can be gathered under the following headings (Power et al., 2010, p. 283-284):

- Strategic response to population losses
- Focus on deprived neighbourhoods
- Specific skills / qualification initiatives targeting skills mismatches
- Efforts to integrate ethnic-migrant population
- Creating stronger linkages between higher education and local businesses
- Investment in higher education
- Focus on specific economic sectors, e.g. cluster strategy
- Creation of economic development / inward investment agencies
- Investment in high-profile physical projects
- Investment in / promotion of high-profile events
- Revitalisation of city centre
- Regeneration through culture
- Strengthening of the retail function of the city (centrality)
- Upgrading of housing
- Investment in accessibility: long-distance transport infrastructure ('hub functions')
- Investment in public transport
- Environmental sustainability on the political agenda
- Actions taken to improve the environment, e.g. land, water, air decontamination
- Public administration made more efficient
- Benefit from devolved powers
- Coherent strategy guiding the recovery actions (for different tiers of government)
- Metropolitan level cooperation

From our previous discussion it is clear that strategic roadmapping as a foresighting tool can be useful in providing input enabling some of the actions identified by both Spoehr (2014) and Power et al. (2010) as necessary actions to achieve economic renewal and / or transformation. It is also clear that agglomeration economics forms an underpinning for some of the actions identified e.g. cluster formation, strengthening of the industrial commons, strengthening of the regional innovation systems both in terms of actors and linkages.

The agglomeration economic lens builds on the joint effects of economies of scale and network effects. As firms with related activities cluster their cost of production declines due to greater specialisation and division of labour, competing multiple suppliers,

economies of scale and scope in the underpinning industrial commons, economies of learning in the regulatory environment, labour pooling, larger number of customers attracted, increased opportunities for communication between participants increasing the learning and innovation, etc. (Faggio et al., 2014).

The key benefits of these proximities are best articulated by Döring & Schnellbach (2006): “Networks of regionally clustered businesses and institutions, therefore, offer two broad opportunities: formal exchanges of knowledge through market relationships, where proximity allows the establishment of closer ties; and the informal exchange of knowledge in social networks of individuals”. Those beneficial aspects of close proximity which firms cannot control or achieve in any other way than through close geographical and specialisation proximity have been named untraded interdependencies by Storper (1995; 1997).

One of the key agglomeration economic policies is known as cluster policies. These cluster policies have continued to evolve and presently EU member states are encouraged to put more emphasis on the smart specialisation of their regions by concentrating resources on a few key priorities and addressing their particular strengths rather than by spending investment thinly across areas and business sectors in order to contribute to knowledge and innovation based economic growth (European Commission, 2010).

The efficiency and effectiveness of Cluster’s have been shown by research in this domain. The findings show that firms that are members of agglomerations, e.g. clusters, have higher productivity as well as higher productivity improvements than firms that are not members of any agglomeration (Jaenicke et al., 2009; Garanti & Zvirbule-Berzina, 2013). Typical benefits are fourteen percentage points higher value added growth, seven percentage points higher profitability growth and two percentage points higher wages per employee (a proxy for productivity) to the advantage of firms in clusters vs. those not in clusters (Extracted from Table 2, page 30 in Sölvell & Williams, 2013). Companies participating in a cluster are far more likely to become innovative than (other companies. Statistical analysis shows that companies participating in clusters increase their probability of being innovative by a factor of 4.5 compared to a control group of companies with similar characteristics (Danish Agency for Science, Technology and Innovation, 2011)

Clusters can be used at both the design and the implementation phase of smart specialisation strategies. In the design phase, they can be used to identify the industrial

strength and assets in a region, to contribute to set strategic priorities and to make the right political decisions. In the implementation phase, clusters can be used as efficient platforms that can focus on and quickly contribute to the objectives of smart specialisation. In particular, by fostering cross-sectoral cooperation, clusters can contribute to implement thematic-based strategies by addressing new society challenges and creating new competitive advantages in a region (European Commission, 2012). From this the importance of using the strategic roadmapping based foresighting as an input into a cluster policy becomes clear.

2.4 Cluster development and path dependency

A path dependent system is a system where the outcomes evolve as a function of the systems' previous states. (Martin & Sunley, 2006). There are three common views in conjunction with path dependency: Firstly, that technological systems has an inherent tendency to become locked in a single development trajectory – so called technological lock-ins. Technological lock-in has been the subject of study since the mid 1980's (see e.g. David, 1985; Arthur, 1989; Cowan, 1990; Liebowitz & Margolis, 1995; Unruh, 2000; Unruh, 2002; Yarime, 2009; Floch et al., 2012). One reason for technological lock-ins is that the nature and direction of technological advance is strongly shaped by the cognitive framework of actors. These frameworks are sometimes called technological regimes (Neleson & Winter, 1977) and sometimes technological paradigms (Dosi, 1982). These frameworks provides boundaries for the thoughts and actions perceived possible by members of a specific technological community and hence limits the efforts to advance the performance of a given technology by only focussing on opportunities that build on past achievements, ideas and knowledge. This means that technological opportunities and solutions that lie outside this dominant framework are rarely explored. Hence, the tendency of technological change to proceed incrementally along certain trajectories rather than radically in discontinuous leaps (Dosi, 1982). Secondly, that path dependent system adheres to the logic of increasing returns. This means that one dominant path in a system gets continuously stronger due to positive feedback loops. This can be observed when two or more technologies are competing for market share. The presence of increasing returns leads to the option securing an initial lead in adoption goes on to dominate the market (David, 1985; Arthur, 1989). This effect may lock the market into an inferior solution since choice during the early stages of competition is characterised by

uncertainty and ignorance about the respective qualities and properties of various options, and hence generate market failure. A lock-in outcome can be generated by a combination of four mechanisms. The first three mechanisms (Economies of experience, economies of scale, economies of learning) have been empirically well documented. The effect of these three mechanisms is normally strengthened by the fourth mechanisms, adaptive expectations, whereby increased adoption reduces uncertainty about the performance, reliability and durability of an offering or a technology (Perkins, 2003). Secondly, that path dependent organisational and social systems has a tendency to self-replicate and grow and thus generating a high degree of self-reliance which does not necessarily reflect the relevant practices that ought to be taking place in the system – this is sometimes known as institutional hysteresis (Martin & Sunley 2006).

The theory of path dependency can be coupled with a theory of path creation. Schienstock (2007) suggests that path creation could be approached as a process of mindful deviation by people who have an understanding of the opportunities that a new paradigm offer, which to a great extent depends on the engagement of social pioneers such as scientists, politicians and entrepreneurs prepared to initiate and conduct anticipatory institutional change. Thus envisioning an industrial transformation which can be viewed as a creative act that aims to build a new path, including a new vision, new structures for collaboration and a new institutional basis.

Gáspár (2011) states that path dependency and path creation are both conditioned by historical trajectory and future images made in the past, but also the future visions made in the present. In his model, path dependency provides the “prognostic power” to explore the future. Thus, path dependency forms the context and the perspective that enables the strategic vision. Path creation represents the potentiality of the future, the openness to make new decisions and take new actions. Gáspár (2011) asserts that path dependency and path creation require each other in order to produce meaningful and actionable strategies to transform something. Path creation is a social practice that should engages the key actors in a creative collaboration (Schienstock, 2007; Gáspár, 2011).

The above argument can also be applied to clusters and other agglomerations (see e.g. Keeble & Wilkinson 1999; Bathelt 2005). According to Sölvell (2008), the emergence of clusters can be explained through two causal factors. The first is the natural factor advantage, which can relate to traditional natural factors, such as soil, climate, ores, logistic position, or forests. The second causal factor is a historical accident, in which

some entrepreneur has started a business, and in a period of time, this has led to spill-over effects, such as emergence of supporting industries, services, and eventually towards cluster structures. Sölvell (2008) stresses that many clusters have a hero whose emergence can be traced back to the initial phases of cluster formation. When the cluster is growing, it needs a specialised sort of social resources. The most important ones are social capital, formal and informal networks, personal and corporate networks, and organizations to foster collaboration. The cluster requires also specific configurations including sophisticated demand, competitive strategies, related industries, infrastructure and R&D to develop further- many of these fall under the concept of industrial commons. These specific assets can also be fostered through policies, such as national and regional level policy instruments (see Ahlqvist 2013).

2.5 *Multi-criteria assessment as a tool*

In our framework the assessment of companies is based on Multi-Criteria Decision Analysis (e.g. Belton & Stewart, 2002) and especially Multi-Attribute Value Theory (e.g. Keeney, 1993) whilst adhering to the fundamental requirements of measurement theory (Pike & Roos, 2004; 2007; Roos & Pike, 2007; Pike & Roos, 2010). The basic idea behind this approach is to include multiple criteria, which are weighted according to their relative importance (see e.g. Fletcher et al., 2003). Different alternatives, or in our case companies, are evaluated with respect to each criterion. The result is an overall value for each alternative, which reflect both the performance of the company against each criterion as well as the relative importance of the criteria expressed in the weights. Assuming that the attributes are mutually and preferentially independent (Keeney, 1993), the overall values can be calculated by using an additive value function.

There are three main aspects in the assessment: criteria, scores and weights. The criteria give the framing for the assessment and determine what is taken into account. These criteria draws on the resource-based view of the firm (Wernerfelt, 1984; Prahalad & Hamel, 1990; Peteraf, 1993; Wernerfelt, 1995; Granstrand, 1998; Barney, 2001) and discussion about firm's internal/external capabilities (including technological capabilities) and dynamic capabilities to exploit opportunities as outlined in Figure xx where the firm's or actor's embeddedness in networks and the surrounding environment is illustrated. At the actor level, e.g. resources, capabilities, knowledge and trust between actors influence the formation of networks that enable opportunity exploitation and at the institutional

level, which usually appears regionally as well as nationally (Lundvall, 1992; Cooke et al., 1997; Rosenfeld, 2002; Hekkert et al., 2007; Cooke, 2008a; Cooke, 2008b; Linton & Walsh, 2008; Asheim, 2011; Morgan, 2012; Simmie, 2012; Varis et al., 2012; Henning et al., 2013; Klitkou, 2013 there are e.g. economic, political, legal, social and technological factors which provide impulses or blockers for opportunity exploitation.

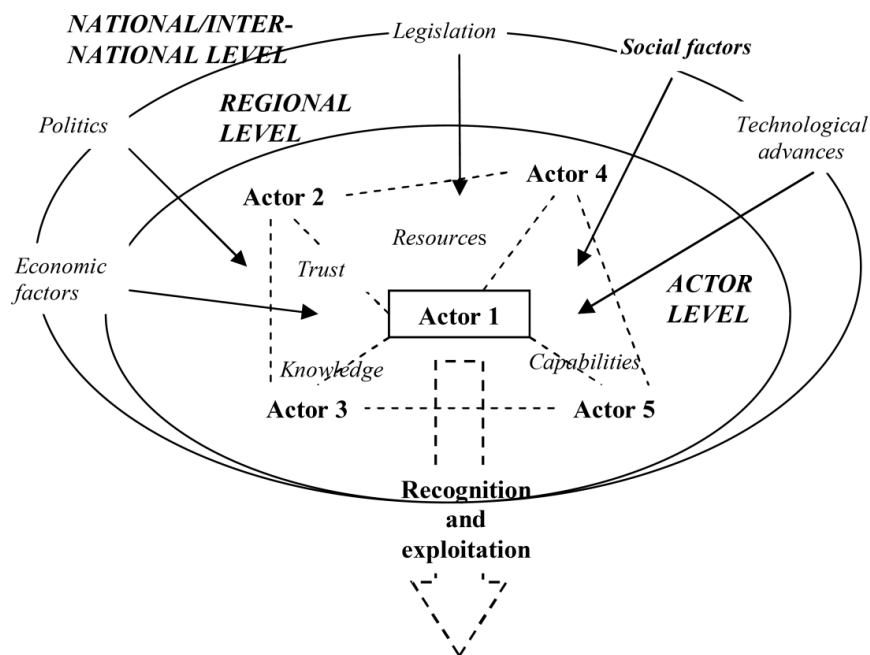


Figure 1: Opportunity recognition and exploitation (Lehtovaara et al., p. 200)

Scores represent the performance of the companies against the criteria. Finally the weights represent the viewpoint taken in the assessment in that they determine what is deemed most important, and how important are other criteria relative to the most important one.

3. The case of the cellulose fibre value chain in the Mt. Gambier region of South Australia

The Green Triangle, incorporating South Australia's Limestone Coast region and adjacent parts of Western Victoria is Australia's premier wood production region. The softwood (SWD) plantations yield 3.2 million m³ of logs annually, approximately two-

thirds saw logs and one-third pulp logs. In Green Triangle, there is a well-established forest and wood products industry cluster developed to grow, harvest and transport, and process these logs. However manufacturing capacity has been declining with notable facility closures in the last several years. Chronic underinvestment for most facilities has left the majority of the remaining industry relatively uncompetitive versus state-of-the-art domestic or international competitors. This sector has experienced poor markets for key products, especially low-grade sawn wood, residual chips and surplus round wood. Consequently, the whole value chain has struggled to generate adequate returns. Increasing SWD log exports are an outcome, as growers seek to re-balance log demands with the log mix produced from their forests.

The hardwood (HWD) plantations produce mainly pulpwood logs. The plantations were developed by ad-hoc planting during the last decade by Managed Investment Scheme (MIS) promoters, many of which have gone into receivership. The estimated volume of logs to be yielded from these plantations will exceed 4 million green metric tonnes (GMT)/year by the middle of this decade. Significant volumes of HWD pulpwood supplies will be available for the following 10 years. Aside from chipping, there is no domestic processing of these logs. Chips are currently exported destined for Asian pulp mills. Export of HWD round wood logs is a recent and growing phenomenon. Infrastructure will limit HWD chip exports to approximately 3.4 million GMT/a.

Asian markets are currently oversupplied with HWD chip and pricing is well below the level required to deliver adequate returns to growers. Consequently, industry observers expect around half of Australia's current HWD plantation estate will not be replanted. This will include plantations in the Green Triangle. The area replanted will affect the HWD pulpwood volumes available beyond 2025.

In addition to the supply of SWD and HWD logs, the region can also generate an estimated 500,000 m³/a of woody biomass. This material comprises the tops and branches of trees left after harvesting.

The HWD pulpwood supplies yielded from the region represent a globally significant volume of high quality, certified fibre. The current owners of these plantations are actively looking to diversify uses away from the current low paying export chip markets. In addition, Australia is the only region with a long term surplus of cellulose.

Few of the current players had initiatives in place to address either the fundamental problems in the existing sector, or to capture the region's unique opportunities (For a

discussion around the challenges and opportunities for the industry see e.g. Roos et al., 2013; Roos, 2013).

3.1 Methodological framework for the Strategic Roadmap

The strategic roadmap framework used for the project is based on two dimensions. The first dimension is the level of analysis, and the second one is the temporal-spatial scale. To assess the companies in regional industry system three functional layers were defined (Figure 2) based on the layers in roadmapping and the levels in the Multi-Level Perspective (MLP) (Geels, 2002).

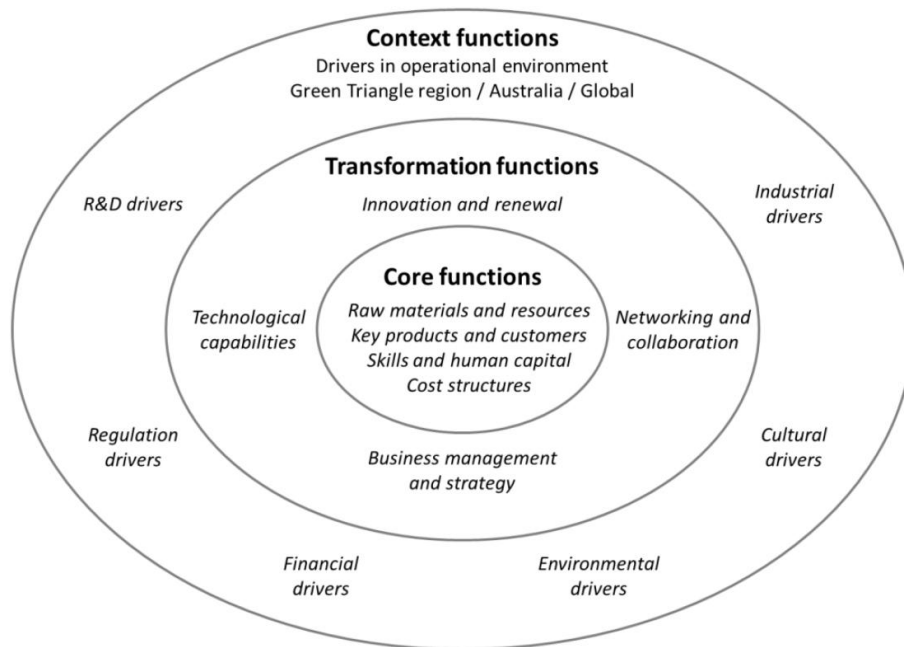


Figure 2: Functional layers used in the assessment of the companies (Dufva et al., 2013, p. 6)

The functional layers describe the key functions of the company in the context of the drivers. The first layer is the core functions that gather the most elemental issues for a (cellulose) company. The core functions are divided into raw material and resources, key products and customers, skills and human capital, and cost structure and finances. This layer is focused specifically on assessing the key business processes of the company.

The second layer aspires to gaining two crucial insights: firstly, it aims at assessing the capacity of the company to transform and renew, and, secondly, it endeavours to identify the core components required for the regional transformation of the cellulose industry in South Australia. The first component is innovation and renewal that focuses on the potential of the company in innovation-fostering activities and, through these, the renewal (see e.g. Roos, 2007; Roos, 2014a). The second component is networking and collaboration that aims at identifying the capacity of the company to form linkages and in finding useful channels for the development of its business. The third component is business management and strategy that aims to recognising the company's capacity in strategy crafting and in constructing and realising feasible targets for future business development (for details see e.g. Roos et al. 2014). The fourth component is technological capabilities, which is used for evaluating the company's competencies in adoption new production technologies as well as technology sourcing competence.

The third layer is called context functions. This layer consists of drivers in operational environment at the regional (Green Triangle region), national (Australia) and global levels. The aim of this layer is to understand, on the one hand, how the company is embedded in the regional structure and, on the other, how the company perceives the possibilities to exploit key drivers of change in national and global domains. The drivers were analysed in six categories: industrial, cultural, environmental, financial, regulation, and R&D.

The time dimension is explicitly defined in roadmapping, and the developments in e.g. technology and markets are considered also with a time scale. A commonly used time scale ranges from the present to the desired long-term future with one intermediate step. The spatial dimension, on the other hand, is not explicitly considered. However, it becomes especially important in the case of a regional sector behind the global developments, because in that case there is a clear mismatch between the local present situation and the global state-of-the-art. The challenge then becomes to map a path through the state-of-the-art and further into the desired future state.

In this project a three-step temporal-spatial scale was defined and used: the local present situation, the global state-of-the-art and the local desired future embedded in the global context. The local present situation focuses on the competences, knowledge, technology, markets, networks and interactions in the region. It represents the starting point with the local historical links. The state-of-the-art focuses on leading edge

technology, global market situation and opportunities, top knowledge centres and global networks. It represents the “external world” with which the regional industry has to cooperate and compete in order to survive.

Aiming only at the state-of-the-art would lead to a never ending catching up situation. It would also disregard the local special characteristics. Therefore the aim should be further in the future, in a vision for the regional industry, specialised and prospering in a global economy. This vision is based on both the local present situation and the global state-of-the-art but goes beyond both.

The methodology framework for the project is outlined in figure 3.

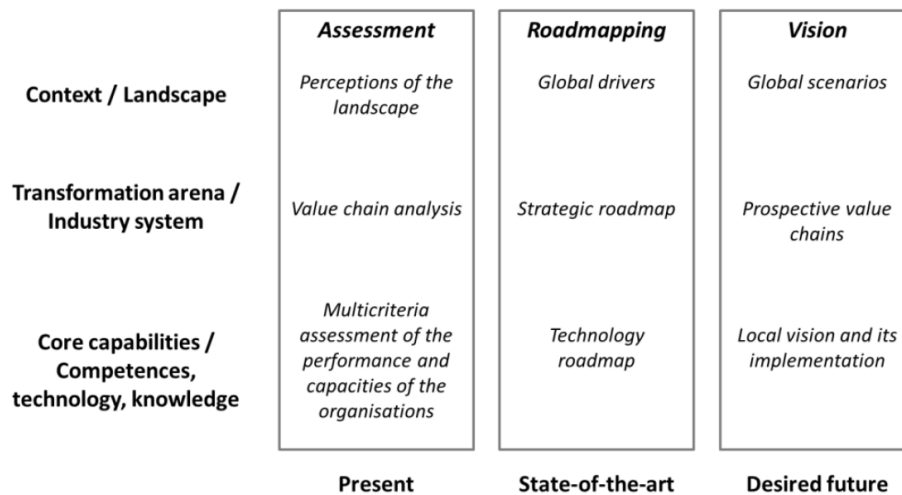


Figure 3: Methodology framework for the case (after Dufva et al., 2013, p. 8)

The process used in the case project consisted of: company assessment (steps 1 and 2 in figure 4), value network analysis (steps 3 to 5 in figure 4) and roadmapping (steps 6 to 8 in figure 4). As can be seen from figure 4, the process meanders across both axis, which illustrates the reflection between the global context and the local situation. We present the process as a sequence of methods, although in reality it was far more iterative and overlapping.

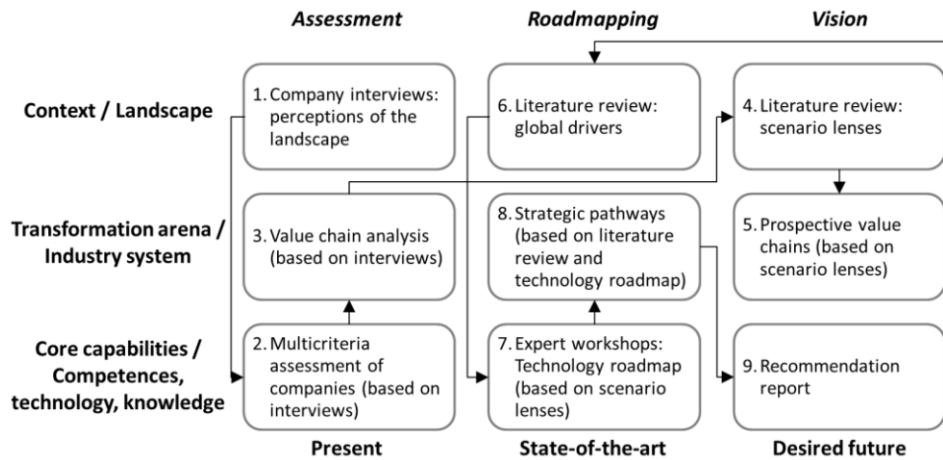


Figure 4: Project process presented in the methodology framework (after Dufva et al., 2013, p. 9)

Another view of the same approach can be seen in figure 5.

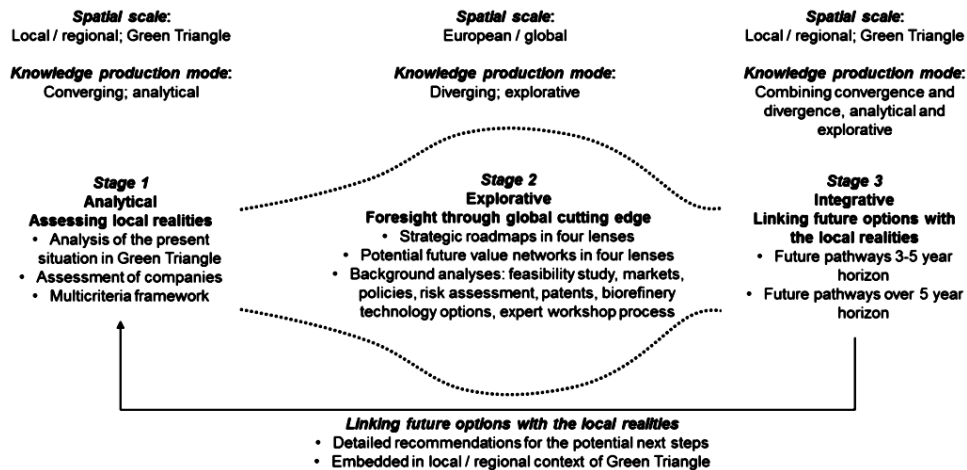


Figure 5: Spatial scales, knowledge production modes and stages in a project aimed at strategic industry renewal (Ahlqvist et al., 2013c, p. 5)

The strategic roadmapping process, adopted a so called “lens-based” approach. The future of the forest and wood products industry was analysed through four lenses (figure 6) as suggested by the chair of the steering committee. The idea of lenses was to get a grip of the global cutting edge in the forest industry development, and build strategic roadmaps on the assessed state-of-the-art.

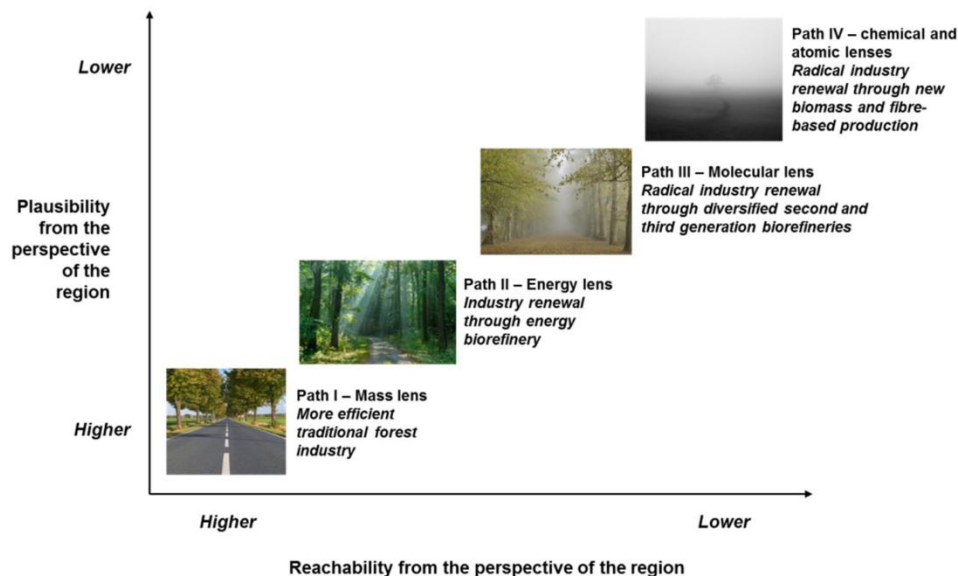


Figure 6: Strategic Roadmap lenses and their connection to the regional knowledge base (Ahlqvist et al., 2013c, p. 8)

The first is a mass lens: it emphasise more efficient traditional forest and wood products industry. Basically, the question was about making the existing type of forest and wood products industry more efficient by forming strategies for how to modernise the old technology and how to make the production processes more efficient. This is the lens that underpins the present traditional logging, wood chip, timber and wood based construction elements sector in Australia. The mass lens represents a lowest level of value adding and varies from very vulnerable to only somewhat vulnerable in a high cost operating environment.

The second is an energy lens. This lens focuses on the potentials of industry renewal through energy. It focus especially on the how much energy can be obtained from the forest production side streams, like branches, bark or excess chips. This lens also underpins the existing and emerging industries that focus on heat and energy generation, as well as ethanol and biodiesel production (normally via a first generation bio-refinery). In the lens, there are pockets of high value opportunities such as biodiesel, bioethanol and aviation fuel.

The third is a molecular lens, emphasising radical industry renewal through diversified second and third generation biorefineries. This is the lens that shows emerging opportunities that have the potential to replace existing chemical production based

industries. The lens could include specialty chemicals that are recyclable such as bioplastics for soft drinks bottles.

The fourth is an atomic lens, with a focus on radical industry renewal through new biomass and fibre-based production. This lens is high value-added and requires exceptional technological understanding and R&D. The lens enables the production of a wide range of new or modified materials such as biodegradable lightweight cellulose nanocrystals (CNCs) with a tensile strength exceeding that of steel or cellulose foams as insulators for the construction industry, and transparent paper replacing petroleum-based materials, like plastics.

3.2 Data Sources for the strategic Roadmapping

The data of the SA project included 23 interviews with South Australian companies, 6 steering group meetings, and 3 strategic workshops, where technology experts in forestry, biotechnology and cellulosic fibre industries crafted strategic technology roadmaps for the region. Massive amount background data was collected and analysed. In addition, a simulation model was constructed to evaluate the flows of biomass in the regional system as well as a model to assess the productions costs of different bioenergy routes.

3.3 Key Findings

The initial phase of the project was an evaluation of the status among key actors in the region. They were evaluated using several criteria and the overall findings are shown in figure 7.

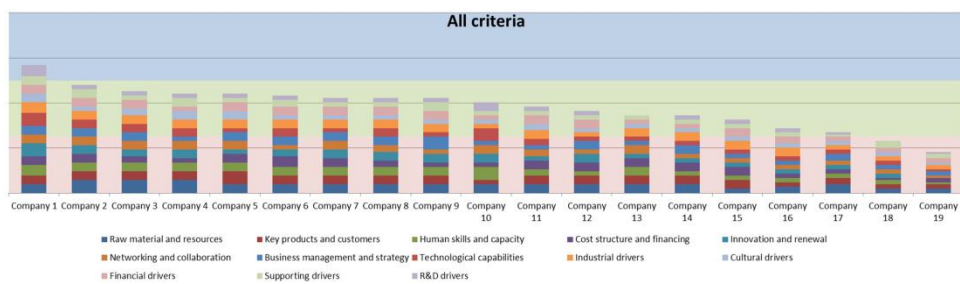


Figure 7: The aggregate scores of core, transformation and context functions (Alqvist et al., 2012c)

From figure 7 it is clear that there is a large variation in the status of the different actors in the region.

The typical outputs for Green Triangle’s large and small sawmills are contrasted with a hypothetical Australian best practice mill sawing the same logs (as available to the large sawmills) (Table 2). The hypothetical mill employs curve or shape sawing technologies and state-of-the-art scanning technologies that allow such sawmills to generate higher yields of product and a higher proportion of structural product than either of the typical mill types in Green Triangle. The best practice mills typically have lower labour and energy costs per unit quantity of timber produced. The present average labour use in large sawmills is one FTE per 800 m³/a.

Table 2: The typical large and small Green Triangle sawmills benchmarked against hypothetical Australian best practice (Ahlqvist et al., 2013a)

Output Component	A typical Large Green Triangle sawmill (>500,000 m ³ log input/a) Av 42.0% dry dressed recovery	Hypothetical Australian best practice large softwood sawmill (>500,000 m ³ log input/a) Av 47.0% dry dressed recovery	A typical Small Green Triangle sawmill (<100,000 m ³ log input/a) Av 48.0% green sawn Recovery = <40% dry dressed recovery
Structural grades (MGP 10 or better)	29%	35%	5%
Non-structural boards	7%	6%	26%
Non-structural core wood	6%	6%	17%
Woodchips	28%	25%	28%
Shavings/dockings	18%	17%	10%
Sawdust	11%	11%	15%
TOTAL	100%	100%	100%
Bark	7%	7%	7%

Figure 8 presents the principle present forest industry value network in the Green Triangle forest and wood products industry (a major part of the industrial commons). Two key functions of the present value network can be divided into the activities of forest owners and supporting actors, notably actors in breeding and genetics, machine suppliers, and data analysis providers that all provide inputs for utilisation and renewal of the resource base in the region, mainly formed of pine and eucalyptus plantations. This set of activities forms the first loop of the value network and act as an input to the second loop i.e. from hauling and harvesting to the downstream sawmills. The key present products of Green Triangle sawmills are sawlogs, pulp logs, roundwoods, woodchips, sawmill and

wood residues and barks. Important external inputs for this second loop are skilled labour and cost-related factors such as electricity and fuel.

In the third loop, the sawmills act as providers to different customer industries, the first of which is direct exports of woody materials such as logs and woodchips, mainly to Asia. Some of this material is later imported back to Australia as value-added products. The second is the declining traditional pulp and paper industry in the Green Triangle region. The pulp and paper industry uses mainly pulp logs and wood chips as material for the production of cellulosic pulp and, subsequently, paper products. The third customer industry is the construction and building industry that produces sawn timber, panels, engineered wood products, posts and treated timber. In addition, the industry produces furniture, fencing and other products. There are also residual products, like mulch and potting mix, but these do not contribute significantly to the present value network. On the basis of the analysis, the side streams are currently under-utilised and provide a clear opportunity for the region.

In the current value network, the functions of the four actor groups in the study (forest owners, hauliers, sawmills, specialised suppliers) can be summarised as follows. The core business of forest owners is to take care of the renewal of basic resources, production of timber (softwood and hardwood), and the core functions related to this. The hauliers and harvesters persevere with their core business of hauling, harvesting and transport. The sawmills produce processed timber, generally at low levels of added value. The specialised suppliers provide services and products both for business-to-business and business-to-customer. There are currently services, for example, in breeding and genetics, machine supply, data analysis and geoinformatics, but their potential in the present Green Triangle forest and wood products industry is not fully realised because there is a lack of advanced demand and demanding customers.

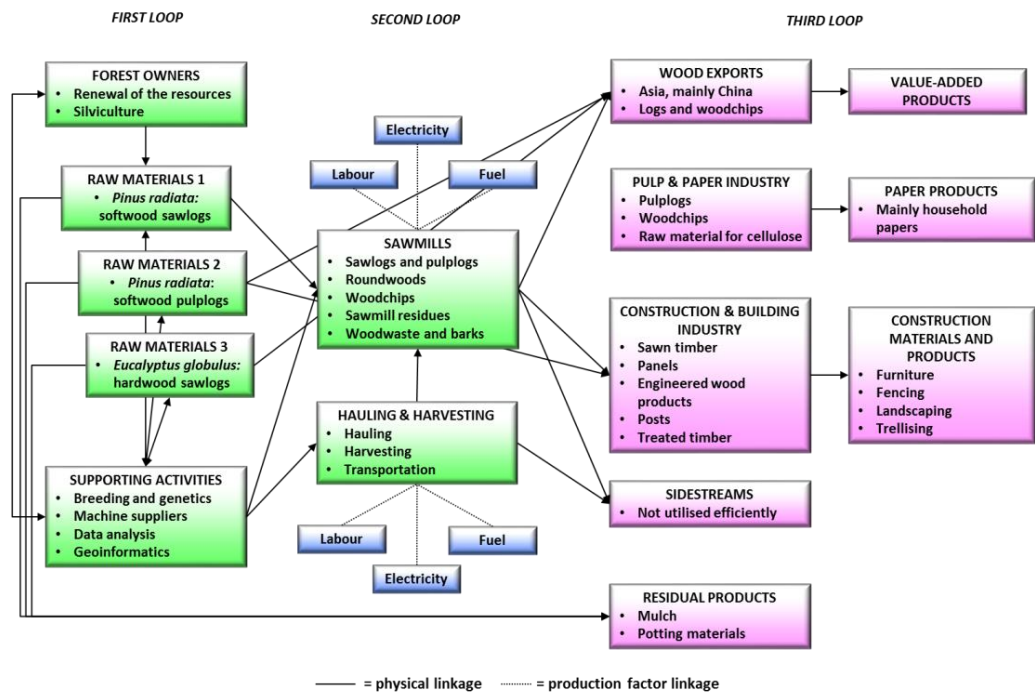


Figure 8: Representation of the forest and wood products industry value network in the Green Triangle region. The shaded green colour depicts the key functions in the value network, the shaded purple depicts key output directions, and shaded blue colour designates key external inputs (Ahlqvist, et al., 2013a, p.70)

The actual wood flow in the green triangle is outlined in figure 9.

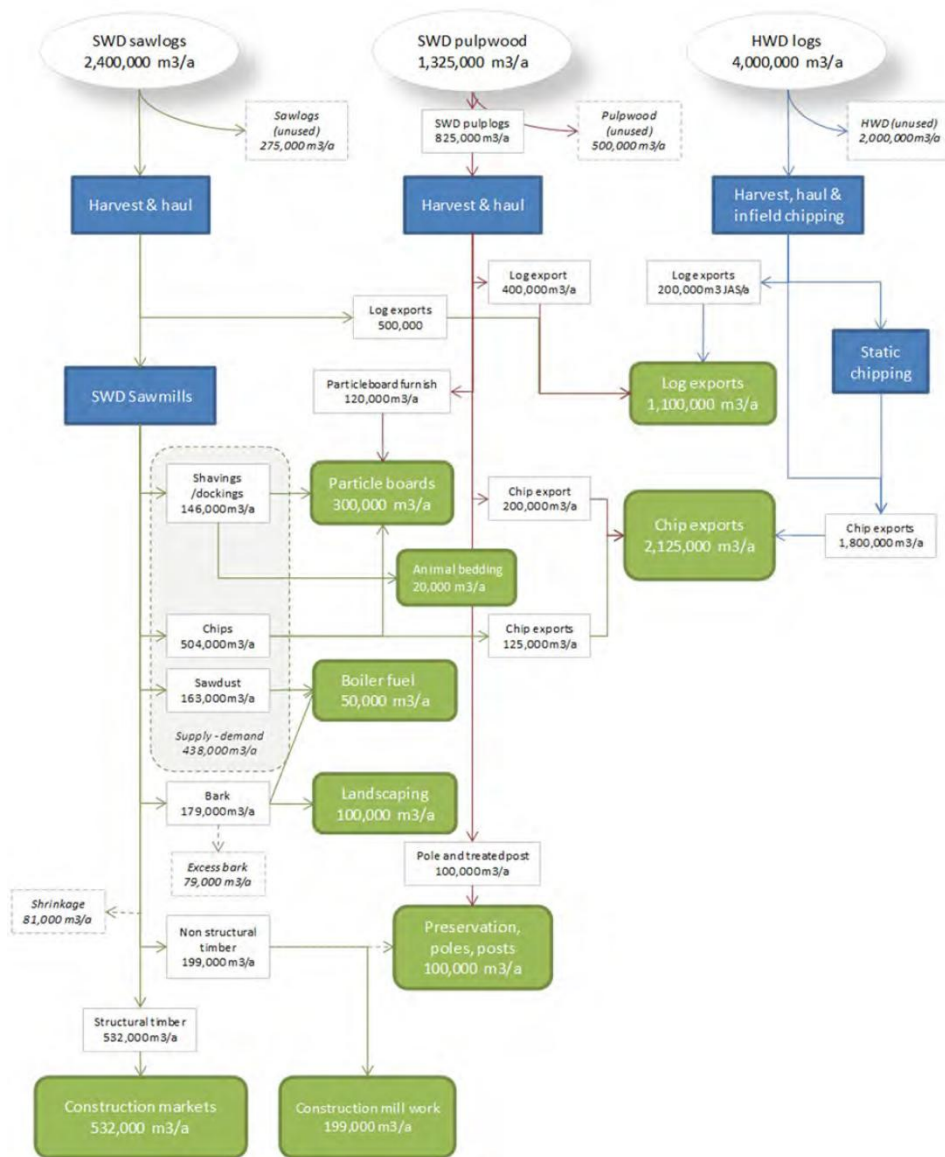


Figure 9: Wood and forest products flows in Green Triangle – current situation. Flows are presented in m³/a. White ellipses – feedstocks, Blue boxes – processing, Green rounded box – applications/demand, dashed boxes – balance/loss. (Ahlqvist, et al., 2013a, p.61)

The roadmaps using the four lenses that were developed in the project are shown in Figures 10-13.

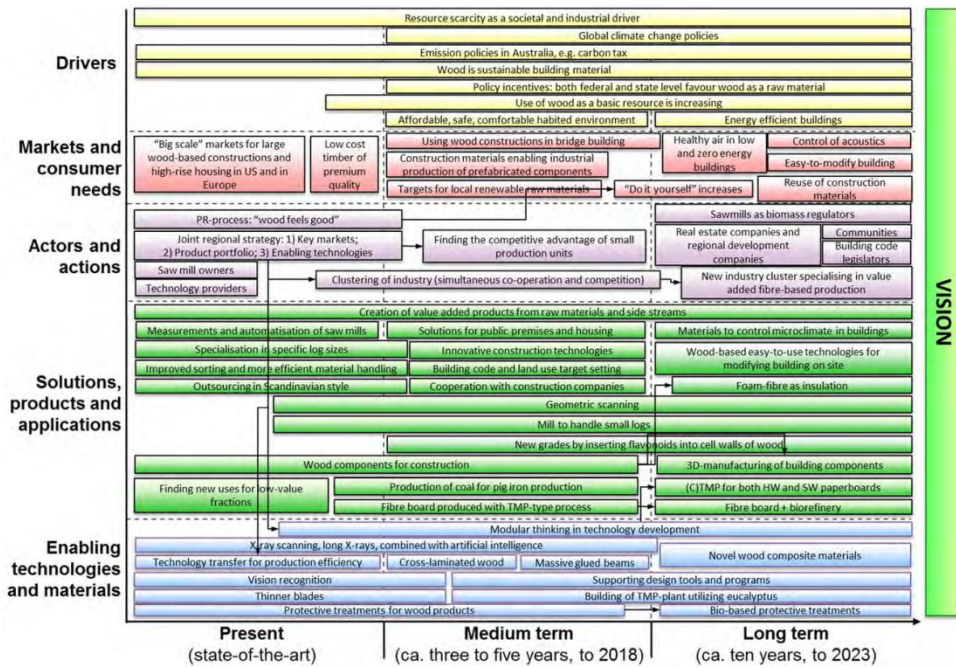


Figure 10: Mass lens roadmap: more efficient traditional forest industry (Ahlqvist, et al., 2013a, p.74)

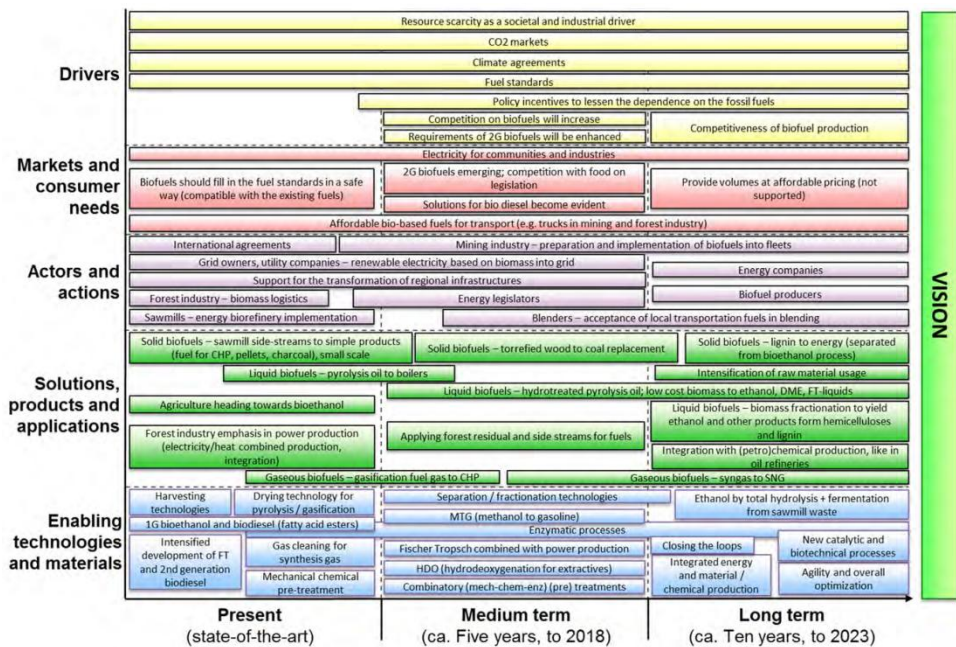


Figure 11: Energy lens roadmap: industry renewal through energy biorefinery (Ahlqvist, et al., 2013a, p.78)

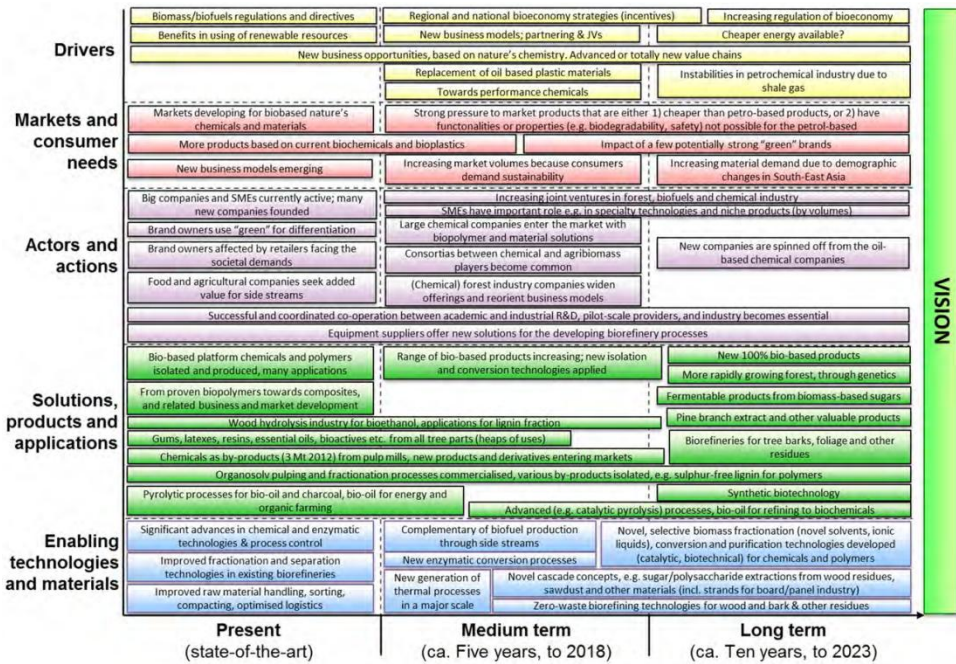


Figure 12: Molecular lens roadmap: radical industry renewal through diversified second and third generation biorefineries (Ahlqvist, et al., 2013a, p.82)

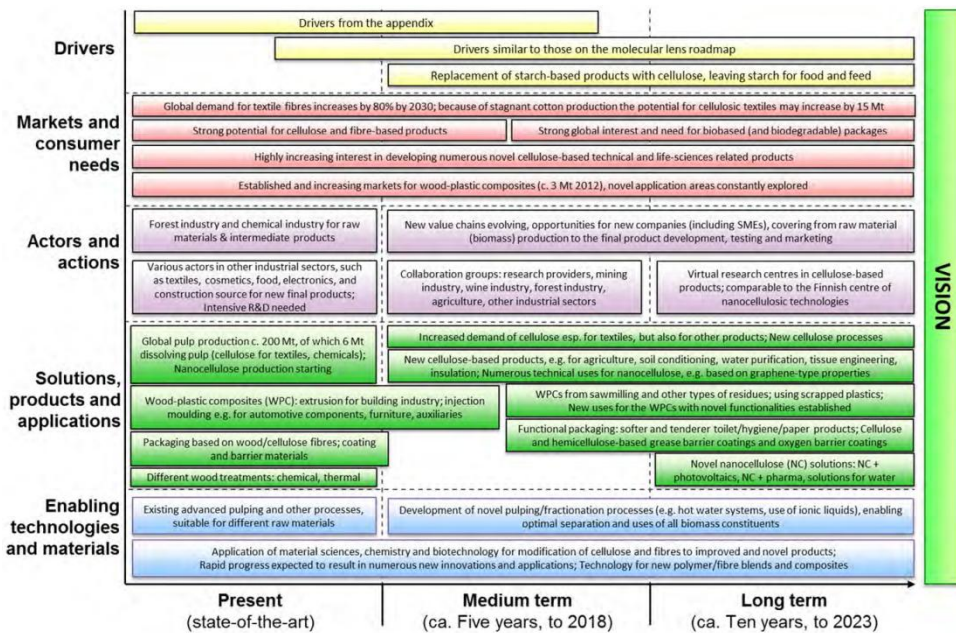
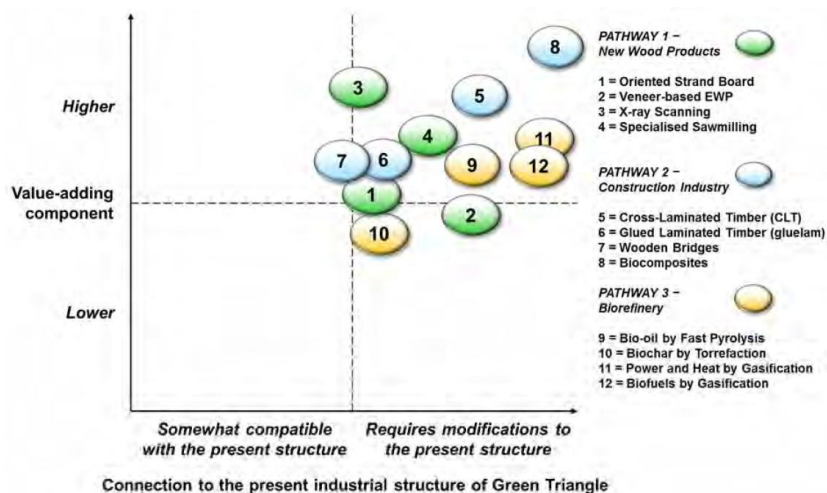


Figure 13: Atomic lens roadmap: radical industry renewal through new biomass and fibre-based production (Ahlqvist, et al., 2013a, p.86)

Grounded in the above four roadmaps a set of recommendations were provided. These are summarised in the table 3 and then in figure 14.

Table 3: Recommendations from the roadmaps with a 3-5 year time horizon (Extracted from Ahlqvist, et al., 2013a, pp.6-10)

	Mass Lens	Energy Lens	Molecular Lens	Atomic Lens
Action recommendations	<p>New wood products from underutilised Green Triangle log supplies:</p> <ul style="list-style-type: none"> • Oriented Strandboard (OSB) manufacturing • Veneer-based Engineered Wood Products (EWP) • Improved sorting and better yields by X-ray scanning • Specialised sawmilling (using smaller logs for sawmills) <p>Opportunities in construction industry using existing outputs:</p> <ul style="list-style-type: none"> • Cross-laminated timber (CLT) and high storey houses • Glued-laminated timber (Gluelam) • Wooden bridges • Biocomposites 	<p>Opportunities for underutilised wood fibre and residues:</p> <ul style="list-style-type: none"> • Bio-oil by fast pyrolysis • Bio-char by torrefaction • Power, heat and biofuels by gasification 	<ul style="list-style-type: none"> • Development of adsorbents and membranes for local opportunities • Cellulose fibres in textiles • Bio-based chemicals and polymers 	<ul style="list-style-type: none"> • Opportunities in nanocellulose



Following on from this a hypothetical future scenario was developed and is shown in figure 15.

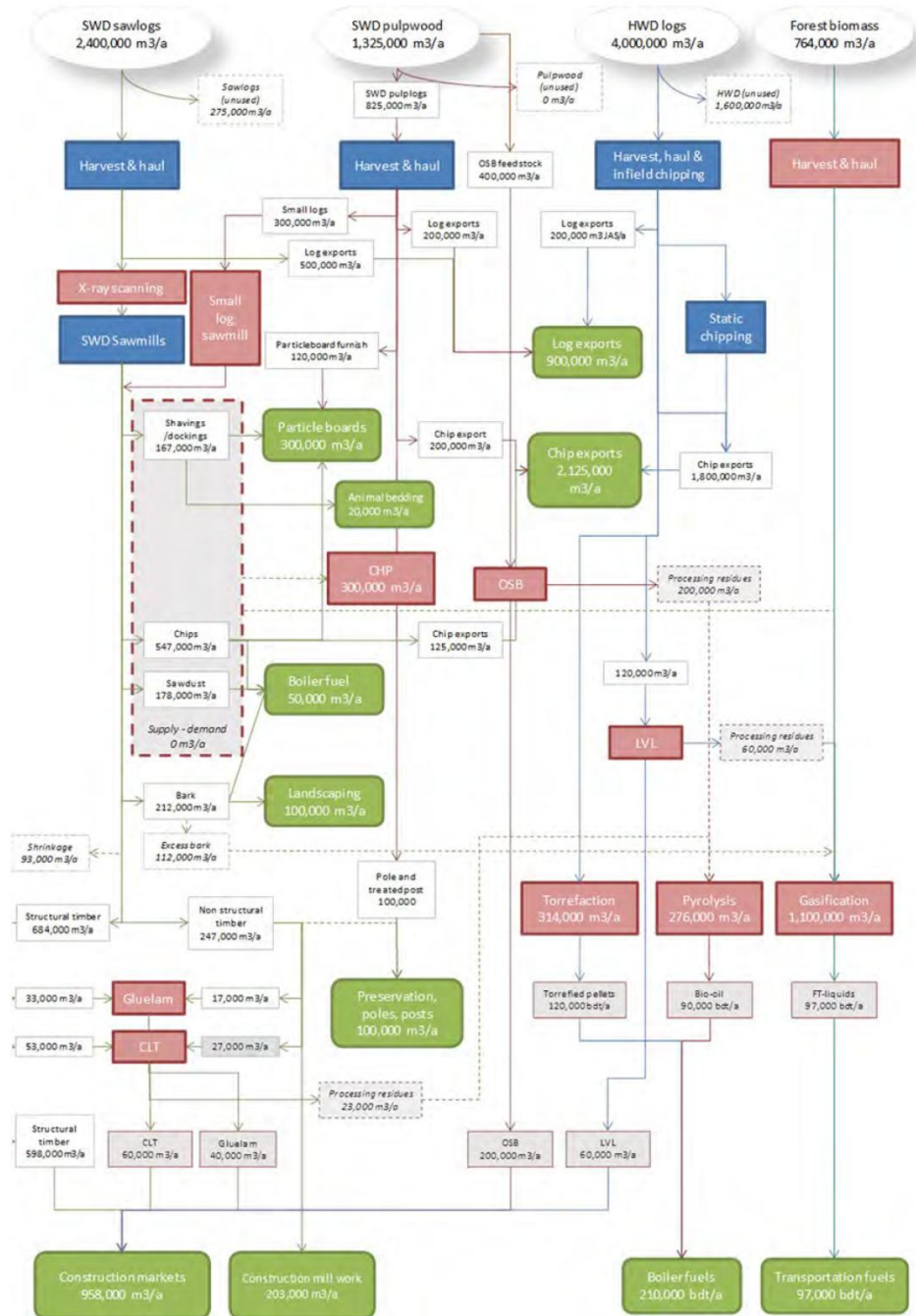


Figure 15: Wood and forest products flows in Green Triangle – hypothetical future scenario. White ellipses – feedstock, Blue boxes – processing, Green rounded box – applications, dashed boxes –

balance, Pink – new processes/product flows. X-ray scanning, small log sawmills, CLT, Gluelam, OSB, LVL, pyrolysis, torrefaction with pelleting and gasification plants implemented. HWD logs used for LVL production and SWD pulpwood for OSB production. All processing residues, excess SWD pulpwood, HWD logs and forest biomass used as feedstock to the energy biorefinery processes, totalling 2,000,000 m³/a biomass used in all biorefineries. Part of timber products is used for CLT and Gluelam production. (Ahlqvist, et al., 2013a, p.62)

4 Conclusions

The Strategic Roadmap executed in the South Australian part of the Green Triangle have through the actions initiated during the roadmapping process and following on from the roadmapping process generated a trajectory (in the form of a pattern in a sequence of actions) that is well aligned with that of a smart specialisation strategy:

The objectives of the strategic roadmapping project on the sectoral level were to enable entrepreneurial discovery of new opportunities that could maximise the value economic returns from the local cellulose raw material, either directly or indirectly.

The objectives of the strategic roadmapping project on the firm level was to minimise the information asymmetry between the firms in the region and global best practice in order to facilitate an entrepreneurial discovery process enabling differentiation of the product-service-system offered as well as the capabilities existing within the firm. In addition the project wanted to instil a mindset that would broaden the resource that the firm could put to use around the waste streams or expressed in the words of the Chair of the steering committee: “there is no such thing as waste – there is only raw material for which you have yet to find a value creating use”.

The objectives of the strategic roadmapping project on the industrial commons level was to provide an entrepreneurial discovery process that would be different across the industrial commons but would have an equally high commitment independent of the individual actor in the industrial commons.

The outcomes so far has been several instances of modernisation of existing firm activities by following the recommendation in, primarily, the mass lens part of the roadmap as well as in the waste use part of the roadmap. There has also been initiation of a sectoral transition by feasibility studies being initiated as well as external investment interest shown as relates to the other three lenses of the roadmap.

The objectives of the strategic roadmapping project on the regional level were to improve the broader linkages in the region as well as injecting a positive view of the future. This has been shown with a clear shift in tone from a negative, defeatist and non-

cooperative tone at the initiation of the roadmap project to one of positive, up-beat, can-do attitude that permeates the region presently. The project has also engendered interest among firms outside the region to potentially migrate or establish activities within the region. This interest is primarily in the more advanced domains identified through the mass, energy and molecular lenses. As the project progressed the interest in participating also grew as well as interest in continuing competence development around the relevant actors activities (e.g. competence development around business models on both the firm and the local government level). This has resulted in new synergies in the region that are showing early indications of new activities. Some of the inward investments will bring with them opportunities to enter new domains in e.g. the chemical lens of the roadmap.

All in all the project is judged, so far, to have been a major success which has made the state government decide to do similar exercises in other regions and other sectors.

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Invention, Adolescence & Absorption: The Urban Social Innovation Process (USIP)

Michael Wicke, Sebastian Wiesenhütter, Anja
Jannack, Jörg Rainer Noennig *

Juniorprofessorship of Knowledge Architecture
TU Dresden
01062 Dresden

* *Corresponding author*

Abstract

Cities are perhaps the most effective basis for innovation, as urban societies have well-established mechanisms of feedback, amplification, and selection to support creative production from their vast resources of human and intellectual capital. Throughout history, cities have been a natural pool of inventions and ideas. Especially in the case of social innovations, urban societies play a central role. This paper asks: How can inventions that originate from within a society effectively evolve into innovations for the respective society as a user and recipient? The model called USIP (“Urban Social Innovation Process”) put forward in this text defines “Social Innovation” from a comprehensively social perspective: it places society as an active player (inventor) already at the beginning of the process, and then introduces “innovation adolescence” and “diffusion” as subsequent key mechanisms. The paper shows central deficits of innovation discourses due to their limitation to economic processes, and how in favour of market absorption, social absorption had been widely neglected. The article concludes with a set of hypotheses how urban social innovation can be empirically investigated in order to derive applications for urban and economic development.

Keywords – Social innovation, urbanity, innovation adolescence

Paper type – Research Paper

1 Innovation

From business to society

Innovation research has drawn some clear dividing lines, the distinction between economic, or business-oriented innovation and social innovation is one of them (Rogers 2003, Fontan et al 2004). Another distinction separates closed from open innovation approaches (Chesbrough 2011). Further there is the opposition of incremental innovation (continuous improvement of existing qualities and goals) versus "radical" or "disruptive innovation" (Christensen 2011), defining the latter as the establishment of fundamentally new qualities and values. In the search process for a contemporary innovation paradigm, the boundaries between these distinctions, however, blur and dissolve.

Business innovation. Classic economic and business oriented innovation theory has argued that only when creative idea ("invention") successfully enters the market it can be considered an innovation (Drucker 1993). On other words: When enterprises and entrepreneurs have established their innovation with users and customers and made it "socially acceptable" (Schumpeter 1991). In order to organize and optimize this process, innovation management was established and introduced to the corporate world. Key motivation for the implementation of innovation processes in companies and institutions was the strategic minimization of the risks and uncertainties of invention. The idea of innovation management, before all, attempts control over the creative process, and to make it an object of planning and organization. This idea has resulted in the well-known models of "innovation funnels" which tacitly assume that innovation is predictable, directed, and goal-oriented (Fig.1, left).

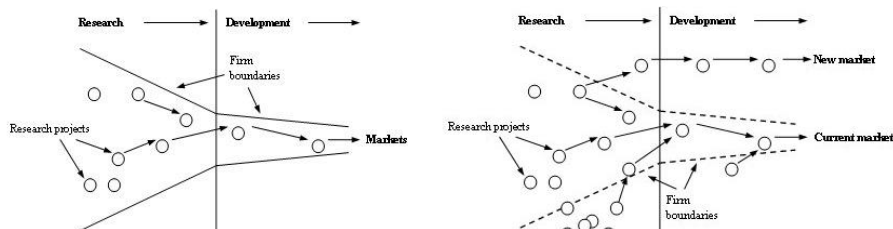


Fig.1 Left: Innovation funnel; right: Open Innovation (Source: H. Chesbrough, 2005)

Commonly, innovation funnels are characterized by a high number of idea input (inventions), the majority of which gets successively disabled through a cascade of systematic evaluation and selection ("stage gates") to eventually reach a certain goal: successful market entry (Cooper 1990). Certainly, a broad basis of ideas must be tested and assessed in order to accomplish a breakthrough innovation in the end. This basis is the creative capital or invention capacity of a company or institution in question. Here, the intellectual input may be provided by the genius of company leaders (one may call it the "Steve Jobs-Model"), the inventiveness of R&D sections ("Xerox PARC-Model"), or the collective creativity of employees ("3M-Model").

Open and User driven innovation. The newer so-called Open Innovation approaches bring the potential of larger communities into focus. They expand the creative base of the innovation funnel to larger "ecosystems" of the local or regional business environments, as well as to larger societies and networks (Chesbrough 2011; Hippel 2013). Open Innovation basically views the environment as an active agent for innovation processes. A larger innovation ecosystem forms when, for example, innovators do not refrain from emitting own (unselected) ideas to the environment, but simultaneously have the capacity to integrate "alien" ideas taken from the environment into their own practice (Fig. 1, right). This leads to two effects: 1) The basis, or creative capital, upon which innovation processes are set, is drastically expanded. 2) A fertilized, rich innovation environment is created which – just like the Silicon Valley – develops complex diffusion systems of intellectual products and property.

Problem 1: Overmanaging Innovation. Management concepts – including open innovation approaches – are still overestimated in their capacity to organize the pursuit of invention and innovation (Porschen 2012, Hermann et al 2007). Studies of R&D in business practice have shown that without any management self-reliant and self-governing innovation processes may emerge that are highly effective. What is more, research on user-driven innovation has demonstrated that apart from developers and producers, customers and end-users themselves possess effective invention potential which may be activated through "participatory design" (Hippel 1995). The user's recognition of inoperability, system weakness, or design failures makes them a rich source for new solutions (Fricke 2009). Innovations that emanate from personal experience are, however, difficult

to integrate into the narrow funnel of conventional innovation management (Christensen 2011). These findings, and many of others, indicate in sum the need for post-tayloristic work and business organization that go beyond the managerial thinking that has originated from mechanical industrial production (Pink 2010, Wolf 2011, Hage 1999, Burns and Stalker 1994).

Problem 2: Innovation as business. A second major deficit in innovation discourse was its limitation to the economic and business sphere. Targeting at market absorption of marketable products or services, other innovation goals and absorption processes had been neglected. To define economic survival as the major criterion of innovation ignores the possibility of innovations targeting at other kinds of public fora, before all their implementation in social realms like education, healthcare, or political systems (Rogers 2003). Eventually, the innovation discourse was extended when the notion of social innovation emerged, referring to new forms of human intercourse accepted and absorbed by communities, not markets (MacCallum et al 2009). Here, innovation success cannot be defined in economic measure; it rather relies on ethical terms and socio-cultural settings.

Social Innovation. Social innovation has been defined as the development and diffusion of new organizational forms of personal interactions that support the achievement of common goals (Mumford 2002). If coexistence within traditional social systems is frail, the inclination of social systems towards change rises and social innovations emerge as a necessary cultural development (Csikszentmihalyi 2007, MacCallum et al 2009). By now, much attention has been given to the different forms of acceptance and diffusion of social innovation; also the processes of implementation and absorption have been carefully described (Rogers 2003). Noteworthy is that the processes of diffusion and absorption are considered part of the general innovation process: Innovations and innovators cannot be identified solely on the basis of their creative work, but emerge only when improvements find acceptance in society.

Moreover, the process of innovation itself has become social. In the digital domain, open innovation was established as a collective practice by way of crowdsourcing interactive platforms and networks (an example is German co-innovation community Hyve, www.hyve.de). Here, the advantages of a broad idea input combines with the network and

marketing potential of a digital community. Close social interaction and feedback is possible, yet social innovation as “innovations for society” has become a business itself.

Convergence. There are convergences and correspondences of business innovation and social innovation. It is the acceptance at the backend of the process (market; society) that defines what an innovation is, and what is not. Also, the start condition is identical: Models of social as well as business innovation depart from a multitude of inventions to progress towards successful innovation. Despite such similarities, there are significant differences in regarding the organizational resp. managerial nature of the process in-between, the roles and numbers of the actors involved, and the scope of the involved environment.

The critical stage: Adolescence of Innovation

Studies in the field of Knowledge Architecture have indicated that the path from invention to innovation requires a period of “cocooning” that brings about social retreat, wild experimenting, and radicalization of concept (Diedrich et al., 2009, Noennig and Jannack 2013). To describe this critical transformative phase oscillating between ideation, social reflection and implementation, the notion of "Innovation Adolescence" was introduced (Noennig et al, 2014). In the context of social innovation, this period of radicalization and a-socialization but becomes problematic due to its profound disregard of social environment. To support and foster radical social innovation - despite its problematic “adolescent” nature – poses profound difficulties to most societies.

In the field of technology, the problem was solved by the notorious start-up garage: The garage-type setting is an environment that provides for maximum experiment and interaction among innovators, while staying in touch with society (Gridneva and Noennig 2013). Another solution has emerged in the creative industries: so-called co-working spaces establish micro-societies of free-lance knowledge workers, artists, and designers in urban hotspots, usually open to everybody to enter, yet with a special address towards the “creative class” (Brenn et al 2012b).

Both types – technology-based start-up garage as well as creative co-working space – usually do neither integrate with, nor depend on, the broad range of society. Although it is understood that information and ideas necessary for innovations may diffuse best in strongly networked groups, these are in turn often highly redundant. On the other hand, it

was demonstrated that open groups in turn have advantages in finding valuable ideas and information, yet they are less quick and effective in communication and exchange (Granovetter 1973). A remarkable finding on “social mobility” but shows a potential way out: The more people move between closed and open groups or societies, the higher the probability of successful innovation is (Ziemer 2013). Such dynamics are based to a large extent on emotional values and soft factors which are difficult to control or manage within organizations or institutions (Ziemer 2013). Yet there are other structures that naturally provide such qualities: cities.

2 Cities as Innovation Systems

Urban (social) innovation. Cities can be regarded natural innovation ecosystems. Although the ongoing process of urbanization is ever more associated with losses in life quality and the perception of cities as places of accelerated marketing and consumption (Lefebvre 1972), their creative potential seems unbroken (Florida 2006, Krätke 2012). Cities certainly differ in their inventiveness and innovation capacity. In urban history, there were pinnacles like Hellenist Athens, Renaissance Florence, or Paris of the 19th century: places of unmatched creativity and innovation. But any city is an astonishing device for the production of knowledge. Wherever people meet and live together, there will be an abundance of thinking and ideas; inventions will inevitably occur. In fact, with the population of a city its productivity and innovation increases, following scaling effects (Bettencourt and West 2010). The inherent dynamics, heterogeneity, and complexity of cities, plus their large number of actors and social interactions make them an excellent arena for invention and the diffusion of ideas (Jacobs 1992, Florida 2006). Yet for describing the crucial role of urban context for the emergence of knowledge there are few systematic analyses (Bettencourt and West 2010, Bade et al 2012). Despite the obvious capacity of urban societies to innovate on all kinds of levels, substantial innovation models were not presented until now. With the new demand for social innovation as a guarantor of balance, prosperity, and growth, urban society should be seriously taken into consideration as a central resource. It was in urban communities, before all, that social innovations have emerged, very often triggered by social disruptions (MacCallum et al 2009; Johnson 2010). But also here: the mechanisms how social innovation in urban societies diffuse and spread are far from being clear. The processes how they are broadcasted, accepted and absorbed remain vague. Clear is only that the emergence of social innovation

cannot be reduced to the inventiveness and personality of individual innovators or knowledge workers. Mostly it is the result of complex social dynamics and the self-organization processes of the population that is confronted with new demands of community life: social innovation in cities is “crowd-sourced”.

Enriched environment. Current attempts to describe the creative capital of cities assume an “intellectual matter” which is metaphorically spread over places of interaction and exchange (Krätke 2012). Environments with such enrichment are characterized by qualities such as serendipity, impulse density, high tolerance, variety of spaces and technological affordance (Florida 2006). The very potential of creative cities lies in the evolution and promotion of intellectually enriched environments, in the generation of knowledge from the collaboration and co-learning of crosslinked knowledge workers. The interplay of actors and activities across different spatial, organizational, and value levels is conditional for vital innovation ecosystems (Gridneva and Noennig 2013).

City as amplifier and trigger. Creative invention as the initial step towards innovation is a complex learning and synthesis process which interweaves private and personal experience with external knowledge (Csikszentmihalyi 2007). In the urban context, intensified exchange thus leads to accelerated idea sophistication and innovation (Bettencourt and West 2010). The social transfer of ideas works like an impulse trigger: Upon stimulation, associations, alternative views and opinions will be quickly evoked in a number of people, which in turn will add evolutionary momentum. Social innovations will be adopted and accepted, if there exist a shared knowledge base and social agreement, common interests and goals of the group. The dynamic distribution of “memes” in peer networks and local cultures (Csikszentmihalyi 2007) can quickly establish communities of “early adopters” (Rogers 2003) based on the oral spread of reports, on personal contact, and trustworthiness. Here, (common) sense may play a more important role than technology (Fontan et al 2004). As a common indivisible property of a community, a commons, this shared understanding creates a sense of place, a local quality that is difficult to transport and transfer – it is atmospheric (Brenn et al 2012a). These effects, however, have clear spatial dispositions.

3 USIP – The Urban Social Innovation Process

Model

Aiming for an instrument to investigate how social innovation emerges and spreads in the urban realm, a new model will be proposed: “Urban Social Innovation Process” (USIP). A derivative of established innovation models (“Innovation funnel”) and above mentioned arguments, it defines social innovation not from the back-end of the innovation process, i.e. when innovations have successfully arrived in society. Instead it takes account of the specific nature of cities as condensers and multipliers of human interaction, thus becoming the very generators of social inventions and ideas. The model revolves around the condition of “innovation adolescence”, which had been identified before as the critical point in social innovation processes.

In Fig. 2, the marks A, B, and D describe the three general phases of the USIP, whereas marks C and E specify the crucial relationship between innovators and society.

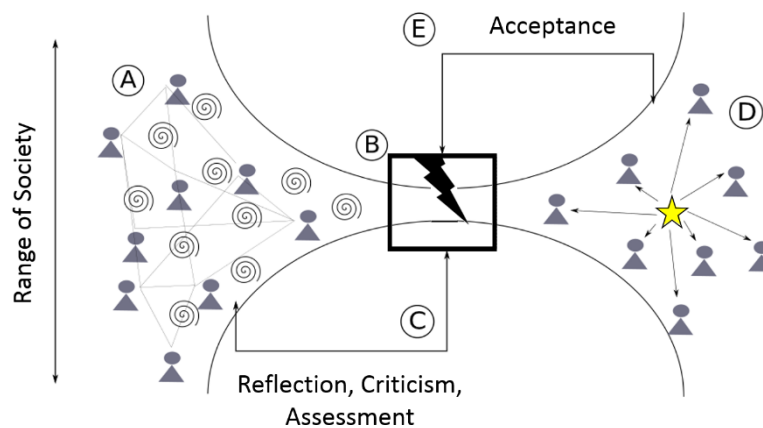


Fig.2 Urban Social Innovation Process (USIP)

(A) Social invention. From actual needs within a community or society, embryonic inventions emerge that reflect cultural, technological, and social disposition. In a way of informal bottom-up creativity, a multitude of ideas appears as a by-product of urban society dealing with problems, needs, and demands. If they have relevance for the community, the primordial inventions become an “issue” of social interaction, awareness, and scrutiny. Through socio-urban processes of mutation (“Chinese Whisper”) and selection (“Hyping”) they may further evolve, or get terminated.

(B) Adolescence. Social innovators pick up inventions with high potential of social or economic acceptance, and develop them further on their own risk and responsibility. Here they enter the critical phase of "Innovation adolescence": in order to mature the concept and its application, certain retreat and detachment from society is necessary, which had been the originator of the invention though.

(C) Social feedback. In the phase of "adolescence", social inventions better survive their "valley of death" before becoming successful if they keep in touch with their social ecosystem. The contact is an essential: Being beneficiaries of society in one way or another (e.g. as scholarship recipient, alimented family member, or accepted crazy neighbour), the "cocooning innovators" are depending at least for a while on the structures which they possibly intend to change.

(D) Social innovation. If a new concept successfully breaks through (i.e. gets adopted and spread throughout the community) it can be considered a successful social innovation. From many inventions for a few (innovators), finally an innovation for many has evolved. The innovation for society has become social itself: this is before all a matter of acceptance.

(E) Social Preparation. Likewise the community plays an essential role as it comes to the acceptance of the innovation "under construction". In order to prepare a soft roll-out for the resulting innovation, diffuse social processes of absorption e.g. "hearsay", "word-of-mouth" are instrumental to spread the innovation through the immediate environment; they activate the essential processes of peer-communication and early-adoption.

In order to clarify the problematic adolescence phase within the whole process, a simple graphic transformation is telling (Fig.3). Assuming that in the case of genuine social innovation (inventions from society develop into innovations for society) the originator of the multiple social inventions is at the same the recipient of the final innovation, the left and right pole of the diagram above (Fig.2) coincide: it is the same people, communities, or societies that are involved on both edges. This sets the central "adolescence"-phase of the USIP drastically aside: the social entrepreneur becomes an outsider, and social innovation is systematically marginalized.

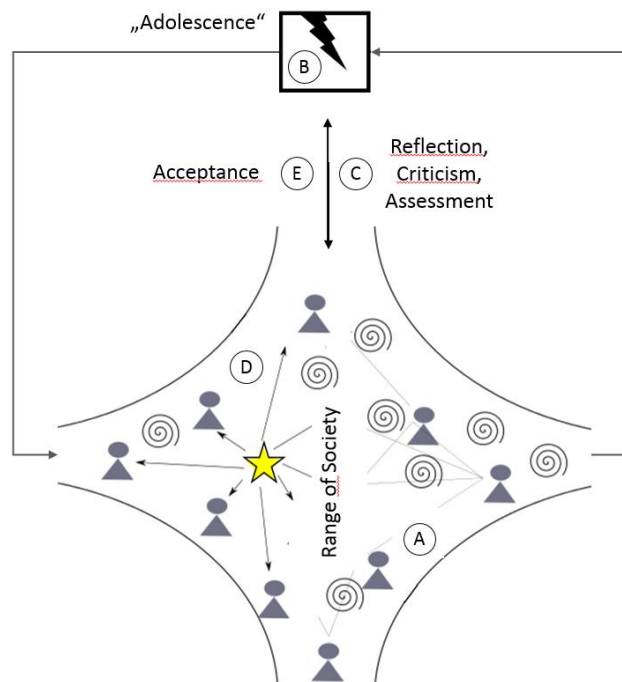


Fig.3 Transformed USIP scheme: Detachment of "Adolescent phase"

Hypotheses

In accordance with above-mentioned key elements of the USIP scheme, a number of hypotheses can be stated that allow empirical testing of the model and of the concept of "Innovation adolescence".

(1) Urban society is a "natural" innovation system. Even without explicit innovation targets, urban societies run iterative mechanisms for the development and diffusion of (social) innovation. Social processes of interaction and invention combine with critical reflection, evaluation and selection. Moreover, there are effective mechanisms for the diffusion and multiplication of innovations. These coupled mechanisms can be identified and descriptive variables be established. Urban factors like impulse density, heterogeneity, or tolerance impact on the inventive capacity ("creative capital") of cities.

(2) Urban society possesses a broad invention basis. Existing models of innovation ignore urban society as one of the richest pools of ideas. Inventions are continuously generated within the whole range of society. Citizens as users of tools, systems, and envi-

ronments are predestined to be the first improvers to these items themselves. Just as inventions can be harvested and collectively refined in internet communities with crowd-sourcing approaches, urban communities too form a reservoir of “crowd” creativity for which suitable platforms shall be devised.

(3) Social innovation needs withdrawal from society. In the case of social innovation, the phase of “Innovation adolescence” demands withdrawal, radicalization, and experiment. The pursuit of social innovation necessitates a-sociality, at least for a period of time. For social entrepreneurs, in order to process social inventions towards accepted innovation, temporary retreat is needed.

(4) Adolescence of innovation demands embeddedness. The retreat of social innovators, paradoxically, should happen within society: subtle connections (“weak ties”) are to be kept to the community. Certain kinds of urban environment provide appropriate free-zones while still being close to ordinary urban society. Invisibility is a key quality for the temporary withdrawal within the community, thus allowing radical experimenting while being “inside”.

(5) Acceptance depends on place of origin. Social innovations are more readily accepted when their basic inventions originated from the same community. Urban societies as critical recipients of social innovations, decide about appropriateness by reflecting about the innovation’s place of origin. That implies that innovations cannot be easily transplanted or transported between different urban contexts. Urban society implements concepts more easily if they are place-responding. Good innovations are likely to occur where they are due – and they are better fit to places where they occurred. Social acceptance needs embeddedness within the overall process.

4 Outlook

The USIP model and its associated hypotheses explains how creative knowledge gets “extracted” from, and applied to urban communities (“crowds”). It sketches the urban environment as a powerful generator of socially applicable ideas, inventions, and innovations. In practical application, the model supports the identification of “natural incubators” which realize participation as a core element not only for social welfare and communal life, but also for the economic development of “knowledge cities”. Thus, the concept hints at a long-term innovation policy– in contrast to existing support practices

which often are too focused and only kick-in in the late stages of the innovation process. Future research shall outline the appropriate processes and places that effectively translate the creativity of urban population into implemented social innovation.

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Embedded Knowledge Management: Strategies for a Science-to-Engineering Cluster

Jörg Rainer Noennig *, Anja Jannack

Juniorprofessorship of Knowledge Architecture
TU Dresden
01062 Dresden

** Corresponding author*

Abstract

Presenting findings from a knowledge management project in a German science-to-engineering research cluster, the paper addresses issues of cluster formation, cooperation, and innovation. In the project, a novel knowledge management approach was developed that stresses activity from within the organization (“Embedded Knowledge”), and combines scientific expertise with strategic-methodical knowhow (“Synthesizing Knowledge”). Integrating measures of knowledge and innovation management and technology transfer, a “Knowledge Architecture Toolbox” was set up and applied. The project not only serves as a case-study for the idea transfer from basic research to engineering, but also presents a prototype for design-oriented knowledge management in large science and technology clusters.

Keywords – Cluster, embedded knowledge, knowledge architecture

Paper type – Practical Paper

1 Background: Cluster Formation

As a reaction to increasing complexity, uncertainty, and competition, the formation of clusters has become a general trend (Bathelt et al, 2004). Large-scale projects, in most cases, lead to large-scale project consortia. In science, technology, and economy alike, organizations tend to transform into extensive alliances in order to increase their competitiveness, to utilize synergies, and to pursue their strategic and operative goals (Gulati, 1999). The formation of clusters is due to an “epigenetic” disposition: the fierce innovation race between institutions, regions, and nations triggered by networked and globalized science and technology. For maintaining public financing, political support, or just a voice in the scientific community, “critical mass” must be built up; organizational bodies are urged to grow, to fuse, and to accumulate momentum (van Hemert et al, 2013). Often

stipulated by economic policy making, the core motivations include administrative synergies, sharing of information and technology, as well as the acceleration of high-level knowledge production (Krätke, 1999).

For the formation, management, and termination of clusters, however, appropriate strategies are rare. This is due to fast changes in science and technology, but also to project partners themselves being already highly differentiated organizations. In effect, the management of cluster cooperation has become an issue of growing importance throughout the past years; the demand for appropriate concepts can be clearly sensed (Landsperger and Spieth, 2011). – A knowledge management project for a German science-to-engineering research cluster provided the opportunity for a case-study and systematic inquiry.

2 The Case

The cluster in case consisted of several hundred scientists, organized in ~ 15 research teams with a total >100 scientists, plus management group. Distributed over different locations but still in geographical proximity within a German city of 500.000 inhabitants and rich science and technology environment, it bundled groups from ~10 public research institutions (university, non-university). In terms of environment, this setting was in ideal accord with conditions necessary for the well-functioning of science networks (Boschma, 2005). In terms of content, the cluster was formed to boost interdisciplinary cross-scale research in engineering and natural sciences, and to establish direct links to industry. As its research outcomes have high relevance in terms of application in high-technology fields, the cluster received massive public funding.

In order to facilitate intra-cluster cooperation and knowledge exchange, a special knowledge management team of 4 to 6 people (“Knowledge Architects”) was established and associated to the central management group for nearly two years (Fig.1). The university-based team itself was of interdisciplinary composition, including natural scientists, computer scientists, architects and designers.

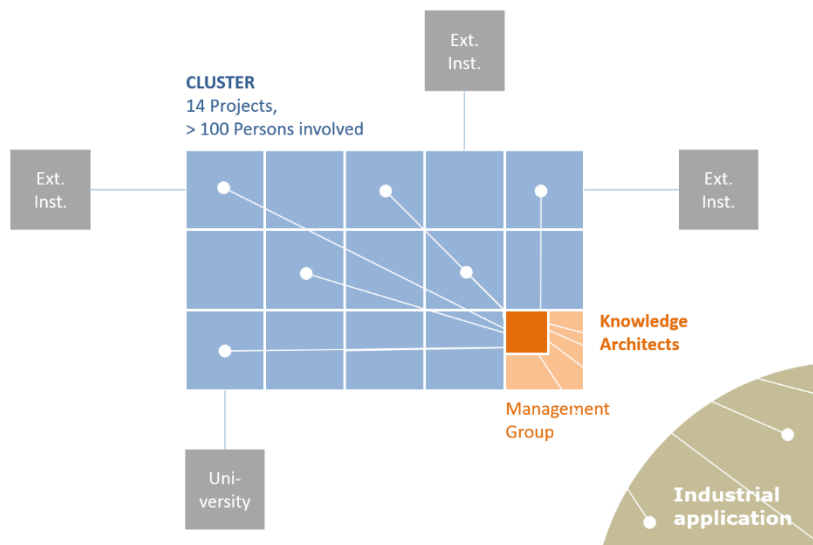


Fig.1 The cluster, management group, and Knowledge Architecture team

The Knowledge Architects could draw from previous experiences in technology management and cluster cooperation projects, ranging from small-scale creativity workshops to joint product development of high-tech consortia on national level. There, agility concepts (Pichler, 2010), Open and user driver innovation (Rass et al 2013; Hippel, 1995; Chesbrough, 2011), ideation and design thinking approaches (Brown and Katz, 2009) had been tested, among others. These practical consultancy experiences provided a basis for long-term meta-research on cluster formation and cluster cooperation, resulting in a number of studies and new concepts. In a previous project, the model of semi-open innovation was developed, featuring a small “impulse-team” that co-develops with a “crowd” of scientists and technologist ideas towards innovative marketable products (Gräning et al, 2013). This model provided the methodical basis for the project presented here.

3 Dynamic Perspective

When commencing work for the science-to-engineering cluster at stake, it had to be clarified how the team’s activity would differ from existing services. A number of public and private agencies existed in the immediate environment, committing themselves to technology transfer, innovation, and science management. The point of distinction became clear upon raising a question that commonly occupies science and technology managers: How deep shall knowledge management immerse into its object of work? In other

words: How much expertise is needed for the scientific content of the consulted projects?
The discussion can be broken down to two opposed arguments:

- **The expert argument: Entering the Ivory Tower.** From an expert perspective, in-depth knowledge is necessary to understand demands, context and culture of the researchers and their projects – especially as it comes to high-technology. In order to communicate with advanced scientists, elaborate scientific knowledge is due. Superficial expertise leads to defective results. This argument supports the tendency to entitle experienced scientists for management duties, i.e. to manage from scientific perspective. This, in turn, brings about narrowing of perspective and focus, as scientific thinking tends to be specific, not strategic; problem- and not project-driven.
- **The manager argument: Highflying bird.** On the other hand, knowledge managers argue that a structural and strategic perspective is needed, a more general view on the multiplicity of activities and projects to be coordinated. Too much detailing distracts from the general direction and the bigger picture. This however, leads to unspecific and abstract concepts which may fall victim to “concretization dilemmas” solutions that looked plausible in a larger prospect (“birds eye view”) turn impossible when touching the ground of reality, i.e. scientific research (Rescher, 1998).

Established forms of knowledge management will either act from within, or from above. The “Ivory tower” can hardly coincide with the “Highflying-Bird” at the same time. A combination of both seems impossible if not a kind of zoom-in/zoom-out method is found that quickly changes perspective from high-above to deep-inside (this is perhaps best known from Google-Maps, which brings new information into scope when zooming in). Addressing this problem, a dynamic perspective was developed by the Knowledge Architects in reference to “classical” architecture as a discipline that creates abstract and highflying concepts on the one hand, but turns concrete and matter-of-fact on the other. Perspective shifting became the core element of the team’s cluster activities.

4 Embedding Knowledge

Perspective 1 takes an inside view; it is based on the idea of embeddedness. The Knowledge Architecture team was established within the cluster with the clear ambition to acquire expertise on the scientific projects. While preparing for interviews and focus-talks, intensive studies were conducted in order to become “communicable” to the experts, and to gain an inside view of their topics. Certainly, exchange on eye-level was not achieved: nobody becomes an expert for 15 highly advanced fields of research within half a years.

Instead, this basic scientific training proved a powerful move on interpersonal and psychological level. Scientists, who tend to be sceptical about management issues impinging on the scientific logic of their projects, clearly notice when efforts are taken towards understanding their issues and concerns. As a matter of trust-building and accommodation, a productive attitude and atmosphere easily appeared which stimulated scientists to simplify their explanations to a degree that they became useful also for knowledge management concepts. The tiny movements on both sides provided for encounter, not unlike political or business negotiations. Both sides moved: the management team to some level of scientific understanding, trying to embed itself to a certain degree in the research projects; the scientist to a level of general abstraction. Thus, small but effective interfaces emerged which originated in turn new projects and developments.

5 Synthesizing Knowledge

Perspective 2 clearly takes a meta- or bird-eye position, due to the overall task of the project. The endeavour could be compared to work in a chemical laboratory. Analysing the core substances of the individual research projects and breaking them down into small compounds of knowledge (“molecules”), subsequent syntheses were attempted eventually. New combinations of knowledge had to be generated and tested with scientists and technologists, ideally to a state of marketability. Once new compounds of knowledge were created, extensive assessment and profiling followed up. Due to the ambitious goal of spanning the whole “production lane” from idea generation to industrial application, three major components had to be combined:

- Knowledge Engineering: In order to stimulate communication and exchange of knowhow between the different research groups, and to recombine their knowledge, in-depth surveys of the on-going projects and structured interviews were carried out, creating the input for a digital data base. For the active recombination of these “molecules”, a matching algorithm was developed.
- Innovation management: In order to develop fresh ideas and research projects, intensive brainstorming was carried out, supported by modelling and visualization techniques. The Basis for these “idea talks” were combinations of existing research results, carried out either digitally by the “matcher”, or by human “wetware”.
- Technology Transfer: In order to identify and promote findings towards industrial application, an expansive market matrix was created to assess the transfer and market potential of the respective findings. For high-potential projects, active promotion with industrial partners was undertaken and a strategy developed for back- and fore-propagating ideas to, as well as from, the market.

6 Results

For putting the above mentioned elements together, a “synthetic” approach was applied which demanded genuine architectural thinking. As the Knowledge Architecture team included members that were indeed educated in architecture and design, a comprehensive toolbox could be developed way beyond conventional management tools and methods. Completely new instruments and methods were invented, or existing tools re-configured, including visualization and diagramming techniques, infographics as well physical models (Fig. 2). The new tools not only discovered existing yet dormant cross-connections between the researchers and their activities, but also effectively supported the generation of new ideas and projects

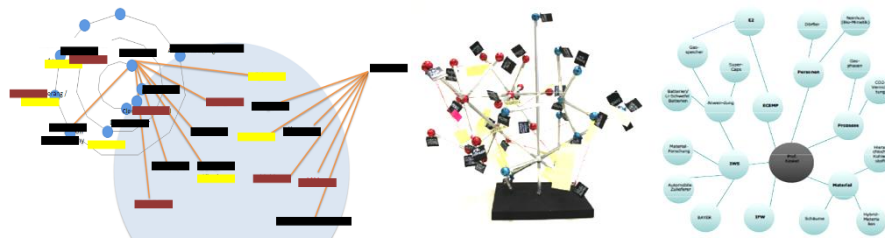


Fig. 2 Competence radar “Matcher” (left);
Physical and digital concept modelling “Project cosmos” (centre, right)

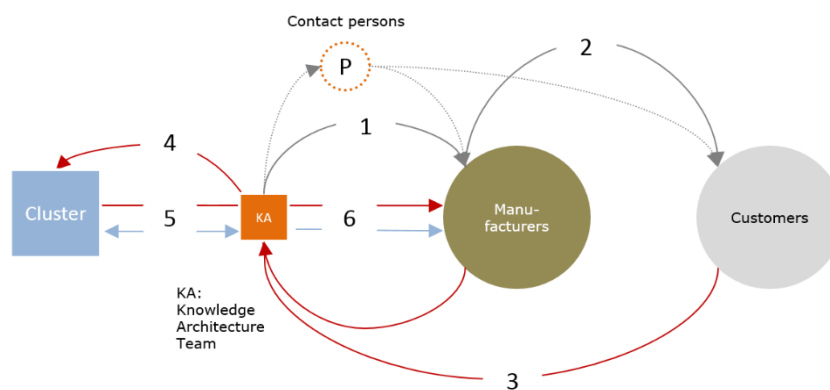


Fig. 3 Marketing strategy: Back- and fore-propagating ideas from / to market

The core result of the project, however, is a formal framework that cross-connects all stages of scientific research and technological application. Key is the careful mapping both of market demands (“properties of products and applications”) as well as of scientific projects (“properties of research items”). The essential ontological link “properties” is the key parameters for the translation of market language into science language, and vice versa. On this basis, a marketing strategy for scientific ideas could be developed and applied for some of the generated projects (Fig.3).

An interesting side-effect of the project was the discovery of new role-models for knowledge managers, for instance as “go-between” for partners inside and outside the cluster. Due to the group’s overview and insight into ongoing research projects in the cluster and related institutions, strategic knowledge was built up that attributed a natural “connector function” to the knowledge architects even beyond the boundaries of the cluster. Metaphorically, the team acted like “bees” in an ecosystem, transporting tiny yet fertile bits of information between various partners and parties. Sometimes the team itself was not aware of this function, or role. The transported “gifts”, however, immensely con-

tributed to the effectiveness of encounters: they easily built up trust, expectation, and commitment among the scientists.

7 Outlook

Foreseeably there will be no unified, or general strategy for knowledge management in science or high-technology clusters. Any large-scale research consortium develops its distinct organizational behaviour which must be carefully investigated in order to be understood and addressed. That implies design-oriented knowledge management: instead of recipe-like, replicable approaches, “fresh” creation of custom tailored strategies becomes a key issue. The prototypical toolbox developed in the project supports the customization of such strategies. By its method of embeddedness, not only the pursuit of cooperation between scientists of different fields is supported, but also institutional strategy-building, policy making, and the development of organizational culture in research clusters.

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Innovation Topologies: Modelling Knowledge Diffusion with Cellular Automaton

Jan Barski *, Magdalena Wagner

Department of Spatial Planning, Wrocław University of Technology
Wrocław, Poland

Anna-Maria Scheler, Jörg Rainer Noennig

Juniorprofessorship of Knowledge Architecture, TU Dresden
Dresden, Germany

** Corresponding author*

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Abstract

As an extract of an ongoing cooperative project of Wrocław University of Technology and TU Dresden, the paper explores the emergence of innovation and asks whether innovation can be to any extent predicted spatially. Cellular Automata (CA) have been chosen for this study as the spatial modelling tool. The goal is to understand the nature of the spread of innovations in a limited space, and to equip the CA with information needed to calibrate it to actual, real-world processes. The CA spaces are formed by cells with specific characteristics concerning their absorptivity, or attractiveness for innovators. In addition, information is given how the agents behave and act depending on the nature of their innovation.

Purpose – The final goal of the research is to examine the possibilities of forecasting the appearance of innovations with the use of spatial, architectural, and economic data.

Design/methodology/approach – Cellular automata were created and tested. As input, categorised data of selected entities were gathered and organised into a matrix. The CA were calibrated in order to recreate the historical processes described in the antecedent research.

Originality/value – The assumption of the study is that well-calibrated CA can model real-world knowledge diffusion processes with acceptable precision. This methodology allows for credible – numerical and spatial – estimation of the likelihood of the appearance of innovation inside a specified branch of economy and inside a specified area.

Practical implications – As a starting point for extended research, the study wants to establish a scientific basis for knowledge and innovation-based spatial planning, having implications for economic development, urban management, and policy-making.

Keywords – Innovation, Knowledge diffusion, Cellular Automata, Environment

Paper type – Academic Research Paper

1 Introduction

Cities evolve constantly, but only few urban areas manage to develop an innovation culture that accelerates social and economic evolution eminently that substantial advantage in the global competition is gained (Florida 2008, Krätke 2012). Examples for urban areas with immense magnitude of innovation have been New York at the beginning of 20th century, or the Japanese Megapolis after WWII. Here certainly scale mattered (Bettencourt et al 2007), yet the innovation capacity of cities is not only depending on size. Below the megacity scale, the Boston-Cambridge area, the Silicon Valley, or the Basel region in Switzerland-Germany-France may provide prominent contemporary examples.

On that background, knowledge research has commenced to investigate spatial features and the geographical dispersion of ideas and innovations (Rogers 2003, Krätke 2012). From an analytical point of view, a central question is how the emergence and spreading of innovations can be properly measured (Scharnhorst et al 2012). From a perspective of urban planning and development, in turn, the question is whether the emergence and growth of innovations in urban realms can be predicted and conditioned. In order to address this obvious desideratum for planners, local authorities, and investors, the paper presents an ongoing study on the mechanisms of innovation emergence and diffusion in urban environments.

2 Relevance and Background

To understand the mechanisms of knowledge generation and transmission is a key issue in the context of the so-called ‘Knowledge Society’ (de Solla Price 1963). It is similarly important for contemporary economy that is increasingly knowledge-driven due to accelerating innovation cycles, globalization, and information and communication technologies (Marx, Gramm 2002). General insight is needed how ideas, inventions and innovations emerge and spread, be it in smaller collectives (e.g. work teams, learning groups),

or in larger societies (enterprises, schools, cities). In response to this demand, Knowledge Management (KM) and Knowledge Engineering (KE) have emerged as new disciplines with a range of applications, e.g. in science and technology clusters, in R+D facilities as well as in learning institutions (Drucker 1969, Senge 1990).

2.1. Knowledge Dynamics

In current discourses in Knowledge Management, notions like ‘knowledge transfer’, ‘diffusion’, ‘spill over-effects’, and ‘serendipity’ have become key concepts (Rogers 2003). They not only indicate the subtle dynamics behind knowledge work, but also the fact that knowledge is being processed by actors (e.g. knowledge workers, innovators) in spatial resp. environmental settings (Nonaka and Konno 1998, McCallum et al 2009). These may be physical spaces (e.g. buildings, campuses, cities) as well as virtual environments (e.g. networks, online communities, platforms). Case studies and statistical investigations have given empirical evidence for the connection of the above-mentioned knowledge processes with their contextual settings, both on small and larger scale (Boutellier et al. 2012). As one result, the new field of knowledge mapping has come into existence. Its aim, among others, is the dynamic mapping of knowledge processes, i.e. the diffusion, spreading, and transmission of knowledge in space over time (Scharnhorst et al. 2012).

Yet, the majority of current attempts in representing knowledge dynamics in space are limited to static maps and statistical schemes of distribution. Most methods are based on data collected in retrospective, and if models are formulated, they are derived from statistical correlation and probability. Based on the “soft” methodology of social sciences, the models’ power of explanation and practical (purposeful) application is limited – they do not allow a priori investigation or forecast. There are few spatial models of knowledge dynamics which can be rigorously studied and tested by inductive simulation. Arguably, this deficit is due to lacking insight into the micro-processes of knowledge generation and diffusion. It is the key parameter ‘knowledge’ which itself remains obscure and vaguely defined, and thus obstructs research on its evolutionary mechanisms. Most definitions of knowledge are based on indexes e.g. publication rates or patent registrations. They acknowledge the results of knowledge work, but give no account of the generative processes of knowledge itself. This diffuse notion of knowledge may explain the lack of sophisticated models for knowledge dynamics in regards to the environment.

Taking into consideration recent advances in the neurosciences, but also well-established concepts in science studies, cognitive psychology, etc., it is surprising that only few concepts on micro-processes of knowledge have entered the discourse of Knowledge Management and Knowledge Engineering. Among the more elaborate models of knowledge dynamics in regards to environment certain approaches from Japanese researchers (Nonaka and Konno 1998) deserve attention which adopt the concept of implicit (tacit) knowledge (Polyani 1966) to organizational as well as to spatial environment. These concepts are interesting for they acknowledge the nature of knowledge as procedural-dynamic, and also because they underline the importance of implicit knowledge. With the concept of 'Ba' (place) reference is given to environmental factors, as implicit knowledge must be understood as being environmentally conditioned to large extent.

2.2. Knowledge Diffusion

The phenomenon of diffusion can be viewed from two perspectives. One view differentiates expansive diffusion from relocative diffusion, while the other juxtaposes contagious diffusion and hierarchic one (Zipser 1983).

Expansive diffusion only transfers the idea or phenomenon to another point in space. A simple example may be mailing between people, which is clearly able to transmit ideas. *Relocative diffusion*, on the other hand, requires a material carrier of an idea or phenomenon to be physically moved in order to spread. This type of situation applies for instance when a teacher or messenger meets other people and introduces new thoughts or modes of behaviour to the travelled area. Relocative diffusion may also involve machines or other objects, whose implementation in a new place equals the introduction of a new idea there.

Contagious diffusion describes scenarios in which the spread of an idea or phenomenon is continuous in geodetic terms or, in other words, covers an area more or less gradually. This can be imagined by way of weather reports, most notably in times of a change of atmospheric fronts. Finally, *Hierarchic diffusion* stands for a "leaping" idea or phenomenon, i.e. for situations where the spread is punctual. This may be observed with ideas that are carried between particular places in space and/or particular groups of people, e.g. academics, artists, followers of a religion, or generally focused groups with shared interests.

The four types of diffusion most frequently overlap and mix and are not necessarily easy to distinguish. That is especially true for urban conditions, where the multitude of

persons and interests, the differences in world view, and the times of globalisation make the tracing of the spread of ideas much more difficult.

Also, the four stages-concept of innovation spread (Hägerstrand 1953) provides a noteworthy model. The concept distinguishes following sequential phases:

1. Penetration (stage prior to the proper innovation);
2. Diffusion (spread of the innovation; creation of links);
3. Condensation (continued growth of the innovation on the area of diffusion);
4. Saturation (final stage; end of spread of innovation).

Further, the theory roughly matches the four stages with four types of users or participants of innovation: Innovators, Early Majority, Late majority, and Laggards. In Figure 1 the blue line represents the estimated average distribution among the groups (with innovators being treated as highly original and few in numbers, and with a mid-group of early adopters added). The orange line marks the cumulated market share taken by the idea/phenomenon, in other words: its success rate.

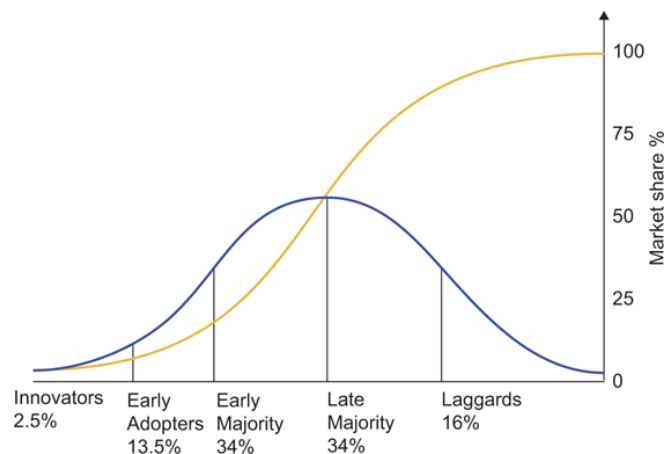


Fig. 1 Four types of users or participants of innovation (Hägerstrand 1953)

2.3. Knowledge Diffusion in Urban Environment

An indication that environment influences innovation processes and knowledge work comes from the fact that innovators of one discipline look for different local conditions than innovators of another discipline (Fontan et al. 2004, McCallum et al 2012). This choice is possible only in cities: The various urban environments form a variety backdrop

for innovation and knowledge work (Gridneva and Noennig 2012); they establish a kind of “creative matrix” that functions by mechanisms such as:

- Socio-spatial concentration / dispersion
- Co-operation between various types of innovations res. Innovators;
- Inhibitions of innovation activities;
- Successive generations of innovations.

Eventually, the recognition of the complex interplay of knowledge work processes (ideation, invention, innovation, learning) and environmental conditions (spaces, buildings, cities, regions) has led to the concept of so-called “Knowledge Ecosystems” – which is turning into a new paradigm at the intersection of urban and regional development and innovation management. In this context, the study presented here endeavours in two directions: (1) It works towards a formal description of urban environments on the background of innovation discourses (“Urban Topology”) and (2) it sketches a dynamic model for innovation processes in regards to urban structures, management, and design (“Urban Innovation”).

3 Cellular Automata Simulations

Computational tools may be of substantial help to investigate dynamic processes like innovation and knowledge diffusion within complex systems such as urban environments. For this, several well-established scientific methods suggest themselves and have been tested already e.g. resource-based planning models (Dantzig and Saaty 1973), Multi-Agent-Algorithms (Bettencourt and West 2010, Bettencourt et al. 2007), or simulation via Cellular Automata (Ishida 2005). As the core idea of the study presented here was to model knowledge dynamics in space, it was found that Cellular Automata (CA) might serve this purpose best as they combine spatial representation with dynamic modes of propagation and diffusion. Subsequently, two CA were designed specifically upon processes of knowledge spread (CA 1: “Meme”) resp. attractiveness of place (CA 2: “Affordance”).

3.1. Cellular Automaton 1 “Meme”

For the purpose of creating a CA for the inherent dynamics of knowledge processes, the simplified notion of knowledge as an “event with viral capacity” was chosen, based

on the theory of memes (Dawkins 1976). Memes are understood as a kind of intellectual substance that have capacities of genetic replication and evolutionary development. Inference about how memes emerge, or where they come from, is of no relevance for the concept; their emergence is understood as being highly accidental. The following assumptions are implied:

- Memes transmit and transfer like viral infections: they multiply and modify when being communicated;
- Memes degenerate as the number of transfers and the range of spread increases, they exhaust and lose value, but will never fully expire;
- Memes have varying quality, magnitude, and level of innovation;
- Ideas may emerge at any place at any time, differing by density and frequency (invention probability).

In order to simulate various modes of knowledge spread on this basis, a prototypical CA was designed which allows systematic exploration of knowledge spread within a defined environment. According to the definitions of memes given above, the CA obeys the following rules and features:

- Delimited space of n cells (micro-spaces), defined as experimental “test-bed” for meme growth; each cell being a potential meme-host;
- Random generator introducing “memes” of various quality in random locations and distribution in the CA;
- Parametric interface for adjusting quality level and frequency of meme appearance, thus profiling certain environments (e.g. “Silicon Valley”);
- Graphical code representing high quality memes as black, low quality (or degenerating) memes in various shades of grey.

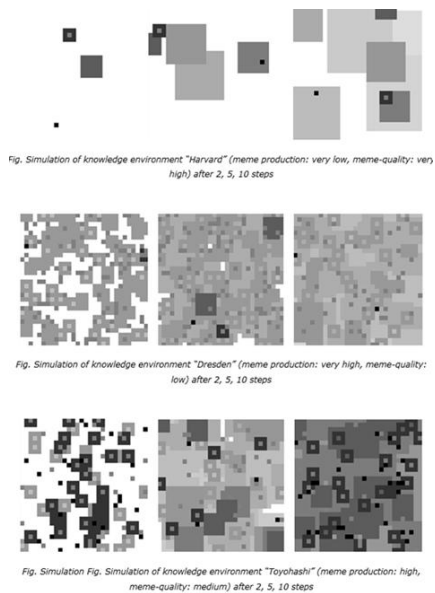
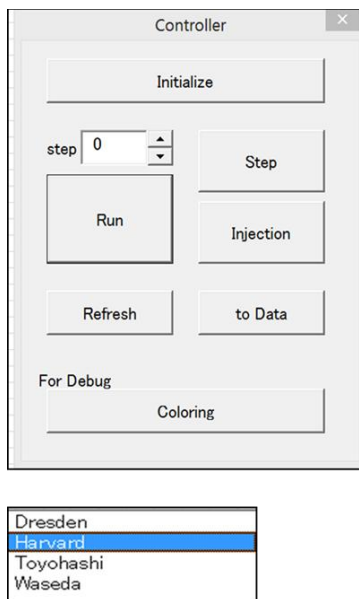


Fig. 2 CA 1: Control Panel for manipulating parameters and various simulation stages

After the basic meme-concept was translated into evolutionary rules, the CA was programmed in Microsoft Excel / Visual Basic (VBA). Test-runs were undertaken and the CA modified; before all alterations regarded the size of the area and the user interface. Finally, the number of cells was limited to 600 in order to maintain reasonable computing speed on ordinary PC. Having a working CA, a set of distinctive profile of fictitious knowledge environments (here called “Harvard”, “Dresden”, “Toyohashi” e.g.) were created (Table 1). For the purpose of generating maximum contrast between the profiles, the following parameters were set:

Table 1: Knowledge Environments.

	Meme Productivity*	Meme Quality**
	(number)	(%)
“Harvard”	1	100
“Dresden”	100	1
“Toyohashi”	50	50

* Indicated by overall number of memes produced by iteration, non-regarding their quality.
 ** Indicated by proportion of low vs high level memes in overall production per iteration

With these “profiles” initial simulations could be conducted, the number of iterations (generations) of memes being limited to max 10, due to minor observable changes in iterations >15.

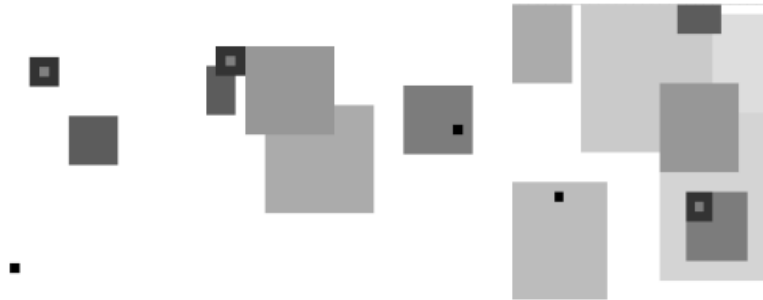


Fig. 3 Simulation of knowledge environment “Harvard” (meme production: very low, meme-quality: very high) after 2, 5, 10 steps.

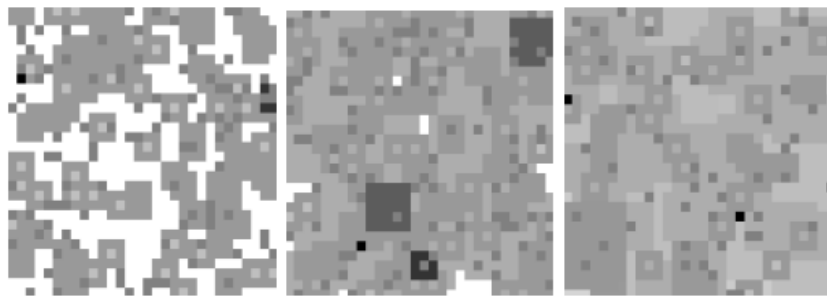


Fig. 4 Simulation of knowledge environment “Dresden” (meme production: very high, meme-quality: low) after 2, 5, 10 steps.

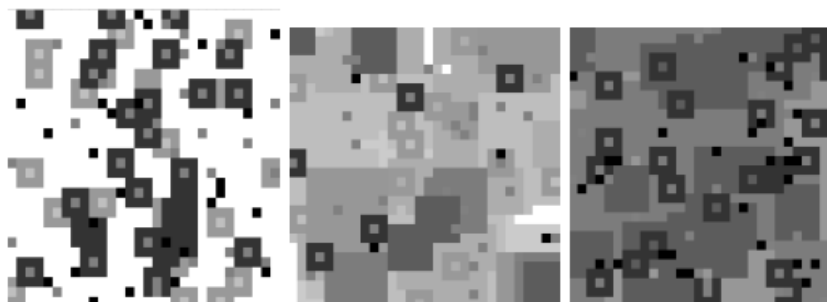


Fig. 5 Simulation of knowledge environment “Toyohashi” (meme production: medium, meme-quality: medium) after 2, 5, 10 steps.

The observations can be summarized in a set of preliminary results:

- Already with the few parameters (numbers of cells, frequency of meme appearance, level of meme quality) distinctive representations of knowledge places resp. their qualities can be achieved.
- According to the respective environment, different “pulses” of knowledge generation with different magnitude appeared. This may be related to innovation cycles (Schumpeter 1942).
- With varying speed, a knowledge base is being formed from degenerated memes (graphically represented by grey background shades) which appears after a number of rounds. This can potentially related to fundamental knowledge cultures.
- The resulting graphs indicate major differences of quality in regards to the expansion of light grey / dark grey areas (accumulations of base knowledge vs islands of advanced knowledge).

3.2. Cellular Automaton 2 “Affordance”

Version 1.0 For the second set of investigations, a different strategy was taken, based on parameters of local attraction, preference, or affordance. This time the software Netlogo was chosen, largely due to comfortable programming and the possibility to comfortable addition of modifiers (sliders).

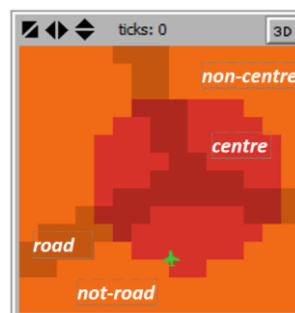


Fig. 6 Model 2, v.1.0. Two sets of two types of cells.

The abstract input area was a square, whose cells were divided in two sets of two features: *centre* (as in “city centre”) and *non-centre*, and *road* and *not-road* (Fig.6). That corresponded with the attractiveness of certain parts of the area for agents: the *centre*

characteristic was preferable to the *non-centre* one, while the *road* feature disabled the agents from settling in such cell, therefore leaving the *not-road* cells as those enabling settlement. In other words, from among all *not-road* cells, the agents were able to settle in cells with either the *centre* or *non-centre* attribute, with the former being more attractive to them than the latter.

Figure 7 presents the starting situation of a simulation. A set of input data can be seen: The number of agents = innovators (one; the small green plane); the number of innovations (zero; cells settled by the innovator); initial energy (representing the founding capital of the agent); cost (of movement from cell to cell; the direction of movement was random); profit from the agent's activity in a cell, and the minimum value of energy "to innovate", i.e. to transform a cell by the agent. This very basic exercise had the agent travel across the area and decide over each cell whether to settle there or not. If the calculation was positive, then the cell was being subjected to the process of innovation and marked white. The other part of Figure 7 includes an example of an advanced stage of the simulation (tick/iteration 81), where the agent has already innovated several cells.

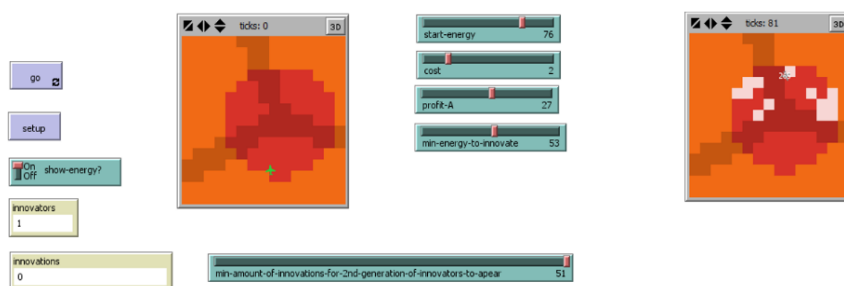


Fig. 7 Model 2, v.1.0. Input data and example of advanced-stage situation.

This small model, associated with the theory of living systems (especially the input-throughput-output process perspective) (Bailey 1994), serves to show an example of decision-making process that is thoroughly dependent of the topology of the area of operation. The agent, in order to act, required initial information concerning the examined area, and made decisions based on these information. This, in turn, allows to create a very rudimentary 'map of attractiveness of the area'. In the perspective of this research project, this is in line with the struggle to uncover the patterns of the emergence of innovations in a given spatial (urban) environment, based on a set of data about that environment.

Version 2.0 With a new version, the model was expanded not only in terms of cell information (features), but also three significant modifications were applied: the creation of new agents was enabled, the advancement of agents was enabled, and the process of aging of innovations was instituted. Similarly to the version described above, the agents were characterised by their initial energy (capital), the travel cost (random direction), cell activity profits, and the innovation energy threshold were provided. However, in this scenario the agent or agents were allowed to decide not only whether they settle or not a cell, but also whether they want to duplicate. Figure 8 displays an example of the command section of the software, in which rules of behaviour of the agents were set. While arriving in a cell, an agent examined its own current energy, the attractiveness of the cell, and juxtaposed it with the provided cost of two available activities: reproduction or innovation. Moreover, the system counted at each iteration the number of cells that reach or exceed a certain level of attractiveness, and if a provided threshold was met, it generated a car symbol – a ‘generation 2’ agent (visualised on Figure 9 as the slider “Minimum amount of innovations for 2nd generation of innovators to appear”). Finally, the ‘innovated’ cells were set to ‘fade away’, i.e. lose its innovated status, in the case they would not be settled by an agent after a certain number of iterations.

The updated version lends itself to the theory of living systems even more in the way that it has more variables and therefore is more complicated. It is possible, among other scenarios, to take the model to the situation where the resources would wear out due to the cheapness of action and the number of agents rise to the point of overcrowding, then it would diminish because of that, and then again rise – just as the systems theory describes the pattern of behaviour of food chains in the animal kingdom.



Fig. 9 Model 2, v.2.0. Input data and examples of advanced-stage situations.

4 Outlook, Future Work

The presented CA certainly are preliminary test-runs results of which shall not be overly generalized due to the limited scope, number of included parameters, and level of abstraction etc. Yet the investigations have established a promising format for future research on knowledge dynamics in space. On this basis, the following items shall be addressed in future work:

Introducing on real-world data: Real-world data (e.g. number and density of actors, patent records, educational level, communication rate, patent expiration) must be translated into CA parameter (number of cells, infection rate / propagation, frequency of memes occurring, background knowledge, memes degeneration etc.).

Acknowledging ground fertilisation: In respect to discourses on “Knowledge Ecosystems”, the role of “ground fertilisation” is crucial. It can be hypothesized that environmental enrichment, or pre-fertilisation with knowledge by way of more or less degenerated memes, impact on knowledge growth and spread. Ground fertilisation must be related to the notion of innovation work’s ‘Background Noise’ (also ‘Cultural noise’ or ‘Environmental noise’) – a description of environment taking into account the respective elements that work in favour of, or against, innovations such as: obstructions and obstacles, rivalling innovations, idea absorptivity, capital potential, multiplicity of actors, etc.

Enabling Memes movement: As a key factor for knowledge spread in a real-world context, the movement, or mobility, of the agents themselves must be regarded in the CA as well. They would not only “infect” their immediate neighbours but scatter the “infection” quickly over larger distances (just as the case is in pandemics distributed by air-traveling, see Fig. 10 left).

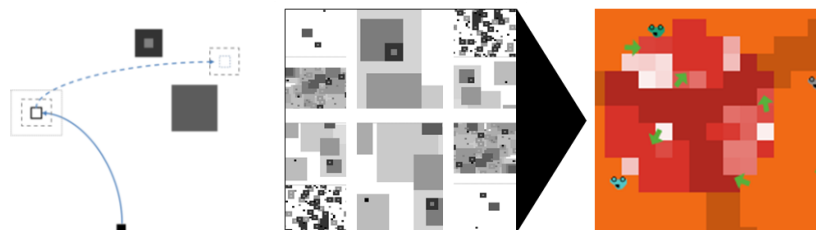


Fig. 10 Memes travelling across CA (left) within a multiple CA-knowledge environment (center), forming a dynamic urban ecosystem (right).

Combining different CA into environmental patchworks: No real-world knowledge ecosystem can be restricted to a single-program environment, as represented by the simple CA 1. Combining differently programmed CA into a system of systems will allow more realistic modelling e.g. of urban environments featuring university campuses, residential districts, and technology areas (Fig. 10 center, right)

Combining memes movement & CA patchworks: A final integrative step can be taken when memes do not only transfer, or travel, freely across one CA table but when they transfer between different environments, or patched CAs (Fig. 10 left, center, right). Such model would help simulating the functioning of knowledge ecosystems where success depends on the effective transfer of ideas, talents, memes etc. from one context to another, such as from university environment to industrial application; from expert sphere to public audience; from lab to school etc.

Mapping attractiveness: Acknowledging the spatial-functional structure of a city as environment for innovations, with the CA maps of attractiveness for innovation and innovators can be derived, which may serve as pragmatic planning tools in future. For different scales (city, region, country) and different spatial criteria (real estate value, infrastructural proximity, centrality, university neighbourhood, competition in the area etc.), probability rates for the emergence and spread of innovation can be given then.

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Common grounds and representations in cross-disciplinary processes

Sander Münster *, Lars Schlenker

Media Centre
Dresden University of Technology (TU Dresden)
01062 Dresden, Germany

Köhler, Thomas

Chair of Educational Technology/Media Centre
Dresden University of Technology (TU Dresden)
01062 Dresden, Germany

** Corresponding author*

Structured Abstract

Purpose – Major challenges of knowledge transfer processes in cross-disciplinary projects result from differing disciplinary terminologies and from work groups which are located at different locations. From a representational viewpoint, visual media such as pictorial images, drawings, or sketches are widely used for cross-disciplinary communication to bridge these gaps in order to build a joint understanding and support a computer mediated collaboration of spatially separated work groups.

Originality/value – Concerning the described settings, the paper discusses the importance and presents practices of representation and structures in Computer-Supported Collaborative Work as common ground in cross-disciplinary processes using examples related to a) the reconstruction and visualisation of “lost” buildings in humanities and b) spatial-based generic configurations inspired by architectural theory and the design of public spaces.

Design/methodology/approach – To cope with these challenges the authors combined both theory-driven and empirical methodological approaches for research and performed three stages of analysis. The first stage was a content analysis for publications to examine current usage and production scenarios of virtual 3D models in cultural heritage, its outcome and purposes. A second stage included four case studies to examine aspects of communication about the reconstructed architecture and their evolution during a project creation process. A third stage investigates aspects of the usage of architecture as media and common ground of cross-disciplinary understanding comparing sociological approaches to virtual and mediated spaces.

Practical implications – The article will provide practical implications on how practices of visual representation and the usage of structures such as architecture as common ground will foster cross-disciplinary processes.

Keywords – Visual representations, knowledge transfer, Computer-Supported Collaborative Work, cross-disciplinary process

Paper type – Academic Research Paper

1 Introduction

Problem – Major challenges of knowledge transfer processes in cross-disciplinary projects result from differing disciplinary terminologies and from work groups which are located at different locations. From a representational viewpoint, visual media such as pictorial images, drawings, or sketches are widely used for cross-disciplinary communication to bridge these gaps in order to build a joint understanding and support a computer mediated collaboration of spatially separated work groups. From a theoretical point of view both phenomena are widely thematised, especially by social sciences and psychology, but also relevant in certain contexts of many applying disciplines, such as cartography, computing, and architecture.

Cross-Disciplinarity

Disciplinarity is closely related to “epistemic cultures” (Cetina, 1999), which contains aspects like a certain methodology and terminology of disciplines. Cross-disciplinarity addresses the phenomenon that individuals with different epistemic backgrounds collaborate in certain projects.

Common Grounds

As one of the most common explanation models for cross-disciplinary understanding, the Common Grounds approach originates in cognitive psychology and explains factors and recommendations for successful communication (Repko, 2007). For a successful knowledge transfer between two individuals their knowledge, beliefs and assumptions must be synchronised (Clark, 1996). Especially for a cross-disciplinary communication, aspects such as varying meanings of the same terms across disciplines or, in an opposite manner, a usage of different terms for the same content is relevant (Bromme, 2000). Closely related to such effects is the fact that the differences are not known in advance, but usually show up only in the course of an interdisciplinary cooperation. While the common grounds theory focusses on communication between individuals, the trading

zones approach focusses on modes of information exchange and collaboration in interdisciplinary working teams (Galison, 1997).

Representation

While common grounds focusses on principles of communication, the aspect of representation addresses the replacement of a represented object by an – e.g. lingual, pictorial, or architectural - representing object. Aspects of representation are closely related to semiotics and model theory. From the point of semiotics an object can be represented by a sign which a recipient could identify as symbolisation for that object (Müller, 2003). Such symbols can represent linguistic and iconic characters, but also, for example, gestures. Character meaning or application contexts are dependent on the conventions and the epistemic culture of the application area and the culture of the user (Schumann and Müller, 2000). On this basis, Bertin developed a specific graphic semiology (Bertin and Jensch, 1974), which subsumes and analyses the various degrees of freedom of a graphic design. Based on the laws of Gestalt theory, a generalised assumption is that only differences and similarities can be perceived between visual signs (Bollmann and Koch, 2001). While semiotics focus on a function and Gestalt of signs, model theory focusses on the relation between an original and a model as its “abstraction” (Mahr, 2004). An established explanation schema provides the general model theory of Stachowiak. This embodies a model of a simplified or abridged image of an original, a “pragmatism” of said component in the sense of a subjective purpose orientation effect (Stachowiak, 1973).

Roles of architecture

Related to the described phenomena, architecture addresses several functions. On the one hand architecture represents concepts, ideas and messages of the builders and manifests and transfers these for the public. In that function architecture can work as common ground to symbolise attributes like power via building height, or wealth via ornamentation and overwhelming craftsmanship, or for more sophisticated concepts like an arrangement of parts of medieval cathedrals which represent the corpus Christi (Horst, 2012).

On the other hand architecture is the object of discussion and is represented by various media and embedded in various contexts. That includes aspects like the representation of

scale (Yaneva, 2005) and spatial dimensions as far as a multi-sensual representation of architecture and its optical, haptic, or aural constitution (Ch'ng, 2009).

Concerning the described settings, the paper discusses the importance and presents practices of representation and structures in Computer-Supported Collaborative Work as common ground in cross-disciplinary processes using examples related to a) the reconstruction and visualisation of “lost” buildings in humanities (Münster and Köhler, 2012) and b) spatial-based generic configurations inspired by architectural theory and the design of public spaces.

2 Methods

Design/methodology/approach –To cope with these challenges the authors combined both theory-driven and empirical methodical approaches for research and performed three stages of analysis. The first stage was a content analysis for publications to examine current usage and production scenarios of virtual 3D models in cultural heritage, its outcome and purposes. The investigation included a sample of 478 journal articles, conference proceedings, and project reports related to 3D modeling of cultural heritage objects and especially a cross-disciplinary virtual reconstruction of no more extant or never realized architecture (Münster et al., Im Druck). An investigation took place via inductive and deductive qualitative content analysis to identify and classify project constellations and related phenomena. While an investigation of reports provide only a retrospective view on communication and exchange during the creation process, a second stage included four case studies exploring reconstruction and visualisation projects of historic architecture over time to examine aspects of communication about the reconstructed architecture and their evolution during a project creation process. Leading paradigm for an evaluation of that stage was a mixed methods approach including a heuristic framework basing on empirical findings in stage one and theories as a base for a grounded theory analysis (Kelle, 2010). While both approaches address architecture as a result of a cooperative reconstruction process, a third stage investigates aspects of the usage of architecture as media and common ground of cross-disciplinary understanding comparing sociological approaches to virtual and mediated spaces. That includes theories from architecture sociology, environmental sciences, and social psychology.

3 Results

As outcomes of these investigations, the article will highlight four aspects. As pointed out in the introduction, communication is highly affected by settings and purposes. Especially in professional contexts a computer mediation and support plays an important role to support both face-to-face and distance communication. Closely related to these aspects of computer mediation are virtual spaces as a computed model of spatiality and related aspects like perception and interaction. Even if visibility is just one of the attributes of architecture, visual media plays a critical role as common ground for communication about architecture. As presented at the beginning of the article, another perspective is to focus on architecture as a common ground of communication.

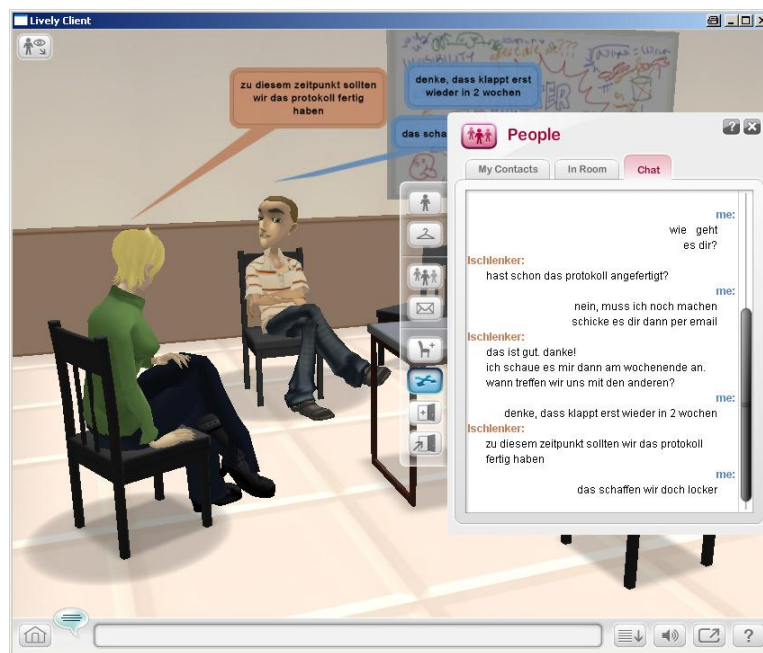
Computer-mediated Communication

As a result, several strategies as well as the media were used for distant communication and cooperation. For such purposes, in a mixture of synchronous and asynchronous strategies, widely established computer-based technologies such as computer-mediated communication (email, teleconferencing, chats etc.) (Köhler, 2013) or environments for Computer-Supported Collaborative Work (CSCW) were employed. A selection of synchronous or asynchronous tools is highly dependent on the urgency of information requests, their complexity and skills, and rank of the communication partner. Computer-based interaction is an exchange of knowledge of people who are not assembled at the same time in one location or room. Measured in terms of the high social contextualisation of face-to-face conversations, computer-mediated interaction is as impersonal as its perception of another person is limited. It therefore leads to problems such as a reduced social presence of the participants and a limitation of a commonly shared knowledge background.

Spatial references of social action

The environment always contains spatial elements with social significance and social elements that they structure spatially themselves (Bahrtdt, 1974). The spatial elements of human environment are socialised at different levels. They can only be understood through its cultural symbolism. Social production of space takes place in the interplay of socio-spatial symbols, formal spatial structures, and social usage patterns. Artifacts and elements of architectural form are by their functional or aesthetic design social symbols

and sign makers. In socio-cultural processes learned and normalised, they must be recognised and interpreted in everyday use of space. The architectural form is a socio-spatial structure supporting social communication symbols. Actors who are socialised correspondingly and are culturally competent can decode rooms in this sense. Foundations of correct interpretation are socio-spatial concepts. The importance of their artefacts, symbols and distances are not innate or automatically transferred from the architectural design; it is a product of a gradual socialisation and learning process. The architectural form refers to a system of acquired expectations and habits like a code (Eco, 1962). They include also specific expectations in terms of spatial situations and contexts with which people are confronted upon entering a room or building. A lecture room evokes other social contexts, features, contents and players, including their behaviour by its architectural design, its cubature, its colours and the nature and arrangement of its elements of equipment, as e.g. a library (Adamus et al., 2013).



Google Lively: A virtual spatial-based environment as a common ground for collaboration processes

Visual Communication (300 w.)

Communication about architecture is highly correlated with a use of visual media, as was determined through an investigation employing case studies of projects which focus on a 3D reconstruction of no longer extant buildings. In all observed projects, visual media such as historic plans and panorama have widely been the most important sources to reconstruct architecture that is no longer extant or has never been built. As a result from such reconstruction projects, mostly visual media such as images, animations, or even interactive visualisations like computer games would be created (Münster, 2013). Besides that, images and visual media would be intensively used to foster communication and quality negotiations, especially when working groups with different disciplinary backgrounds are involved in such projects. While common strategies for quality negotiation in such projects is based on a comparison between source images and images of the created reconstruction, images in communication contexts are especially used in combination with textual or oral explanations. While widely established symbols like arrows are used in all projects, some projects created their own graphical codices or metaphors for communication. Several projects successfully adopted highly standardised conventions from architectural or engineering drawings for interdisciplinary exchange.



Images as sources



Visualisation of reconstruction



Visual quality negotiation comparing images of sources and reconstructions

These empirical findings describe the importance of the role of visual media and are widely supported by research literature. A major potential of visual media is to be found

in the possible visual similarity to the depicted object and the low level of abstraction associated with it. In this context, Tversky speaks of a “naturalness” of iconic objects in terms of an orientation at physical analogies and “spatial metaphors” of human world experience (Tversky, 2002). Through just a low level of abstraction, visual media support decision-making as well as memorisation processes significantly, especially for professionals like architects, art historians, or archaeologists who are responsible for the quality of reconstructions and whose vision is highly trained on the reception and negotiation of visually perceptible phenomena (Goodwin, 1994).

Architectural design as common ground for communication processes (300 w.)

A spatial structure design formulates architectural statements with structural instruments and the making of communicative contexts (Bär, 2008). People use built forms to store and transfer social experiences. It is the reality in real spaces and also in the virtual spaces of online environments. Physical and virtual environments contain spatial elements. They constitute spaces with specific social conditions in this way. Spatial elements in online environments have a similar social meaning as in the real physical environment. This manifests itself in the generation of specific spaces for communication and collaboration. Space production takes place in an interplay of socio-spatial character repertoire, formal spatial structures, and social usage patterns. But the user of online environments cannot perceive their spatial features identically to the real physical environment. Nevertheless, the perception of virtual rooms and spaces takes place before the same socio-cultural background. Their spatial elements and structure are perceived based on existing (social) experiences of space and the associated knowledge. Rooms and spaces in the online communication and collaboration processes cannot be reduced to a container function for the structuring of people involved in online communications, as it often happens in text chats and collaborative learning environments, such as virtual classrooms. The different manifestations of spaces in online communication environments and massively multiuser virtual environments like online worlds cannot be considered in isolation from their social implications. This is especially important for socially-oriented online environments and learning environments that want to support the collaboration of learners. They align their functions, characteristics and rules instead of reaching playful objectives, e.g. in online games, to promote social contacts between their participants. In the context of collaborative learning and knowledge working processes,

they provide a specific reference to socio-spatial typologies and a way of deliberately contextualising rooms in online environments for communication and collaboration needs (Noennig and Schlenker, 2013).

4 Conclusion (200 w.)

The daily contact with the forms and structures of architecture and built space in everyday life creates a strong familiarity with their characters, symbols, and representations. It is a system that means concrete content and structural concepts on the one hand and social markings on the other hand. It provides a supply of well-known (spatial) signs for the construction of shared structures of meaning also far from their home domain. Their use as a bridge in understanding unknown domains in terms of a symbolic order or as a shared metaphor to organise cross-disciplinary processes in terms of a symbolic environment is therefore obvious.

That leads to several implications. Especially in contexts of distant and computer-mediated communication, architecture and built spaces are important to represent and illustrate spatial relations and build analogies for space referred social behaviour processes. Important attributes are that architecture and its visual representation allow a “natural” human world experience and contain a high level of information about design patterns and spatial relations of objects and make them easy perceptible for recipients. On the other hand, architecture and architectural representation lacks the ability to transfer abstract, non-nomothetic information like multiple reconstruction alternatives of no longer extant historical buildings or relational information, i.e. about personal connections in virtual spatial-based environments. While such information could be more properly transferred via media like text or speech, often a combination of visual and textual media would be used in such scenarios. Especially if both media address the same issue, a Dual Coding (Paivio, 2006) takes place which could enhance the quality and sustainability of information transferred between involved persons.

Related to the usage of architecture as common ground, it seems most important that the participants of communication have a joint understanding of inherit metaphors. As a practical implication it would be necessary, on the one hand, to obey different cultural connotations such as disciplinary meanings, especially of non-directly visible aspects. As an example, concepts or symbolisms incorporated in architecture could have different meanings and varying aspects could be of interest for different disciplines. On the other

hand, a visual representation of architecture and spaces in combination with a high level of interactivity encourages participants of virtual collaborative environments to develop certain and sophisticated forms of social interaction within such virtual spaces. One important finding is that in these cases not only a visual representation or modelling of spatial features is relevant, but a space-related interaction gains importance as an object, too. That implicates the idea that an evaluation of such social practices provides impulses for the design of such environments in order to support knowledge transfer processes in a cross-disciplinary collaboration.

At a glance, architecture and built space add important values to foster a wide scope of cross-disciplinary processes and build a common ground for communication. These issues are not only related to a representation of concepts and mental models via architecture, but to a modelling of architecture via visual representations like virtual environments or images, too. Especially in that last context it seems obvious that visual representations, on the one hand, allow a low level of abstraction in comparison to an original and can build a widely understandable common ground to foster cross-disciplinary processes. On the other hand, such media do not just represent an original, but become a stand-alone object (Mahr, 2004) connoted with certain social and cultural practices, requirements, and meanings.

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Drivers of eco-innovation in the wine industry

Alessandro Muscio *

Dipartimento di Scienze Agrarie, degli Alimenti e dell'Ambiente
Università degli Studi di Foggia
Via Napoli, 25 - 71100 Foggia (Italy)

Gianluca Nardone

Dipartimento di Scienze Agrarie, degli Alimenti e dell'Ambiente
Università degli Studi di Foggia
Via Napoli, 25 - 71100 Foggia (Italy)

Antonio Stasi

Dipartimento di Scienze Agrarie, degli Alimenti e dell'Ambiente
Università degli Studi di Foggia
Via Napoli, 25 - 71100 Foggia (Italy)

** Corresponding author*

Structured Abstract

Purpose - The importance of eco-innovations for industry has been rising exponentially in recent years. However, even if recent trends show that firms are increasingly committed to eco-innovations, there is little knowledge on why and how companies integrate environmental sustainability into new product development. In this paper we offer a detailed analysis of the drivers of eco-innovation in the wine industry. We account for environmental regulation, demand factors and firm-specific and technology-push factors.

Design/Methodology/Approach - The empirical evidence is based on an original questionnaire survey carried out on Italian wine producers. 334 questionnaires were returned and the response rate was of 16.5% and the response rate was of 16.5%. we distinguished between two different types of environmental innovation: cleaner production (CP) and end-of-pipe technologies (EOP). A set of logit and ordered logit models helped in estimating the effects of environmental regulation, demand factors and firm-specific and technology-push factors on CP and EOP innovations.

Originality/Value- In this paper we attempt to respond to some recent challenges set in the economic literature adding knowledge on why and how companies integrate environmental sustainability into their production. The analysis of a specific industry and product allows to control for cross-industry differences which are common in other empirical works on eco-innovation.

Practical Implications - Our results confirm the importance of regulatory aspects and networking across the supply-chain for eco-innovation. These factors determine to a large extent firms' adoption of an ecological profile. The empirical evidence confirms the appropriateness of the recent developments in the EU agenda with respect to eco-innovation.

Paper type: Academic research paper

JEL Codes: L2, L6, O3, Q5

Keywords: Wine industry, eco-innovation, environmental innovation, green innovation, innovation drivers

1 Introduction

The importance of eco-innovations for industry has been rising exponentially in recent years. Traditionally, eco-innovation was understood mostly as a solution to minimise or fix negative environmental impacts from production and consumption activities. This interpretation derives from consumers' increasing willingness to reduce the ecological footprint of their consumption choices (Harrison et al., 2005), and from public concern about pollution, supporting increasingly restrictive policies punishing environmentally harmful behaviours (Porter and van der Linde, 1995a). It is increasingly evident today, however, that the key challenges of the 21st century are not only about reducing pollution, but also about controlling the overconsumption of natural resources. There is evidence that substantial resource-efficiency gains in industrial production can be realised relatively easily and cost effectively (EIO, 2011:7). However, lack of strong coordination between different public policies may lead to an incoherent policy-mix with negative effects on the development and diffusion of environmental-friendly technologies (Costantini and Crespi, 2010) and on the geographical distribution of environmental performance (Costantini et al., 2010).

Over the past decades the global wine production has undergone fundamental changes, characterised by the emergence of New World producers. The new shape of competition is pushing towards the application of strict rules and techniques for wine standardisation, processes optimization, certifications and cost reduction in order to increase the international competitiveness. At the same time, concern about the environmental impact of wine production has increased because of changes in consumers' awareness and in producers' mission, supported by government incentives to the adoption of environmental friendly technologies and processes.

According to this, the environmental economics literature emphasises the key role that environmental regulations play in stimulating eco-innovations. The innovation literature, on the other hand, underlines the relevance of other important determinants of eco-innovations, such as technology push and market or demand-pull factors for the explanation of innovation activities (Bernauer et al., 2006; Hemmelskamp, 1999; Kesidou and Demirel, 2012). Eco-innovation in the wine industry includes a wide set of actions and possible investments, which might mitigate the environmental impact of wine production and reduce the use of resources. Although in the common perception wine firms could be considered eco-friendly when compared to firms in other manufacturing industries, such as plastic and oil processing, some basic information on energy use and water use (e.g. there is an average consumption of 25 litres of water per 1 litre of wine) could question that initial prejudice. Supporting this, Demirel and Kesidou (2011) classify the manufacture of food products and beverages as a highly polluting sector.

In line with very recent works on eco-innovation (Horbach et al., 2012) the aim of our paper is to contribute to the existing research on the drivers of eco-innovation focusing on different environmental impact areas. In this paper we offer a comprehensive analysis of the drivers of eco-innovation in the wine industry. We analyse the impact of firms' characteristics and their technological and organizational capabilities. On the basis of a large survey on Italian wine producers carried out in 2013 we investigate the main characteristics of eco-innovations in the wine industry and the key drivers of their adoption. The relevance of these drivers in influencing the probability of introducing eco-innovations is measured with a latent class econometric model. We argue that, even in the case of eco-innovation, technology adoption is a complex task that relies on several factors, where business characteristics and research activity could be at least as relevant as other drivers highlighted in the economic literature such as government environmental regulations, demand factors, market opportunities and resource saving in driving eco-innovation.

In this paper we attempt to respond to some challenges set in the economic literature adding knowledge on why and how companies integrate environmental sustainability into their production. The analysis is based on an original survey in which data are used to determine the impact of the drivers identified by the non-industry-specific literature on a single sector, which results singular for tendency to radical eco-innovative and knowledge intensity. The fine grain analysis of a single sector aims at understanding how different a

single focus could be compared to a broader analysis on the highly diversified industry of a country. In order to verify this aspect we referred to the literature for the identification of the drivers included in the analysis.

2 Theoretical background

2.1 *The background to eco-innovations*

Eco-innovation encompasses all innovations that have a beneficial effect on the environment regardless of whether this effect was the main objective of the innovation (Bernauer et al., 2006). According to the Eco-Innovation Observatory (EIO): “Eco-innovation is innovation that reduces the use of natural resources and decreases the release of harmful substances across the whole life-cycle. The understanding of eco-innovation has broadened from a traditional understanding of innovating to reduce environmental impacts towards innovating to minimise the use of natural resources in the design, production, use, re-use and recycling of products and materials.” (EIO, 2011:VII). According to Frondel et al. (2007) typically, the literature distinguishes between two different types of environmental innovation that mitigate the environmental burden of production: cleaner production (CP) and end-of-pipe technologies (EOP). Cleaner production reduces resource use and/or pollution at the source by using cleaner production methods, whereas end-of-pipe technologies curb pollution emissions by implementing add-on measures. Thus, CP technologies are frequently seen as being superior to EOP technologies for both environmental and economic reasons.

Resource efficiency and eco-innovation have both recently climbed the EU policy agenda. The Europe 2020 strategy includes a dedicated flagship initiative on “Resource Efficient Europe” (EC, 2011), which responds directly to the challenge of resource scarcity. Other flagship EC initiatives, mention explicitly that support to the issue of sustainable supply and management of raw materials in the context of industrial processes among the strategic commitments for action (EC 2010a, 2010b). Eco-innovations could bring relevant savings of material costs and for SMEs the potential to improve material productivity is estimated to be even higher than for large enterprises. Accounting for material flows properly and realising potentials to save costs through increasing material productivity will become one key determinant for European companies in the coming decades, in order to maintain competitiveness on global markets (EIO, 2011).

Despite the interest on eco-innovations in the economic literature and in policy-making is on the rise, research on this field is still limited (De Marchi, 2012). Even if recent trends show that firms are increasingly committed to eco-innovations, there is little knowledge on why and how companies integrate environmental sustainability into new product development (Dangelico and Pujari, 2010). Some recent economic studies attempt to provide a comprehensive analysis of the factors that drive eco-innovation.

Innovation theory stresses the relevance of technology-push and demand-pull factors for the explanation of innovation activities (Hemmelskamp, 1999). Building on this framework, Horbach (2008) and Triguero et al. (2013) classify the determinants of environmental innovation in three groups: technology-push (or supply-side) factors, demand factors and environmental policy. Horbach et al. (2012) use a simple framework for separating four groups of factors that have been found to be the main determinants of eco-innovation in the literature: firm specific factors, technology-push, market (or demand) and regulation.

We classify the drivers of eco-innovation in three groups: environmental regulation, demand factors and firm specific and technology-push factors.

2.1.1 Environmental regulation

The environmental economics literature has underlined the relevance of regulatory aspects in the promotion of eco-innovations. Differences in environmental regulations across countries determine different levels of development in their eco-innovation capabilities (Klaassen et al., 2005; Popp, 2006). As argued in Brunnermeier and Cohen (2003), given the significant regulatory and non-regulatory pressures on firms to abate pollution and the resultant cost burden, it is natural to wonder whether environmental innovation is a response to these pressures or to other market forces such as international competition and industry or economy-wide characteristics. The question of what role environmental regulation can or should play in this regard has become ever more policy-relevant in recent years. According to the seminal papers of Porter and van der Linde (1995a, 1995b), properly structured environmental regulation may not only benefit society but also the business sector by making firms realize otherwise neglected investment opportunities. Environmental regulation could force industry to innovate and thus increase resource efficiency and enhance productivity. Environmental regulation increases firms' turnover and profits by creating markets for environmentally improved products and technologies and compliance costs might be offset by the gains from these

innovations (Porter and van der Linde, 1995b). From this point of view, regulation is not seen as an undesirable cost-increasing factor but as a driver of firms' innovation, leading to a first-mover advantage in markets for eco-innovations (Bernauer et al., 2006) and providing economic opportunities that offset the burdens and costs induced by regulatory compliance (Rennings, 2000). However, this "win-win" hypothesis has been heavily criticized in neoclassical economists, whose supporters argue that regulation might motivate firms to develop eco-innovations, but that these efforts would produce opportunity costs offset only in exceptional cases (Jaffe et al., 1995; Palmer et al., 1995). Moreover, the effectiveness of regulations for firms could potentially differ depending on whether or not they are already ahead of their peers in eco-innovation investments and activities (Kesidou and Demirel, 2012).

A further step in the analysis of the impact of regulation on eco-innovation has been taken in recent years, with the major shift from mandatory environmental regulations toward the use of voluntary modes of regulation (Lyon, 2013). These new approaches encourage environmental improvement but do not compel it. According to L  v  que (1996) they can take the following forms: unilateral commitments by industrial firms; public voluntary schemes, in which participating firms agree to standards that have been developed by public bodies such as environmental agencies; negotiated agreements created out of a dialogue between government authorities and industry. A growing body of research has emerged that is beginning to provide a comprehensive framework for understanding these new voluntary efforts (Lyon, 2003). In general, corporate environmental voluntary initiatives have been attributed to a variety of different motives, including cost-cutting, marketing to "green" consumers willing to pay extra for environmentally-friendly products, and pre-empting government regulation (Lyon and Maxwell, 2001). In some cases voluntary approaches can be adopted more rapidly than alternative policy instruments, like new regulations. However, according to the OECD (2003), their environmental effectiveness is still questionable.

Finally, Frondel et al. (2007) point out that the effects of regulation may differ across different environmental technology fields: Whereas cost savings and environmental management systems (EMS) tends to be more important for the introduction of CP, and regulation being important for the introduction of EOP.

2.1.2 *Demand factors*

It is now acknowledged in the innovation literature that demand factors play a critical role for innovations. However, these factors have generally been overlooked in the case of eco-innovation (Kesidou and Demirel, 2012). A small number of recent empirical studies suggests that they play a significant role for the creation of eco-innovations (Horbach, 2008; Horbach et al., 2012; Wagner, 2007). There is empirical evidence (Darnall, 2006; Horbach, 2008; Kesidou and Demirel, 2012; Wagner, 2007) demonstrating that factors such as the influence of consumers associations and customer requirements for environmentally friendly products affect positively firms' decision to invest in eco-innovation and enhance their environmental management practices (Hart, 1997). Eco-innovations offer to companies implementing environmental concern into their strategies the opportunity to consolidate their competitive advantage (De Marchi, 2012). There is empirical evidence that expectations of increases in the turnover of the firm, is an important determinant of eco-innovations, at least in the case of manufacturing firms (Horbach, 2008). Eco-innovations create new market opportunities for companies, increasing the competitiveness of firms and countries that eco-innovate (Arundel and Kemp, 2009).

However, as suggested by Triguero et al. (2013) a precondition for the positive impact of demand for eco-innovation on firms' performance is that environmentally friendly products need to be seen as such by consumers and there must be a potential improvement of the firm's image and reputation based on environmental products. The exploitation of green image allows firms to gain from the rise in sales or in the price of the products. However, producers will be urged to implement eco-innovations only if consumers are provided with appropriate information on companies' eco-friendliness through eco-labels (Bleda and Valente, 2009; Rennings, 2000). Supporting this, Kammerer (2009) provides evidence that customer benefit plays a key role for environmental product innovations. According to the author, firms that attribute a large potential for customer benefit to an environmental issue are significantly more likely to implement eco-innovations. Perceived customer benefit fosters the implementation of product eco-innovations, their broad application and their level of novelty.

Finally, there is some evidence that demand factors do not influence the intensity of allocated investments (Chen, 2007; Demirel and Kesidou, 2011). In fact, according to Kesidou and Demirel (2012) the societal pressure and demand for environmentally

friendly products and processes may not necessarily lead to increasing investments in eco-innovation, but rather be limited to initiate a minimum investment in eco-innovation that will signal the commitment of the firm to 'green issues' (Bansal and Hunter, 2003; Darnall, 2006). In fact, the authors provide evidence that demand factors, especially corporate social responsibility (CSR) and customer requirements for environmentally friendly products, do not affect the level of investment in eco-innovation.

2.1.3 Firm-specific and technology-push factors

There is limited evidence in the economic literature concerning the role of firms' organisational and structural characteristics as drivers of eco-innovation. As in the case of other innovations, the development of eco-innovations is driven by firms' organisational capabilities (Florida et al., 2001; Kemp et al., 1992; Winn and Roome, 1993). Kesidou and Demirel (2012) highlight the role of EMS in eco-innovation. Although external certification alone does not boost eco-innovation because the organisational implementation of EMS is often rather ostentatious, and often dependent on scale factors (Johnstone and Labonne, 2009), organisational capabilities are not only important in firms' decision to undertake eco-innovation activities, but also in increasing the level of resources allocated to eco-innovation activities. Trigueiro et al. (2013) provide evidence that firms' technological and managerial capabilities positively influence process eco-innovation. Giving much importance to a good access to external information and knowledge, including technology support services, is also correlated with the likelihood of process eco-innovations. Supporting this, Horbach (2008) shows that the improvement of technological capabilities by R&D triggers eco-innovations. However, the arguments raised in innovation theory supporting R&D efforts as key determinants of the firm's ability to access new knowledge and innovate need to be considered with some caution in the case of eco-innovation, especially in the case of SMEs, where alternative components of firms' learning processes as human capital capabilities and quality assume a key role in driving innovation, and in generating absorptive capacity (Muscio, 2007). Supporting this, unlike in the case of other types of innovation, there is recent evidence that R&D intensity is not a significant driver of eco-innovation (De Marchi, 2012; Horbach, 2008).

With regard to external or networking technological capabilities, innovation studies have underlined the crucial role played by the interaction of different organisations in fostering the innovation process (Dodgson and Rothwell, 1994; Von Hippel, 1988). With reference to eco-innovation, De Marchi (2012) provides evidence that R&D activities and

cooperation trigger environmental innovation, even if they do not complement each other. According to Trigueiro et al. (2013) collaboration with universities, research institutes and agencies positively influences the decision to perform product and process eco-innovations by contributing to access to external knowledge. However, Horbach et al. (2012) do not find any significant influence of such factors. This result is in line with Cainelli et al. (2012) who point out that the existence of knowledge transfer mechanisms and firms' involvement in networks contribute to eco-innovation activity.

Finally, there is sparse evidence in the literature about other firm-specific drivers of eco-innovation. Firm's size seems to be a structural characteristic that boosts green innovations to a greater extent than other innovations. Several empirical studies show that, by and large, firm size has a positive influence on environmental innovation (e.g., Cleff and Rennings, 1999; Rehfeld et al., 2006). Cainelli et al. (2012) significant impact of size on eco-innovation. Baylis et al. (1998b) and Clayton et al. (1999) argue that environmental activities are associated to a higher amount of financial and human resources, which is why larger firms have better opportunities and abilities to reduce environmental impacts and eco-innovate. Supportive evidence is found concerning the impact of export orientation on eco-innovation. According to Porter and van der Linde (1995b) world demand is moving rapidly in the direction of valuing low-pollution and energy-efficient products. Thus, they speculate that internationally competitive industries are more likely to innovate in response to environmental regulation than industries that are uncompetitive to begin with. In support of this, Cainelli et al. (2012) find that in the case of Italy export orientation has a significant impact on eco-innovation in internationally competitive industries and Scott (1997) finds that R&D investments in air emission controls by US manufacturing firms increased in response to foreign competition. Therefore, these results are consistent with the notion that foreign demand for greener products spurs environmental innovation. Finally, Cainelli et al. (2012) argue that in general, "foreign effects" on eco-innovation overshadow agglomeration effects. Agglomeration economies and industrial district effects spur the adoption of eco-innovation only in areas that have historically rooted specialization patterns in eco-innovation friendly sectors, such as for the ceramics sector. Supporting this, Florida et al. (2001) and Theyel (2000) find little evidence that geographic factors such as spatial clustering or agglomeration affect the adoption of environmentally conscious manufacturing practices.

3 Empirical analysis

3.1 *Introduction on eco-innovations in the wine industry*

The empirical analysis investigates eco-innovation performance and dynamics, focusing on the identification of firm-level drivers of eco-innovation in the Italian wine industry. Choosing one specific manufacturing sector for studying eco-innovative behaviour provides the opportunity to minimise the potential bias in the introduction of eco-innovations which derives from the co-existence of different set of regulations for the promotion and adoption of eco-innovation across different economic sectors, as suggested in Kesidou and Demirel (2012). Moreover, focusing on one specific country we can overlook any country-level differences in environmental mandatory regulations and focus instead on voluntary aspects.

The focus on the wine industry also has a number of interesting aspects. First of all, the food and beverage sector is the first manufacturing industry in Europe and is particularly significant in economic terms in Italy. After the automobile industry, this industry is on top of the list for radical eco-innovation (EIO, 2011), thus, policy implications could be a leading example for other sectors. Frondel et al. (2008) demonstrate that food companies are particularly willing to introduce EMS with respect to other sectors. Secondly, the wine industry is a highly innovative, export-oriented sector, especially within the food sector, and unlike in other food industries, the absence of a price cap allows unlimited product differentiation and innovation. Thirdly, the wine industry is potentially one of the most representative sectors for the implementation of a win-win strategy, which has been found to be a key driver of eco-innovations (Porter and van der Linde, 2005). Given the wide product differentiation and the growing consumers' concerns for environmental and safety aspects, companies are becoming increasingly committed to develop green competences (Chen, 2007). Finally, the wine industry is characterized by the presence of stringent regulation and the grapevine cultivation has pervasive effects on landscape preservation and countryside tourism. Therefore, investments in eco-innovations could have relevant indirect effects on rural economies and their sustainability.

Italy leads the world market, together with France, for volume of wine production (about 18% of global market). The value of Italian production is estimated at €8.3 bn and consumption at €4.6 bn (Rabobank, 2012). A significant share of wine manufactured in Italy is exported. In 2011 volume and value increased respectively by 9.1% and 12.4%,

with an increase of the average price of wine exported (Rabobank, 2012). A large share of Italian wine companies are family-managed. Family control accounts for 54% of the total net equity. Cooperatives account for a significant part of the total number companies, although their share is gradually decreasing over the years. Foreign investors own some 18% of net equity. 2011 saw a general reduction in level of investments, which were the lowest in the last 6 years, there was a general increase in sales both in Italy (7%) and abroad (about 9%).

The environmental impact of wine production and of the food sector as a whole is an issue that is worth consideration (Demirel and Kesidou, 2011). Italian wine companies must comply with a set of rules,¹ which regulate conditionality in agriculture and national laws,² which discipline waste management and phyto-sanitary use. Companies implementing EMS can choose to certify, as cost saving and diversification tool, through the application of standards with different level of intensity and different actions that can be verified by third party entities. Among the environmental certifications we find the family of ISO 14000³, and the carbon footprint.⁴ Mandatory and voluntary rules for environmental management, however, could be accompanied by a set of other actions and investments that companies implement to increase input efficiency and reduce the production of emissions and waste aimed at improving management practices, with the final aim of optimizing outputs and reducing costs. The environmental impact of wine production could be reduced by adopting a wide set of technical solutions.⁵ Following the conceptual framework introduced by Dangelico and Pujari (2010), we can define green product innovation as a multi-faceted process wherein three key types of environmental focus – material, energy, and pollution – are highlighted based on their major impact on the environment at different stages of the product's physical life cycle. A frequent distinction in eco-innovation literature is between Cleaner Process (CP) and End of Pipe (EOP) technologies, as suggested by Del Rio Gonzalez (2009), and this distinction is also applicable to the wine industry, where we account as CP indicators of eco-innovation:

¹ E.g. the EU Reg. 1698/2005

² E.g. the no. 152/2006 and no. 4/2008, as well as the Ministry Decrees no. 12541/2006, no. 13286/2007 and no. 21/2008.

³ It aims at promoting more effective and efficient environmental management in organizations, and to provide useful and usable tools - ones that are cost effective, system-based, flexible and reflect the best organizations and the best organizational practices available for gathering, interpreting and communicating environmentally relevant information, as well as carbon footprint certifications.

⁴ It measures the total amount of carbon dioxide (CO₂) and methane (CH₄) emissions of a defined activity. The basic concept is that once the emission are known, then strategies can be adopted for its reduction, and their impact can be assessed.

⁵ See www.agro.geoenvi.org

- Improvements in resource efficiency – improvements in productivity of raw materials, optimization and technologies for the reduction of waste;
- Reduction of water consumption – reuse stabilization solution, high-pressure washing, rainwater collection systems, reuse of washing water.
- Reduction of energy consumption – solar and wind energy systems, biomass plants for energy production, underground cellar for reducing air conditioning costs, solar panels system for heating water, electrolytic separation of tartrate;

We account as EOP indicators of eco-innovation:

- Waste management – wireless technology and ozone use for cleaning cloaks, multiple steps sanitation of bottles, recovery of antioxidants from solid wastes, use of recyclable materials and lighter glass bottles;
- Gas emissions – use of solar irradiation for heating, recovery and purification of CO₂, use of cooling systems, use of hybrid machines.

3.2 *Econometric analysis*

In order to estimate the key drivers of eco-innovations we selected a sample of 2000 wineries and set up a questionnaire for a CATI survey addressed at company managers⁶. Wineries were randomly selected and their number has been determined regionally, proportionally to the local number of companies. Moreover, stratification based on company size has been applied in order to have a more representative sample.

In order to gather the information on the companies and analyse the drivers of eco-innovation coherently to the literature, the questionnaire included questions that allowed identifying proxies of regulatory aspects, demand factors, and firm and technology factors including networking and market orientation. The survey has been set up on a web-based platform. A first phone contact has been established in order to ask for companies' availability to participate. We then sent an email with our phone contact details and the link to the questionnaire to those managers that agreed to participate. 334 questionnaires were returned and the response rate was of 16.5%⁷.

⁶ *The universe of Italian companies is of about 380,000 wineries (ISMEA, 2012)*

⁷ *Sampling choices and stratifications have been oriented to the minimization of the selection bias. When comparing to National data on wineries (ISTAT 2011 - Censimento dell'Industria e dei Servizi), the sample represents well all the size classes (expressed in terms of number of employees) with less than 4% deviation, with the exception of wineries with just one employee, which are under represented, and companies with 3 to 9 employees, which are over represented.*

3.2.1 Methodology and Results

Most of the firms are medium-small size with about 20% of graduate employees. The majority of firms are part of a cooperative or a limited company, although more than 30% is a sole proprietorship. Frequently they establish collaborations with other wineries and suppliers, while collaborations with universities and research centres is less frequent. About 20% adheres to organic production discipline while other types of ecological certifications such as ISO 14000 and Carbon Footprint are pursued less frequently. About 20% of companies conduct routinely winemaking experiments in order to improve their products.⁸ The adoption of eco-innovation is less frequent than traditional types of innovation. Product innovation and process innovations concern about 70% of companies, while organizational innovation concerns about 54% of them. While CP concerns about 40% of the sample and EOP about 25%, the simultaneous adoption of both types of eco-innovation (Any Eco Innovation - AEI) concern 22% of the wineries surveyed.

The test of the research hypothesis is based on a set of *logit* regressions and one *ordered logit* regression. The *logit* regressions estimate the correlation between the theoretical drivers on the probability of firms adopting CP and EOP innovations. The ordered *logit* regression evaluates the impact of the same drivers on the cumulative probability of firms to adopt one specific type of eco-innovation (CP or EOP) and AEI. Individual regressions allow understanding the mechanisms enabling a specific type of innovation. CP concerns the improvement the resource/cost efficiency in production process and technologies. Thus, their implementation could follow profit-maximizing reasons, implying high knowledge of technologies and skills of personnel working in the process. EOP concerns waste management and CO₂ reduction. Their implementation could refer more to the environmental profile of the company and imply a tighter networking across the supply-chain. Those regressions are then compared to the regression measuring the determinants of AEI, which is aimed at identifying the factors driving firms' cumulative effort to introduce both CP and EOP innovations.

The generalized model used here is the following:

$$\text{Prob}(Y_i = j) = \sum_{\mu} c_{\mu} + \sum_k \beta_k R_{ik} + \sum_{\tau} \beta_{\tau} D_{i\tau} + \sum_{\gamma} \beta_{\gamma} T_{i\gamma} + \sum_{\delta} \beta_{\delta} G_{i\delta} + \varepsilon_i \quad \text{Eq. 1}$$

⁸ Winemaking experiments are generally considered as good proxies of R&D effort in the wine industry.

Where J represents the variables CP and EOP in the *logit* estimation and is equal to zero when no eco-innovation has been introduced and the value 1 when the company adopted CP or EOP . In the *ordered logit* estimation J is equal to zero when no eco-innovation has been introduced, 1 when the company adopted either CP or EOP and 2 when it adopted AEI. μ equals 1 in the *logit*, 1 and 2 in the *ordered logit*, indicating the cut points. With respect to the independent variables:

R represents the $k = 1, 2, 3$ proxies of Regulatory Factors;

D represents the $\tau = 1, \dots, 4$ proxies of Demand Factors;

T represents the $\gamma = 1, \dots, 11$ proxies of Firm-specific and technology-push factors;

G represents the $\delta = 1, \dots, 4$ Geographical and Economic Control factors.

Table 1 presents information on the variables used in the econometric analysis. Table 2 presents some descriptive statistics.

Table 1 – Variables used in the econometric analysis

Theoretical Variables	Variables	Type	Source	
Regulatory Aspects	Using Organic Grapes for Wine Making	dummy	survey	
	ISO 14000/14004 Certification	dummy	survey	
	Carbon Footprint Certification	dummy	survey	
Demand Factors	Conducting Market analysis	dummy	survey	
	Share of Sales to Regional Markets	share	survey	
	Share of Sales to National Markets	share	survey	
	Penetration of Wine Products	Percentage	ISMEA	
	Penetration of Organic Products	Percentage	ISMEA	
	Number of exhibitions	count	survey	
Firm & Technologies	R&D effort	On-going experimental wine productions	dummy	survey
	Networking	Relationships with Universities	dummy	survey
		Relationships with External Wine Makers	dummy	survey
		Collaboration with Other Wineries and Consortia	dummy	survey
		Relationships with Suppliers of Grapes, Equipment and Chemical Products	dummy	survey
		Relationships with Customers	dummy	survey
	Capabilities	Share of Graduate Employees	share	survey
		Winemaker only as external consultant	dummy	survey
	Structural Characteristics	Volume of Sales (1-5 scale)	discrete	survey
		Corporate	dummy	survey

Market Orientation	Share of Sales to Foreign Markets	share	survey
Geo-economic Factors	No. Food Firms in the Province	count	ISTAT
	Province Added Value	M€	ISTAT
	South	dummy	survey
	Centre	dummy	survey
	North	dummy	survey

Table 2 - Descriptive statistics

Variables	Mean	St. deviation	Min	Max
Using Organic Grapes for Wine Making	0.221	0.416	0	1
ISO 14000/14004 Certification	0.061	0.239	0	1
Carbon Footprint Certification	0.018	0.134	0	1
Conducting Market analysis	0.310	0.464	0	1
Regional Penetration of Organic Products	2.224	4.206	0	30
Regional Penetration of Wine Product	23.582	13.189	7.9	38.5
Share of Sales to Regional Markets	38.304	31.706	0	100
Share of Sales to National Markets	25.520	24.861	0	100
Number of exhibitions	51.757	5.254	44.6	58.8
On-going experimental wine productions	0.215	0.412	0	1
Relationships with Universities	0.164	0.371	0	1
Relationships with External Wine Makers	0.336	0.473	0	1
Collaboration with Other Wineries and Consortia	0.267	0.443	0	1
Relationships with Suppliers of Grapes, Equipment and Chemical Products	0.382	0.487	0	1
Relationships with Customers	0.100	0.300	0	1
Share of Graduate Employees	0.230	0.422	0	1
Winemaker only as external consultant	0.114	0.215	0	1
Volume of Sales (1-5 scale)	2.227	1.164	1	5
Corporate	0.715	0.452	0	1
Share of Sales to Foreign Markets	15.839	24.679	0	100
No. Food Firms in the Province	20.215	21.217	1	84
Province Added Value	22136.7	5625.9	12444	32653
South	0.358	0.480	0	1
Centre	0.182	0.386	0	1
North	0.461	0.499	0	1

Source: Authors' elaboration of survey data

Table 3 reports the results of the econometric analysis, which includes the *ordered logit* and the *logit* regressions, with the corresponding marginal effects. The analysis of the marginal effects of the *ordered logit regression* confirm that those factors driving CP and EOP innovation are also relevant when firms' cumulative effort to eco-innovate is considered. The large majority of the estimated coefficients in the ordered logit model are similar in terms of sign and marginal effect to those estimated in the logit models.

Overall, the results of the regressions show that some regulatory aspects have a strong impact on the probability of adoption of eco-innovations, confirming that regulation does not necessarily represent an undesirable cost-increasing factor but can be a driver of firms' innovation (Bernauer et al., 2006), bringing a win-win strategy with positive economic impacts (Porter and van der Linde, 1995b). Voluntary certifications such as the ISO 14000 group, working as process control and impact measurement, increases the awareness about the environmental impact and promotes firms' investments towards eco-innovation. The organic discipline in wine production, on the other hand, refers mainly to grape production and results confirm that it has no impact on eco-innovation activity. Similarly, carbon footprint, being a new and not widespread certification, does not show a significant impact.

Outcomes of the distinct regressions for CP and EOP, following the definition in Del Rio Gonzalez (2009), highlight different elements that could be defined as peculiar of the type of innovation. Voluntary certifications have stronger and more significant impact on EOP innovations. Such result matches the expectation given that the measurement of the impact and the control of the environmental performance of the production are key elements of those certifications. The awareness of the emissions, for example, could drive the company to increase the probability of adoption of EOP technologies. Weaker impact, on the other hand, has been found for R&D effort. In fact, general innovation activity, e.g. product quality improvement could be less related to the final environmental impact of the company. Relevant differences emerge at the level of the type of organization involved in networking activities.

Although demand factors are acknowledged to be crucial in innovation activity as a whole, they have been overlooked in the eco-innovation literature. Our results confirm that their impact on eco-innovative activity is not significant, and confirm the argument raised by Kesidou and Demirel (2012), societal pressure and demand for green products may not necessarily lead to higher investments in eco-innovation, but rather be limited to initiate a minimum commitment on "green issues".

Several firm specific and technology-push factors are found to be positively correlated with eco-innovation activity (Triguero et al. 2013, Horbach et al., 2008). R&D effort measured in terms of on-firm wine experimentations is highly correlated with the probability of eco-innovating. This result confirms what found in the eco-innovation literature (Horbach, 2008) and more generally in the innovation literature. Confirming the

determining role of firms' internal effort, we find that the employment of an internal wine maker is also highly correlated to eco-innovation. Similar results are estimated for both CP and EOP innovations, although CP innovations, being strictly linked to the production process, are more correlated than EOP to internal efforts expressed both in terms of the intensity of experimentation and to the employment of an internal wine maker. The indicator of internal capabilities, expressed in terms of share of graduate employees, is never significant in any of the regressions. In wine companies, in fact, the wine maker and its staff has often the exclusive responsibility of innovation. Moreover, in the case of EOP, none of the variables concerning the capabilities has been found to be significant, indicating that internalization of skills and competences are not relevant to this type of innovation, and that such capabilities are probably more easily found externally.

Wine companies that are more outward-oriented are also more likely to eco-innovate. These results confirm that firms' interaction with external agents supports the development of innovations (Dodgson, 1989; Dosi, 1988a, 1988b). Nevertheless, some differences emerge in the relevance of different external agents in influencing innovation capabilities and in the way the innovation process is performed.

A good access to external information and knowledge via networking, including the access to technology transfer services, as showed in Trigueiro et al. (2013) positively influences eco-innovation. Cooperation with universities and research Centres affects the intensity of eco-innovation estimated with the AEI regression. This result is in line with Cainelli et al. (2012) who point out that the existence of knowledge transfer mechanisms and firms' involvement in networks contribute to eco-innovation activity. However some differences emerge between CP and EOP: in our case, collaboration with universities and research centres resulted significant in the case of CP innovation, and not significant in the case of EOP innovation. This result could be justified having more information on the scope of the cooperation with research institutions, which could be characterised by a stricter focus on CP innovations.

The significant coefficient of the variables "collaboration with suppliers" confirms this finding. Suppliers of technologies and products for wine processing, thus, generate a common knowledge that contribute to wine companies' eco-innovation. We also find a positive correlation between eco-innovation activity and firms' networking with other wineries and consortia. The exchange of knowledge within such a network could generate a leader-follower mechanism that enhance eco-innovation propensity.

Cooperation with other wineries or consortia, as well as relationship with customers is found to be less significant. This set of results indicates a specific profile of wine company investing into cleaner processes: a company that tends not to share competences with direct competitors. CP innovations, most likely, could be perceived as differentiation elements that allow increasing company competitiveness.

Structural characteristics, such as size and corporate organization, do not seem to affect significantly eco-innovations adoption. This result does not confirm the results of Cainelli et al. (2012), in which size impacts the adoption of green investments.

Table 3 - Results of the econometric analysis

		Ordered Logit Model			Logit Models					
		Coeff.	Marginal fx		Coeff.	Marginal fx	Coeff.	Marginal fx		
			Y = 1 (CP or EOP) Y = 2 (AEI)	Outcome = 1						Outcome = 2
				0.217	0.513		0.236	\$		
Regulatory Aspects	Using Organic Grapes for Wine Making	0.618 [0.483]	0.039	0.111	0.339 [0.540]	0.084	0.943 [0.606]	0.183	#	
	ISO 14000/14004 Certification	2.774** [1.051]	-0.160	0.600	2.501+ [1.289]	0.442	3.160** [1.176]	0.655	#	
	Carbon Footprint Certification	-0.739 [1.309]	-0.080	-0.101	-1.039 [1.488]	-0.244	-1.723 [1.762]	-0.190	#	
Demand Factors	Conducting Market analysis	0.640 [0.460]	0.039	0.116	0.800 [0.539]	0.195	0.161 [0.636]	0.029		
	Number of exhibitions	0.008 [0.054]	0.001	0.001	-0.017 [0.062]	-0.004	0.072 [0.076]	0.013		
	Regional Penetration of Organic Products	-0.015 [0.0503]	-0.001	-0.002	0.034 [0.056]	0.008	-0.055 [0.072]	-0.010	#	
	Regional Penetration of Wine Product	-0.057 [0.110]	-0.004	-0.010	0.039 [0.126]	0.010	-0.130 [0.151]	-0.023		
	Share of Sales to Regional Markets	-0.010 [0.015]	-0.001	-0.002	-0.003 [0.017]	-0.001	-0.024 [0.023]	-0.004		
	(Sales to Reg Mkt) X (Reg Penetr of Org)	0.000 [0.001]	0.000	0.000	0.000 [0.001]	0.000	0.001 [0.001]	0.000		
Firm & Technology Factors	R&D effort	1.141* [0.459]	0.045	0.220	1.099* [0.530]	0.262	1.007+ [0.585]	0.201		
	Networking	Relationships with Universities	1.121* [0.564]	0.034	0.223	1.456* [0.705]	0.330	0.323 [0.709]	0.061	#
		Relationships with External Wine Makers	-0.471 [0.449]	-0.039	-0.078	-0.515 [0.510]	-0.128	-0.740 [0.613]	-0.128	#
		Collaboration with Other Wineries and Consortia	1.261** [0.455]	0.058	0.236	0.959+ [0.510]	0.233	1.590** [0.590]	0.316	#
		Relationships with Suppliers of Grapes, Equipment and Chemical Products	1.359** [0.444]	0.086	0.237	1.404** [0.509]	0.336	1.274* [0.614]	0.234	#
		Relationships with Customers	1.506* [0.713]	-0.003	0.321	1.571+ [0.885]	0.341	1.917* [0.934]	0.427	#
	Capabilities		0.968 [0.981]	0.076	0.164	0.585 [1.074]	0.146	1.806 [1.282]	0.324	
Share of Graduate Employees Wine maker only as external		-0.763+ [0.981]	-0.064	-0.123	-1.038* [1.074]	-0.254	-0.272 [1.282]	-0.048	#	

	consultant	[0.424]			[0.484]		[0.553]	
Structural Characteristics	Volume of Sales (1-5 scale)	-0.217 [0.301]	-0.017	-0.037	-0.129 [0.339]	-0.032	-0.508 [0.413]	-0.091
	Corporate	0.700 [0.775]	0.061	0.112	1.047 [0.874]	0.255	0.716 [1.017]	0.122 #
Market Orientation	Share of Sales to Foreign Markets	0.001 [0.001]	0.000	0.000	-0.008 [0.010]	-0.002	0.012 [0.012]	0.002
Geo-Economic Controls	No. Food Firms	-0.008 [0.014]	-0.001	-0.001	-0.009 [0.016]	-0.002	-0.009 [0.023]	-0.002
	Province Added Value	0.000 [0.001]	0.000	0.000	0.000 [0.000]	0.000	0.000 [0.001]	0.000
	South	-2.275 [1.799]	-0.184	-0.330	-1.164 [1.921]	-0.283	-3.380 [2.377]	-0.484 #
	Centre	-1.886* [0.827]	-0.199	-0.228	-1.308 [0.909]	-0.308	-2.837* [1.155]	-0.317 #
Cut1 (Constant for Logits)		-4.597 [5.853]			-1.077 [6.542]	10.68 [7.701]	8.438 [7.675]	
Cut2		-3.115 [5.848]						

4 Concluding remarks

The importance of eco-innovations for industry has been rising exponentially in recent years. EU and national policies are focusing more on more on environmental aspects of production and sustainability across the supply-chain. In this paper we offered a comprehensive analysis of the drivers of eco-innovation in the Italian wine industry in order to add knowledge on why and how the companies integrate environmental sustainability into their product, processes and organization. The analysis we provide is based on an original survey in which data are used to determine the impact of the drivers identified by the non-industry-specific literature on a single sector, which results singular for tendency to radical eco-innovative. Differently to the empirical literature on the topic, we offer a fine grain analysis on a single sector, in this case wine sector, in order to understand how different a single focus could be compared to a broader analysis on the highly diversified industry of a country, from regulatory to technological aspects. In order to verify this aspect we referred to the literature for the identification of the drivers included in the analysis.

Our results confirm the importance of regulatory aspects. More specifically, given that a single sector follows identical set of mandatory regulations, we found voluntary certification aimed at measuring and keeping track of environmental impact to be highly correlated with eco-innovation investments of wine companies, implying that creating environmental awareness about own production boosts targeted investments. Moreover,

voluntary certification corresponds to entrepreneurial attention to environmental issue, becoming a fundamental proxy of the environment related aspects of the company mission. Secondly, networking across the supply-chain, which could be intended as the perception of a supply-chain dimension, determines an important share of knowledge that drives a more ecological orientation of production choices. In addition, relationships with technology transfer institutions and high knowledge centres such as universities and research centres accelerates the acquisition of cleaner production technologies more than end of pipe systems. Last, R&D attitude is correlated with eco-innovative behaviour in general, confirming what already found in the literature.

Important policy implications derive from the outcomes of the investigation. European orientation of incentivising sustainable entrepreneurship through R&D multiplier effect, obtained by networking and collaborations across the supply-chain and with knowledge intensive institutions, has been found to be in line with our results.

However, in order to provide a stronger evidence of the impacts, as well as a clearer direction of the causality between the drivers and the eco-innovative behaviours, historical information on the companies instead of a cross-sectional snapshot should be used. Further research, moreover, could focus on a in depth qualitative analysis of the correlations found in order furnish a finer grain understanding of the mechanisms behind the correlations presented in the paper.

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Can the Knowledge Management discipline help municipalities improve their environmental policies? A multiple case study of zero waste initiatives.

Gianfranco Elia

Università LUM Jean Monnet
S.s. 100 Km 18 - 70010 Casamassima (BA)

Structured Abstract

Purpose – The purpose of this paper is twofold. Understanding if knowledge management can help local governments develop more effective environmental policies and, if so, to provide some guidelines to increase the uptake of knowledge in the policy process. This requires discovering the recurring good or bad knowledge management practices within some zero waste initiatives undertaken by municipalities. The human and material resources available for the local authorities are obviously scarce; therefore, being able to identify some useful elements for the success of an environmental policy can save time and resources, and, above all, can save irreversible damage to the environment (i.e. the use of landfill practices).

Design/methodology/approach – Research strategy is a qualitative case study approach, using a qualitative approach to data collection and analysis. We used existing data from previous research done by Robert Krausz for his own PhD thesis and official documents available on websites dedicated to zero waste initiatives. The rationale for using existing data is the perfect coincidence of the study population and also the unit of analysis. The study population is the complete set of local government zero waste programs which exist, or have ever existed; the unit of analysis is an individual zero waste program taken from this population. Results are analysed using specific theoretical perspectives.

Originality/value – This paper puts forward evidence for the value of the knowledge management discipline in the design and implementation of a zero waste strategy. It is known that the implementation of all municipal policies is laborious, time-consuming and expensive, so it may be useful to know in advance all the determinants of the success of a policy. When we talk about environmental issues, it becomes even more important considering that some environmental problems are irreversible (e.g. the pollution of an aquifer in proximity to a landfill); the failure of an environmental policy could have disastrous consequences.

Practical implications – The outcomes of the application is related to the fact that municipal waste management is one of the key areas of municipal environmental policy and is also the item on which citizens spend most resources. Therefore, for a good environmental policy a wide range of tools needs to be used, including knowledge management discipline, to obtain ever improving results. There are many municipalities who have adopted a zero waste strategy and many of those who have adopted one have benefited from it, considering all possible factors critical to the success of this strategy.

Keywords – – Knowledge management, public sector, knowledge to policy, municipal solid waste, zero waste strategies. (*max 5 words*)

Paper type – Academic Research Paper

1 Introduction

Stephen Tindale (Greenpeace Executive Director), in his foreword to the book Zero Waste, written by Robin Murray, affirms: The issue of waste has become a political hot potato. Central Government wants sustainable waste management but passes on the buck to local authorities. Local authorities decry the lack of funds from central government to enable anything but the cheapest option and reproach householders for failing to participate in reduction and recycling schemes. And the public opposes waste disposal facilities – both incinerators and landfill – with a vehemence they normally reserve for nuclear waste disposal.

The purpose of this paper is twofold. Understanding if knowledge management can help local governments create more effective environmental policies and, if so, to provide some guidelines to increase the uptake of knowledge in the policy process. This requires an understanding of the recurring good or bad knowledge management practices, within some zero waste initiatives undertaken by municipalities.

Human and material resources available for the local authorities are obviously scarce, while the design and subsequent implementation of a program for management of municipal solid waste requires time, expertise, material resources and involves many stakeholders. Being able to identify some useful elements to facilitate a more effective uptake of new knowledge in their work, particularly on environmental policy, can save time and resources, and, above all, can save irreversible damage to the environment (i.e. the use of the landfill practices).

Considering that in December 2013 in Italy 200 municipalities and more than four million inhabitants which represent 7 % of the national population have adopted a zero waste strategy (www.rifiutizerocapannori.it), we can imagine that this work could be useful in many local communities to prevent the waste of time as well as human and natural resources.

This paper puts forward evidence for the value of knowledge management in the design and implementation of a zero waste strategy. If we consider that annually in Europe (27 countries) we produce more than 250 million tons of waste, and more than 60

% of waste produced is still incinerated or sent to landfills, it is easily understandable that many municipalities have yet to implement an effective policy to reduce waste (Report 2013 on solid waste – ISPRA). As a consequence, the present study can be useful in order to increase the chances of implementing a successful environmental policy.

It is known that the implementation of all municipal policies is laborious and expensive, so it may be useful to know in advance all the determinants of the success of a policy. When we talk about environmental issues, it becomes even more important considering that some environmental problems are irreversible (e.g. the pollution of an aquifer in proximity to a landfill); the failure of an environmental policy could have disastrous consequences.

The agenda of the paper is as follows: The next section examines the theoretical background. The third section defines the methodology used in the paper. In the fourth section, the results are reported. The fifth section discusses the results. The last section provides the conclusion of the research.

2 Theoretical background

The theoretical background of this paper is focused on the link between knowledge and policy.

It is useful to start with the broad definitions of knowledge and policy.

Although today knowledge is recognised worldwide as the most valuable resource within all types of organizations and institutions, there is not a standard definition of knowledge nor of knowledge management.

So, what is knowledge?

Justified belief that increases an entity's capacity for effective action (Nonaka, 1994).

Knowledge is information which changes something or somebody – either by becoming grounds for action, or by making an individual (or an institution) capable of different or more effective action (Druker, 1989).

Some definitions of knowledge highlight the role that experience and tacit knowledge play, as well as other definitions, framed in a positivist view, suggested that knowledge primarily functions to 'describe' the world, and justification must involve 'testing' propositions through experiments and direct experience. Criticising this true and justified belief perspective, Quine argues that individual pieces of knowledge cannot be 'justified' or held as true in isolation, but rather a whole belief system is tested. Kuhn, also describes

how paradigms effect our experience and change the outcomes to collective value judgements, pointing to the shared nature of these paradigms. Other definitions emphasise the inseparability of knowledge from action, and suggest that ‘understanding’ is something that comes about from, and demonstrated through, ‘doing’.

Anderson (1975) defines policy as a purposive course of action followed by an actor or set of actors. Nielson (2001) points out that policy encompasses not just discrete decisions, but a set of processes, activities or actions. This paper focuses on public policy, and, in particular, on the municipal level of government. Court, Hoveland and Young (2005) define a policy as something adopted and implemented by government which affects or is visible to the public.

Within the numerous schools of thought focusing on the link between knowledge and policy, there are three paradigms that can help for understanding the link.

Rational. In this model, also described as the linear model, knowledge inspires and guides policy. Knowledge is a neutral input that improves policy, while, according to reason and logic, policy-making works in a problem-solving mode.

Pluralism and opportunism. The second paradigm challenges the ‘rationality’ of the policy process. Policy-making does not necessarily proceed as a linear problem-solving enterprise, but rather involves pragmatic decisions taken in uncertainty; the flow of knowledge into policy is not taken as a given, and is opportunistic and dependent on explicit efforts of various actors. Although this entails a wider view of useful sorts of knowledge, including non-academic producers of knowledge and local populations and civil society, there is still an underlying assumption that the incorporation of knowledge is generally ‘good’. For example, work on innovation systems argues for the importance of both supply and demand of knowledge as well as the need for intermediaries and regulatory framework conditions, but retains an assumption that innovation and the uptake of knowledge will generally be ‘good’, that promoting such innovation will lead to social and primarily economic benefits. Other work which falls under this paradigm are the practice-centred approaches to KM, and sustainability science (Jones, p.11).

Politics and legitimisation. Under this conception, power is infused throughout the knowledge process, from generation to uptake. Rather than being universally instrumental, knowledge will often reflect and sustain existing power structures and imbalances. The policy process is seen as the site of politics, processes of contest, negotiation, marginalisation, etc., with knowledge production and use entwined with

these forces: knowledge can serve to add legitimacy to political action often after the decision, and what counts as ‘legitimate knowledge’ is itself politically determined. Work in this area might focus on how ‘technical’ knowledge is used to gloss over contested and political aspects of situations, for example (Jones, p.11).

What is knowledge management?

Knowledge management is not a new phenomenon per se, but it has only recently emerged as an explicit area of inquiry for managing organizational knowledge (Wiig, 1997).

3 Methodology

Research strategy for this paper is a qualitative case study approach. Methodology used is a qualitative approach to data collection and analysis.

Existing data was used from previous research done by Robert Krausz for his own PhD thesis and official documents available on websites dedicated to zero waste initiatives.

The rationale for using existing data is the perfect coincidence of the study population and also the unit of analysis. The study population for this research can be defined as the complete set of local government zero waste programs which exist, or have ever existed. The unit of analysis is defined as an individual zero waste program taken from this population. Results were analysed using specific theoretical perspectives.

Because the data used in this study was generated by other research, it is important to describe how the data was generated.

One important decision made by Krausz is about the choice of the sample of case studies from the population. Among all the zero waste programs a non-random selection of cases is chosen for this research.

In order to select a sample of 3-5 cases which well represents the diversity of the population, the following criteria are applied to selection: Geographic diversity, diversity of local government features and diversity of position on the timeline. An additional constraint is applied: that all case studies be selected from English-speaking countries (Krausz, p.36-37).

Based upon these criteria and constraints, the following set of four case studies has been chosen, with prominent reasons for selection given for each location:

- 1) Australian Capital Territory (ACT) – Canberra and surrounds, Australia;

- 2) Christchurch, New Zealand;
- 3) Toronto, Ontario, Canada; and,
- 4) San Francisco, California, United States.

These case studies thus comprise a set that meets the diversity criteria in the following ways:

- **Diverse in Geography:** They cover four different countries, on two different continents (Oceania and North America), in both the northern and southern hemispheres.
- **Diverse in Local Government Structure and Intergovernmental Dynamics:** The four cases include three local governments (two cities and one city/county) and one dual city/territory government. In addition, one of the local government cases is also a case where the local initiative has operated simultaneously under a national government zero waste policy.
- **Diverse in Position on the Timeline:** One case (Canberra) abandoned its original zero waste to landfill goal just one year before the target date, and has since renewed the same goal but with no specific deadline. Two cases (Christchurch and Toronto) abandoned their original goals years in advance of their target dates, and replaced them with less ambitious % diversion goals. And, one case (San Francisco) is still before its target date and is continuing along with its original overall goal unchanged (Krausz, p. 37-39).

Each case study was reviewed from the point of view of either good or bad KM practices through the literature review to provide some guidelines and warning to help local governments better understand the link between knowledge and policy.

4 Results

As indicated in the previous section, the results are drawn from research carried out by Krausz's PhD Thesis.

4.1 Australian Capital Territory (ACT) formed by Canberra with its surrounds

The city of Canberra serves a dual role as Australia's capital city, and seat of the Australian Capital Territory (ACT). Canberra is the only city in the ACT, a region with an estimated population of around 347,000 residents (Krausz, p. 58)

Canberra, by the “ACT NoWaste by 2010” initiative launched in 1996, represented the world’s first local government adoption of a zero waste to landfill goal with a finite deadline. As a consequence, Canberra gained instant global notoriety as a sustainability exemplar (Krausz, p.57).

After the campaign was launched, the ACT reported a steady increase in their % diversion from landfill rate, from 42 % in 1996 to 73 % in 2009. However, the resulting decrease in per capita waste to landfill was comparably modest: a reduction of less than one-third by 2006, which has since been followed by a levelling off and even slight increase in this rate. The key statistic which can explain this poor achievement is the overall per capita rate of waste generation, which increased steadily during this time, rising by over one third between 1996 and 2009 (Krausz, p.57).

The warnings of likely failure of the initiative grew increasingly acute as the deadline of 2010 approached, culminating in the abandonment of the zero waste to landfill initiative in 2009. A new ACT Waste Strategy was formally adopted in 2011, which replaced the zero waste to landfill by 2010 goal with a more modest long-term goal of 90 % or greater resource recovery by 2025 – and as of 2012, the ACT is planning to expand its existing landfill site to extend capacity beyond 2015 to at least 2035 (Krausz, p.57).

4.1.1. Good KM practice

A good knowledge management practice was the attempt to generate knowledge for policy. The zero waste to landfill declaration arose based on feedback gathered from a series of community workshops and stakeholder meetings in 1995 and 1996, after which the ACT government articulated the specific goal of “a waste free society by 2010” (Krausz, p.60).

Another attempt to generate knowledge for policy, in particular from the process of implementing a program, was when in 1999, the ACT’s Commissioner for Sustainability and the Environment, Joe Baker, conducted a study of ACT NoWaste by 2010’s progress to date, and released a report in 2000 titled, *Progress towards No Waste by 2010*. Overall, the Commissioner commended ACT NoWaste by 2010 for “some good work done to date”, but stressed that “there is a very challenging task ahead” (Krausz, p.61).

A good KM practice was about knowledge sharing, outlining a three-year plan for the years 2000-2002, which included interim waste reduction targets in advance of 2010, and a mixture of top-of-pipe and end-of-pipe strategies for meeting these targets. Other

commitments listed included increased public awareness and education, including the development of a No Waste Education Centre (Krausz, p.62).

A further good KM practice was the attempt to capture new knowledge about the continuation of the zero waste initiative, by giving a task to external consultants. Later in 2008, a consultant's report titled, *ACT No Waste Strategy and Targets – Review & Assessment of Options*, was released (Krausz, p.65). The consultant's overall assessment echoed the Commissioner's then-recent recommendation to abandon the "No Waste by 2010" initiative (Krausz, p.66).

Another good KM practice was the attempt to generate knowledge before setting a new waste strategy. 2010 saw the release of the *ACT Sustainable Waste Strategy 2010-2025 Draft*. This draft document was issued by the ACT Minister for the Environment, Climate Change and Water, Simon Corbell, and it invited public submissions towards the preparation of a final strategy document for 2010-2025 (Krausz, p.66). Subsequently, in 2011, the *ACT Waste Management Strategy 2011-2025* was released, and this officially replaced the "ACT NoWaste by 2010" initiative as the ACT's overall waste policy (Krausz, p.67).

A further good KM practice was the attempt to generate knowledge for policy before launching a zero waste initiative. The idea of setting the higher aim of zero waste to landfill emerged from community member feedback, during a period of public consultation in 1995-1996, notes ACT NoWaste by 2010 Senior Project Officer at the time, Gerry Gillespie (Krausz, p.69).

4.1.2. Bad KM practice

A bad KM practice was the lack of an appropriate stakeholders' management strategy with regard to the opposition party, the Labour Party, which was unlikely to be supportive. As reported by Krausz, in 2001, Labour Party government elected in the ACT, replacing the Liberal Party government which had been in power since 1995 and had brought in the NoWaste by 2010 initiative.

Indeed, during the period 2004-2008, funding for the initiative was scaled back by the ACT government, and no further progress reports were released after 2004 (Krausz, p.64).

Another bad practice of KM was the over optimism in goal definition given low attention to the previous similar initiative with more realistic goals. As reported by Robert

Krausz ACT NoWaste by 2010 followed similar waste-related legislation that was passed in Australia in the preceding years: in 1992, the Commonwealth of Australia government set a nationwide goal of 50 % diversion from landfill by 2000; and, in 1993, the neighbouring state of New South Wales set its own higher goal of 60 % diversion by the same deadline of 2000 (Planet Ark Environmental Foundation, 2005).

This is supported as stated by Graham Mannall (Operation and Contrats Manager, ACT NoWaste). He points out that the ACT achieved a 75 % diversion rate, which was a first for Australia and among the best outcomes anywhere in the world – yet the NoWaste initiative was still largely viewed as a failure because of its stated goal of zero waste to landfill. He states that setting a finite deadline was a mistake that initiatives elsewhere have avoided (Krausz, p.70).

This is supported also by Zero Waste South Australia’s CEO, Vaughan Levitzke, who explains that their relatively modest stated goals have been very consciously selected, to deliberately aim for reachable targets that generate short-term success, rather than long-term failure, as has been attributed to the ACT’s NoWaste by 2010 programme.

Besides, Mannall wonders if the ACT community would have viewed NoWaste as a success if their stated goal had been 70 % diversion, given that they achieved a 75 %age rate.

4.2 Christchurch (New Zealand)

The City of Christchurch, with approximately 370,000 residents, is New Zealand’s second-most populous city. It is also the most populous city and the economic and cultural centre of the country’s South Island (Krausz, p.83).

In 1998, Christchurch City Council (CCC) became the second local government and first major urban one in New Zealand to declare a zero waste to landfill goal, with a deadline for achieving this set at 2020. The launch of this initiative arose in response to growing public interest in the concept of zero waste, and followed from Canberra’s pioneering launch of the ACT NoWaste by 2010 just two years earlier. Christchurch’s adoption of a zero waste to landfill goal also came at a time when the privately-funded Zero Waste New Zealand Trust (ZWNZT) was offering financial incentives to local councils around the country – and while the CCC campaign operated independently of this programme, it nonetheless represented an important part of the overall zero waste movement that was growing in prominence at this time (Krausz, p.82).

Christchurch's zero waste to landfill by 2020 initiative, however, was remarkably short-lived, with the goal officially dropped three years later in 2001 in favour of a 65 % diversion by 2020 goal. In 2006, the CCC revised the waste reduction goal again, to a target of 320 kg/person/year to landfill by 2020, which would represent a 60 % reduction from the 1994 baseline rate (Krausz, p.82).

Christchurch is a well-articulated case study with regard to its peculiarities:

- that CCC's coincidental, concerted efforts to develop a new regional landfill site, as part of a public/private joint venture, placed them in a conflicted situation whereby the profit motives to landfill inherent in the joint venture business model ultimately and irreconcilably compromised the zero waste to landfill campaign (Krausz, p. 82);
- the Zero Waste New Zealand Trust launched a programme that offered a \$25,000 funding incentive to councils that adopted a formal zero waste to landfill policy with a specific deadline (Krausz, p. 87), although Christchurch's initiative operated independently of this scheme (Krausz, p. 116).
- the pivotal role that a single City Councillor managed to assume, by taking on a virtual monopoly of waste-related committee Chairmanship roles, and subsequently championing both the adoption and soon-after abandonment of the zero waste to landfill initiative (Krausz, p. 82).
- the evolution of the central New Zealand government's national Waste Strategy. Beginning in 2002 with an aspirational goal of zero waste for the country, this policy swung away from and then back towards identifying with 'zero waste', and was ultimately dropped completely in 2010 by the National Party government which replaced the Labour Party government in 2008 (Krausz, p.83).
- the destructive earthquakes of 2010-2011 have only pushed waste reduction further back on the list of CCC's priorities, as the rebuilding process is set to last and dominate the City's overall agenda for several years to come – with zero waste not a particularly evident part of the renewal plan (Krausz, p.83).

4.2.1. Good KM practice

Good practice of KM can be traced in the attempt to generate knowledge, when Christchurch City Council commenced a process to deliver a formal waste management plan to meet the new requirement defined by a 1996 amendment to New Zealand's Local Government Act. In 1998, a draft Waste management Plan was produced by City staff, and the public was invited to submit feedback. This is a way to acquire knowledge before setting policy. Later that year, the Plan was formally approved by the Council (Krausz, p.89).

A further good practice of KM was the attempt to generate and share knowledge when, three years after the March 2001 meeting, the Council voted to notify Christchurch residents of its intention to make the above revisions to the zero waste to landfill goal, with the additional goal of zero organics to landfill by 2010. A subcommittee of three Councillors, including Councillor O'Rourke, was appointed to consider public submissions on the proposed revisions and then report back to the Council with its findings (Krausz, p.95).

Another good KM practice was the attempt to capture and share knowledge within the process by declaring a priority product (a tool that gave the central government unprecedented powers to address the waste problem) which would include consideration of advice from Waste advisory board and public consultation. This tool for preventing waste gave the Minister the authority to declare any product to be a priority product if it was deemed to cause significant environmental harm once it was disposed (Krausz, p.112).

4.2.2. Bad KM practice

One bad practice of KM was having first requested a public submission and then not having considered the objections. O'Rourke acknowledged that the public submissions to the proposed revision included considerable opposition, but he pointed to the various factors that he had outlined in his previous comments and commented that "some members of the public will not understand these factors, but we must take account of them in making our decision" (Krausz, p.98).

Another bad KM practice was the lack of knowledge before setting waste reduction goal of 100 % by the year 2020 or by time the new regional landfill was filled. Evidence can be traced to Councillor O'Rourke's words: "back in 1998 he had

proposed and the Council accepted, the goal of zero waste to landfill, and a target – the year 2020, but added that we had little idea whether this rather idealistic target was feasible, or how would be achieved in practice” (Krausz, p.96).

O’Rourke also summed up the need for revising the goal in this way: The target date of 2020 for zero waste to landfill was optimistic in the extreme. Idealism was fine in the context of our knowledge in 1994, but in the context of experience gained since then, persistence with a zero waste target by 2020 would now simply be dishonest. This does not mean, however, that I or the Council are retreating in any way from the zero waste goal. Indeed, we have determined to increase our efforts, as proposals published in the council’s draft annual plan for increased expenditure on composting and recycling clearly show. But the zero waste goal must be pursued in the context of a waste plan which has credibility. This requires realistic targets rather than pie-in-the-sky idealism.... The zero waste goal therefore remains intact, while the constraints in achieving zero waste are openly and honestly acknowledged (Krausz, p.96).

Another bad KM example is the lack of knowledge sharing when O’Rourke pointed to information from international sources which suggested that a diversion rate in the 30 % to 35 % range was towards the very top of current international best practice. He notably, however, did not cite the example of Canberra, which at this time was reporting a 61% rate of diversion from landfill (Krausz, p.96).

A further bad KM practice was the lack of attention paid to experiential knowledge when the report (presented at the June 2001 by Waste reduction goal Subcommittee) acknowledged that a local grassroots group had conducted a poll in which 57 % of respondents indicated that zero waste by 2020 was achievable. The Subcommittee’s response to this, remarkably, was: “Without a proper understanding of the constraints set out in this report such opinions are of little value. Furthermore 57 % is hardly a large majority in support” (Krausz, p.99).

4.3 Toronto (Canada)

The City of Toronto has a population of 2.7 million, making it the largest city in Canada and the fifth largest in North America. It is an amalgamated city, resulting from the merger of seven municipalities in 1998. In addition to being Canada’s principal financial and corporate centre, it is also a seat of government, being the

capital of Ontario – the country’s largest province by population and second largest by area. Toronto is located in the Great Lakes region of North America, along the northwest shore of Lake Ontario (Krausz, p.140).

In 2001, the City of Toronto launched Task Force 2010, a waste reduction initiative with a zero waste to landfill by 2010 goal. This goal was adopted amid ongoing challenges regarding the location of a new landfill site for the City’s solid waste, in anticipation of the impending closure of the last local site at Keele Valley at the end of 2002 (Krausz, p.139).

Prior to the decision to undertake a zero waste to landfill initiative, the City had actively considered the option of shipping its waste 500 km by rail, to the decommissioned Adams Mine site, in northern Ontario. However, amid extensive opposition from both the Toronto and northern Ontario regions, City Council rejected this option in 2000 (Krausz, p. 139).

Toronto began its zero waste to landfill initiative with a reported residential diversion from landfill rate of 27 % in 2001, and surpassed the Phase I goal of 30% diversion by recording a 32 % rate in 2003. The Phase II target of 60 % diversion by 2006 appeared increasingly out of reach, and in 2005 the deadline for this intermediate target was pushed back to 2008 – and the ultimate zero waste to landfill deadline of 2010 was likewise postponed to 2012 (Krausz, p. 139).

The purchase of the Green Lane site, which offered Toronto up to more than 20 years of further landfill capacity, coincided with a policy shift from the City regarding its waste reduction goals. In 2007, City Council voted to replace the zero waste to landfill initiative with Target 70, a new programme with an overall goal of 70% diversion from landfill by 2010. By 2010, however, even this scaled-back initiative had fallen short, with the City reporting a diversion rate of only 47 % (Krausz, p. 139-140).

The fate of Toronto’s zero waste to landfill initiative appears to be linked closely to the City’s perceived availability of future landfill capacity – starting with the initiative’s launch amid an acute imminent inability to find a new site, and ending with the securing of the Green Lane site which was followed shortly thereafter by the outright abandonment of the zero waste programme (Krausz, p. 140).

4.3.2. Good KM practice

One good KM practice was (in the attempt to capture knowledge), the formation, in January of 2001, of the Waste Diversion Task Force 2010. This group comprised all Toronto City Councillors, and was co-chaired by Mayor Mel Lastman and the Chair of the Works Committee, Councillor Betty Disero (Krausz, p 144).

Another good KM practice was also, in the months that followed the creation of the Waste Diversion Task Force 2010, consultation meetings were held across the city, with councillors and staff seeking input from the general public for the purpose of shaping the final strategy (Krausz, p. 144).

Another good KM practice, with the same purpose to capture knowledge, was made in 2003, the year when the number of truckloads of waste going to Michigan peaked at 142 per day, City Council created the New and Emerging Technologies, Policies and Practices Advisory Group, comprising a mix of Council-appointed expert and non-expert citizens. The overall mandate of this committee included providing guidance on whether or not 100 % diversion from landfill was an achievable objective, and assessing and developing opportunities to apply new technologies aimed at going beyond 60 % diversion and towards zero waste to landfill (Krausz, p. 147).

This advisory group, early in their tenure, expressed concern that the overall timelines for diversion were too short, and suggested that this pointed to a City staff preference for incinerating waste in the long term (Krausz, p. 147). That is to say, that incineration should not be considered a means of diverting waste from landfill, partly because the contract with the landfill operator in Michigan contained a clause which precluded the City from incinerating its waste (Krausz, p. 149).

Good KM practice was also made in February 2006, when Toronto City Council established a new citizen advisory group, the Community Environmental Assessment Team (CEAT), which was charged with guiding the City's environmental assessment process for managing residual waste (Krausz, p. 150).

4.3.3. Bad KM practice

A bad KM practice seems to have been in sharing knowledge about of the scope of the Zero Waste to landfill goal.

Looking at the Waste Diversion Task Force 2010 report of June 2001, it seems that the task force had sufficient knowledge about the enormity of the goal.

The following statement from the report acknowledged the ambitious nature of the goal:

It's a visionary plan — a great city needs to dream great dreams. It's an ambitious plan — a great city must have a big reach (Krausz, p. 144).

In this other statement the Task Force acknowledge the need to focus effort not only at the end of pipe, but also at the top of the pipe:

Changing habits is important. But so is changing minds. We have to encourage the people of Toronto to see leftover household material not as "waste" but as a valuable resource that can be used again and again. Indeed, we shouldn't even be talking about "municipal solid waste (MSW)" but rather "municipal solid resources (MSR)." Public information and education must be a large part of our effort (Krausz, p. 145).

Also the New and Emerging Technologies, Policies and Practices Advisory Group, early in their tenure, expressed concerns that overall timelines for diversion were too short, and suggest that this pointed to a City staff preference for incinerating waste in the long term (Krausz, p. 147).

Another bad KM practice was an excess of information that appear to have been in the words of Heather Marshall (Campaigner, Toronto Environmental Alliance) when she suggests that the city has not offered much education on avoiding waste because they are still trying to get people informed about how to sort their waste for recycling – including the work of translating this information into 26 languages (Krausz, p.158).

A further bad practice was that the Phase III goal of 100 diversion was already outlined in the Task Force's initial media release, *before* the period of public consultation. It is reasonable to argue, therefore, that zero waste to landfill was something that the Mayor and other Councillors had decided to pursue, regardless of public opinion, by 2001. Positive feedback from the public – particularly from environmental activists in the city – simply offered validation of this agenda, and from there City Council was able to sell the concept to its more sceptical waste management staff (Krausz, p.167)

4.4. San Francisco (California)

San Francisco is a consolidated city-county on the northern half of the west coast of the State of California in the USA. There are around 800,000 residents living within the city county jurisdiction, while the San Francisco–Oakland–Fremont Metropolitan Area has a population of around 4.3 million, making it the 2nd-largest urban centre in California, and the 11th-largest in the USA. San Francisco is also a central part of the larger ‘Bay Area’, which includes the eight other counties that surround the San Francisco Bay, and is home to over 7 million residents (Krausz, p. 173).

Following from a State of California law that required cities to divert a minimum of 50 % of waste from landfill by 2000, in 2002 the City and County of San Francisco launched its own further initiative to reach a diversion rate of 75 % by 2010, and a 100 % diversion rate – zero waste to landfill – by a time to be determined once the 50 % diversion rate was confirmed (Krausz, p.171).

San Francisco confirmed it’s surpassing of the State goal of 50 % diversion in 2003, and in that year set a deadline of 2020 for achieving zero waste to landfill. The City thereby gave itself 17 years to reduce the per capita waste to landfill rate from over 800 kg/person/year, down to nothing. Since the 2003 adoption of the goal, the programme has been run from the Zero Waste department of SF Environment, under the authority of the City’s Mayor and Board of Supervisors (BoS), and their appointed Commission on the Environment (CoE) (Krausz, p.171).

In the nine years since 2003, the City has passed a significant number of ordinances which legislate change with respect to waste generation in San Francisco (Krausz, p.171).

Since 2003, the reported % diversion from landfill rate has risen from 63 % to 77 % – and this statistic has been widely promoted by the City as evidence that San Francisco is an exemplar for waste reduction among cities across the USA and around the world. Other statistics, however, suggest that San Francisco’s performance on waste reduction has been less impressive. During the period since 2003, absolute amounts of waste to landfill have dropped from 800 to 500 kg/person/year – which is a positive reduction trend but one that has not matched the increase in the diversion rate. The reason for this is that the overall generation of waste in San Francisco has actually *increased* over this same period, from 1900 to 2200 kg/person/year. So, while

the City has achieved success at managing waste at the end-of-pipe, it has thus far failed to address the fundamental problem of consumption which is driving waste generation at the top-of-pipe (Krausz, p. 171-172).

In the face of these prevailing circumstances, it appears that San Francisco's zero waste to landfill by 2020 initiative is headed for failure (Krausz, p.173).

4.4.1. Good KM practices

A good KM practice was made in the early nineties when waste characterisation studies were done which found that food scraps represented the bulk of the City's waste, so this was targeted to get to 50% diversion. San Francisco was the first city in the state to launch large-scale food composting, beginning with commercial service in 1996 and moving into the residential sector in 1997, with citywide service commencing in 1999 (Krausz, p. 178).

A further good KM practice was made with the passage of the Environmentally Preferable Purchasing for Commodities Ordinance. The legislation gave SF Environment the authority to declare as a Targeted Product Category any "broad category of products routinely purchased by the City which have been identified by the Commission as having undesirable environmental health impacts for which alternative products should be identified and substituted. For each Targeted Product Category, the Department would develop, in consultation with City staff and relevant experts, an *Approved Alternatives List* of products which "will have a lesser impact on human health and the environment compared to other similar products, consistent with the Precautionary Principle (Krausz, p.181).

Good KM practice was also the use of the fee of \$ 0.20 per pack of cigarettes sold in San Francisco to create the Environment Cigarette Litter Abatement Fund which would pay for the administration of the fee, cover the cost of cleaning up cigarette litter, and also provide outreach and education to address the cigarette litter problem (Krausz, p. 183).

4.4.2. Bad KM practices

A bad KM practice appears to have been when the knowledge on the previous Zero Waste initiatives was used to launch the initiative, when the stated motivation for adopting the zero waste goal included that "several jurisdictions have adopted zero

waste as a long term goal, including Santa Cruz and Del Norte Counties in California; Seattle, Washington; Toronto, Canada; Canberra, Australia; New South Wales, Australia and 45% of New Zealand's local governments" (Krausz, p. 179), omitting to say that none of these cases had obtained a successful.

A bad KM practice is a lack of sharing knowledge about of the scope of the Zero Waste to landfill goal.

Indeed, although the Commission of Environment (CoE) resolution No. 002-03-COE included the acknowledgement that the goal was ambitious and will require product manufacturers and consumers to take responsibility to ensure that all discarded materials are diverted from landfill (Krausz, p. 180), does not appear to have been sufficiently communicated to the various stakeholders the burdens resulting therefrom.

Another bad KM practice is about the knowledge capture, within the too exclusive relationship between SF Environment department and Recology, when Bob Besso (Recycling and Waste reduction manager, Recology) explains that the prevailing system is one where SF Environment "essentially tells us what it wants – and we figure out how to make it work." He cites the example of the City's food waste collection programme which started back in 1996: "The City told us what they wanted, we told them what we thought it would cost, they said we could go ahead and charge for it, and so we did it – almost a decade before anybody else" (Krausz, p.195). This kind of relationship ignore the risks of "regulatory capture" (The theory of regulatory capture is associated with Nobel laureate economist George Stigler, one of its main developers).

Another instance of that hazardous relationship is about the choice of the landfill site. According to David Tam, Research and Development Director of the Bay Area grassroots Sustainability, Parks, Recycling and Wildlife Legal Defence Fund, there are better landfill options for the city than Recology's Yuba County site. Tam observes that the Bay Area has 15 existing landfills with only one-third of their capacity used up, and suggests that six of those sites would make more sense for disposing of San Francisco's waste. Meanwhile, David Tucker, Government Affairs Director with existing City landfill contractor Waste Management, argues that the Yuba County landfill proposal contains a host of unknown costs, and points out that the rail transport component – touted as one of the key environmental strong points in

Recology's bid – lacks the necessary infrastructure in place to make it work. Tam concurs on the latter point, describing the rail haul component as “a long shot” (Krausz, p.196).

A further bad KM practice was the lack of exploitation the knowledge generated in the process of implementing of the plastic bag reduction ordinance. As affirmed by Kevin Drew (Residential Zero Waste Coordinator, SF Environment) studies on the impact of the PSB ban have been very costly and time-consuming, so further studies on this have not been done (Krausz, p.199).

5 Discussion

In the previous section for each case we had put in evidence some good and bad KM practice, but there is a result that is important to point out: each zero waste to landfill initiative has either failed, or is on track for failure: Canberra, Christchurch and Toronto all abandoned their initiatives in advance of their target dates. San Francisco is ahead of its target date and is still officially committed to its original zero waste to landfill goal; however, as discussed within case analysis of results there indicates that achieving the goal is highly unlikely under present trends and circumstances (Krausz, p.214).

In this section we will try to analyze the causes of this widespread failure from the standpoint of KM. In particular, we will investigate the link between knowledge and policy in order to identify some guidelines for local governments who have embarked on a zero waste initiative.

5.1. Guideline n. 1: Use different perspectives to understand the role of power in the policy process

A good way for understanding the role of knowledge in policy process is following the Summer and Jones (2006) insight. They argue that there are three interlocking domains of interest based around different types of power relations: actors, institutions and discourses. Of course between these domains there are areas that overlap.

Actors and networks: this appears to be the driving force in policy processes as material political economy, with interest groups competing over the allocation of resources and the formulation of rules and regulations. Knowledge is often seen as subordinate to interests, used tactically or as ‘ammunition’ in adversarial decision-making. Taking a closer look, the effect of actors deploying information and ideas, and

the role that knowledge and ideas play in structuring networks, coalitions and ‘interests’, suggests a more active role for knowledge¹ (Jones, p.5). For example, in the case of San Francisco we have an actor with extraordinary power that has withstood by a wide margin several ballot initiatives to end its monopoly.

Institutions: this attributes an ongoing force in policy-making to the context and institutions that shape the formal and informal ‘rules of the game’ such as constitutional rules and cultural norms. Knowledge and ideas are refracted, altered and translated to fit prevailing institutions, or certain types of knowledge may be excluded entirely. It can also play a role through becoming institutionalized, embedded in bureaucratic procedures, laws, or organizational forms² (Jones, p.5). For example, in each case there emerged the role of the central government in the waste management and its role for addressing 100% of problematic wastes at the top of pipe waste. In the case of Christchurch, for instance Central Government attention to the issue of waste has generally oscillated between a waste management focus from National Party governments, to a waste minimization focus from Labour Party government. In the case of Toronto, for instance, in 2003, the Ontario General Election saw a new Liberal Party government replace the Conservative Party government that had ruled the province since 1995. In June 2004, the Liberal government passed the *Adams Mine Lake Act*, which prohibited the disposal of any waste in the Adams Mine site, and revoked, with financial compensation, all of the permits which had been granted to the private developer by the previous Conservative Party government, between 1998 and 2001. With the ongoing pressures against waste shipments across the USA border, and the Adams Mine landfill proposal now off the table, Toronto was under increased pressure to secure new long-term landfill capacity – or else make good on its goal of zero waste to landfill by 2010 (Krausz, p. 149).

Discourse: this sees knowledge and power as intertwined, with considerable power held in concepts and ideas seen as relevant for policy, and exerted through interactive processes of communication and policy formulation. There are various areas of study within this, for example: the role of cognitive paradigms in limiting the range of policy options considered, and the dynamics of ‘narratives’ in the policy process, simplifying

¹ For more on this see Keeley and Scoones 1999, Knots 2006, Sumner and Jones 2008, Weiss 1977, Heklo 1978, Haas 1992, Kingdon 1984, Nutley 2007, Campbell 2002.

² For more on this see Steinmo et al. 1992, Steinmo 2001, Court 2006, Collier and Collier 1991, Beland 2005, Schmidt and Radaelli 2004, Campbell 2002, Lukes 1973, Sanderson 2004.

complex situations and driving policy¹ (Jones, p.5). In each case there is a story to tell for launching an initiative. In some cases, like Christchurch and Toronto the story is about the landfill crisis; in other cases, like Canberra and San Francisco, the story is about sustainable development.

2* guideline: Take into due account the “sites” of the policy process: when and where knowledge meet policy.

In policy making, a range of different actors are involved; different institutions, evidence and knowledge are used; and decisions are made. In other words, it is important to pay attention to when and where policy is made.

When policy is made: Stages and streams

Under the rational paradigm of the policy process, it is possible to separate policy-making into different stages (Nielson, 2001) and in each stage there is a potential role for knowledge (Pollard and Court, 2005).

As well represented by Jones (p.16-17):

At the agenda-setting stage, knowledge is used to identify new problems or highlight the magnitude of a problem; uptake of knowledge is enhanced if it is crystallised around a policy narrative, and credibility and communication are shown to be important. There has been a lot of work from the third paradigm on agenda-setting. For example, as well as Kingdon’s model, Cobb and Elder (1972) argue that an unequal distribution of influence generally leads to systematic biases in the range of issues considered, sustained by significant pre-political forces. The Christchurch case is paradigmatic, with the pivotal role that a single City Councillor managed to assume, by taking on a virtual monopoly of waste-related committee Chairmanship roles, and subsequently championing both the adoption and soon-after abandonment of the zero waste to landfill initiative (Krausz, p.82).

At the formulation stage knowledge plays a role in structuring various alternative policy options, and in suggesting the causal links between the policy and its outcomes; the quantity and credibility of the evidence is important, and analyses of costs and benefits tend to be required. For example we can look again at Christchurch case when O’Rourke acknowledged that the public submissions to the proposed revision included considerable

¹ For more on this see Foucault 1991, Schmidt and Radaelli 2004, Campbell 2002, Hall 1993, Krznaric 2007, Sutton 1999, Knots 2006, Molle 2008, Lewis et al. 2005, Jasanoff 2005.

opposition, but he pointed to the various factors that he had outlined in his previous comments, and commented that “some members of the public will not understand these factors, but we must take them into account in making our decision” (Krausz, p.98).

At the implementation stage operational knowledge functions to improve the effectiveness of initiatives; it needs to be relevant and generalizable across different contexts, and directly communicated with those implementing policy. In each case we have found that too little attention has been paid to the implementing stage of the policy process.

Evaluation functions to monitor and assess the process and effects of an intervention; objectivity or independence are important for accountability functions.

Kingdon (1984) offers a model of the agenda-setting process building on the ‘garbage can’ model of the policy process, where choices seek problems and solutions seek issues, rather than vice versa. The framework is built around three streams of activity that attempt to move alternatives higher on the agenda: The ‘problem stream’ denotes which issues are recognised as significant social problems; the policy stream involves the ideas about how to solve identified problems; the political stream characterises the political environment with elections, changes in government, changes in public opinion, etc. Policy windows - moments that constitute significant opportunities for influence – occur where there is an opening for new views, often triggered by a major event such as a crisis or international agreement. At this stage there is an opportunity to couple the policy stream with the political or problem stream with the policy stream to produce action (Jones, p.17).

Delvaux and Mangez (2008) argue that knowledge plays a particularly important role in defining problems and fabricating policy ideas, during which ideas must pass a series of ‘tests’, which shape the types of knowledge that must be mobilised.

Where policy is made: Places and spaces

Ranging from more literal notion of the place to more conceptual ones, there are various ways to identify where policy is made. One perspective may be the level at which policy is made, such as local, national and international ones. The actors involved, relevant institutions and prevailing discourse will significantly differ according to each of these (Jones, p.17-18). In each case, we have found that different levels of government had affected the zero waste policy. For instance, it is useful to recall what happened when San Francisco tried to pass legislation to address the use of the plastic shopping bags

(PSBs). When the initial bag fee idea was proposed, there was a lack of political will to approve it, in response to opposing arguments that poor people would suffer as a result. Instead, a voluntary agreement was reached with grocers to reduce PSB consumption by 10% within a year – with the proviso that if this failed the City would revisit the fee option. During that year, grocers and the American Plastics Council went to the State Legislature and managed to get Proposition 2449 passed, which pre-empted local charges such as the proposed bag fee. Dmitriew recalls that City Hall took this as a “really bad-faith move” by industry – counter to the negotiations that had been done before. When the year ended, grocers did not bother to provide the City with data on bag consumption – as the new State law pre-empted asking the industry for this information, on the grounds that it was considered a trade secret (Krausz, p.193).

5.3 Guidelines n. 3: Pay attention at the key sources of knowledge for policy

Research

One of the key sources of knowledge for policy is research and a large part of literature focuses on how to promote the production of research in order to more strongly link it to policy.

This will involve the promotion of policy-oriented research, knowledge produced in order to directly assist decision makers in dealing with the policy problems they face. This is often produced in a consultancy-type mode, with organisations selling their analytical services to policy-makers. One key element of this is the commissioning of scoping reviews to identify the state of research in priority areas, as well as producing and updating systematic reviews of existing knowledge in priority areas (Lavis et al 2006). In general, the involvement of users in all stages of research is advocated in order to ensure its relevance (Jones, p.19).

The main risk in the generation of such knowledge is about the instrumentalism of knowledge. This problem can be addressed the promotion of critical and ‘reflexive’ research and advocacy, or with other tools such bodies are proposed to ‘police’ the boundary between science and policy (Waterston 2005) or to ‘peer review’ policy for intellectual content (Choi et al 2005), or to ensure ‘buffering’ and separation between knowledge producers and users (Jones et al 2009). In each case we had found a lack of link between good research and policy. Each Zero waste to landfill initiative was

launched without previously having promoted a critical and reflexive research and advocacy on zero waste to landfill initiatives.

Process

The knowledge generated in the process of policy implementing can be an invaluable resource (Powell, 2006) as well as research.

As argued by Mosse et al. (1998), this sort of knowledge can inform policy makers about the viability of a generally applicable development model, or give implementing agencies a means of monitoring progress or generating solutions to a specific problem.

There are two significant obstacles to usefully linking this kind of knowledge with policy. Firstly, there are a number of well-documented practical problems. As well as issues such as staff capacity for carrying out monitoring and evaluation, and the time commitments required to carry it out (when project workers may already be under great pressure), there may be issues such as the timing of the results. For example, 'impact' may take years to come about, and, hence, the knowledge could be available too late to inform the particular intervention that caused it to come about (Jones et al 2009).

Second, is that it is difficult to 'spread' the knowledge from its locality – project and process information is frequently based heavily on tacit knowledge, which must be formalised or made explicit in order to be shared, and then people who might need it must be aware of it and have access to it. Processes such as formalising knowledge possessed by workers on the ground are central elements of knowledge management strategies (Devlaux 2008). For example, it would be useful to acquire the knowledge produced in the process of implementation of previous initiatives so as not to repeat avoidable mistakes, but that does not seem to have been done, excepting Canberra that was unprecedented.

Voice, participation and citizen knowledge

In order to properly incorporate citizen or participatory evidence in policy process, Jones and Sumner (2009) affirm that they should enable people to express, enhance, share and analyse their knowledge of life and conditions, to plan and act within policy processes.

A relevant concern about this knowledge is a power imbalance.

Morgan (2008) also argues that citizens experiential knowledge of social issues hold a legitimate and worthwhile perspective, and cannot be lightly dismissed by social scientists. In each case we have attempted to capture this kind of knowledge.

Multiple sources and interdisciplinary

Traditional science and research is not well equipped to deal with such challenges due to being divided into ‘silos’ and disciplines, focusing on specific dimensions instead of holistic understandings of the problems faced (Clark 2007).

Lomas et al (2005) argue that decisions must be based not just on ‘scientific evidence’, knowledge gained through formal research, but also colloquial evidence, which refers to “anything that establishes a fact or gives reason to believe in something”. Important sources of knowledge for guiding policy include: values, political judgement, habits and tradition, and professional experience and expertise.

This is echoed by other authors who emphasise that facing significant uncertainty requires scientific experts to share the field of knowledge production with a variety of actors such as stakeholders, activist groups, think tanks, media professionals or even theologians and philosophers (Funtowicz and Ravetz 1992, Nowotny et al 2003).

Brown (2007) argues that there are five key contributors which bring the knowledge necessary for long-term, constructive decisions: key individuals, the affected community, the relevant specialists, the influential organisations, and a shared holistic focus. Solutions require establishing patterns of connection which replace existing hierarchies. In each, we have found a lack of a interdisciplinary approaches to addressing the waste issue.

5.4 Guidelines n. 4: The processes that mediate between the generation and use of knowledge play a crucial role in the link between knowledge and policy¹.

These processes are really important for a better uptake of knowledge in policy. When communicating and translating ideas and knowledge it is relevant to make messages sticky, short and easy to understand, adapting them to the audiences’ mind-set. In these circumstances. There is a risk of a wrong kind of influence.

For example, the link between generation and use of knowledge requires stimulating interaction and collaboration in order to take on board the contextual nature of knowledge and the complexities of its use.

In this process it is important to take into account social factors such as face-to-face communication and social networks that are good ways to spread messages through peer influence.

¹ For more on this see Nielson 2001, Jones et al 2008, Maxwell 2003.

Sustaining long-term links between knowledge and policy requires intermediary organisations. As well as communicating and translating knowledge, they must also 'mediate' between different actors and types of knowledge, which require trust and credibility.

Another factor to take in account is the importance of the right capacities and incentives for policy actors to use knowledge, as well as political determinants of demand.

6 Conclusions

In this study we achieved two results. The first is that each case consistently fails to achieve its goal; the second is that in each case we have found an overall lack of knowledge management in policy setting and implementation.

The causes of the failure could be, separately or jointly, the definition of an overambitious goal or a poor policy implementation. In any case, having provided evidence of the usefulness of knowledge uptake in the policy process, it is reasonable to argue that the answer to the first research question can be affirmative. About the second research question, we have provided a set of guidelines to improve the uptake of knowledge in the policy process for a more effective policy setting and implementation.

As argued by Funtowicz and Ravetz (1992), facing significant uncertainty requires scientific experts to share the field of knowledge production with a variety of actors such as stakeholders, activist groups, think tanks, media professionals or even theologians and philosophers.

That said, since it is certain that environmental problems involve uncertainty, a policy process that utilises knowledge from many sources, it is desirable to make use of KM techniques.

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Relationship between knowledge management and effectiveness of reverse logistics

Radoslav Škapa

Department of Corporate Economics
Masaryk University
Lipová 41 a, 602 00 Brno, Czech Republic

Structured Abstract

Purpose – The paper explores the relationship between three constructs: customer orientation of reverse logistics, knowledge management and effectiveness of reverse logistics. Reverse logistics is generally seen as an instrument for sustainable development due to its ambition to minimize the extent of waste “generated” in supply chains. The role of knowledge management is investigated in this field.

Design/methodology/approach – The explorative research is based on primary data that were collected through personal interviews with representatives of 162 companies operating on the Czech market. The majority of presented findings are based on subjective statements of informants due to the fact that many questions asked for the data that companies don't measure, collect and reprocess. Majority of the questions were constructed as scales; the data were reprocessed by means of uni-, bi-, and multivariate statistical analysis.

Originality/value –The originality of the paper stems from the fact that it tests the relationship among maturity of knowledge management, customer orientation and effectiveness of reverse logistic by means of a structural model. The more elaborated knowledge management is found to be related to the effectiveness of reverse logistics and its customer orientation. The paper also shows that knowledge management is linked with other motives related to reverse logistics.

Practical implications – The empirical study suggests that effort in application of knowledge management might bring also benefits for companies in the field of reverse logistics. Traditionally, it is accepted that knowledge is important in the inspection and sorting activities of reverse logistics, when the material flow (including waste) is analysed and then dispatched for economically efficient reprocessing. The data shows that the importance of knowledge management in the field of reverse logistics might be crucial for tactical and strategic decisions too.

Keywords – reverse logistics, waste management, knowledge management, empirical research

Paper type – Academic Research Paper

1 Introduction

The term of reverse flow in context of logistics refers to material that is transferred from “a place of consumption” to “a place of origin”. This material flow, typically made by returned, used or unsold products and packaging that producers, retailers, and end-users return to their supplier, is referred to as reverse flow (de Brito, 2003). The managerial activities associated with these materials and their reprocessing started to be called reverse logistics (RL) in the mid–1990s (Rubio et al, 2008). The scope of reverse logistics has been broadened since that time. Whereas in the beginning the RL was about re-sale and redistribution of unsold products and product warranties, now it is a broader concept for an overall supply chain optimization, whose aim is to support a closed-loop character of supply chains by affecting activities such as product design, supply chain design, and product and material recovery (Škapa & Klapalová, 2011); as it is apparent from nowadays definitions. For instance, Brito and R. Dekker (2003) claim that “Reverse Logistics concerns activities associated with the handling and management of equipment, products, components, materials or even entire technical systems to be recovered... Recovery can simply be just reselling of a product or it can be accompanied by a series of processes as collection, inspection, separation, and so on, leading to e.g. remanufacturing or recycling”.

RL is currently considered to be one of the key supply chain management competencies (de Brito, 2003), critical factor of competitiveness (Rogers & Tibben-Lembke, 1998), and source of value (Mollenkopf & Closs, 2005). It implies that there is the variety of motives, which leads to companies’ involvement in reverse logistics some of them are voluntary, necessary and compulsory or mandatory. “This division is very important for the right approach of management and employees to RF and usually is reflected in policies, strategies, plans and resource commitment. Companies usually have to cope with all three groups depending on type of industry, character of business and its environment, and consciousness of management” (Klapalová & Škapa, 2012).

The problem with RL is that for the majority of organizations it is not a primary business activity and due to specificities of reverse flow, managerial commitment is often low: An U.S. survey revealed that 39% of companies perceived RL as relatively insignificant and 26% of managers reported the lack of interest in RL (Rogers and Tibben-Lembke, 1999). Later on other studies came to similar conclusions (e.g. Chan and Chan, 2008 or Ravi and Shankar, 2005) with one exception analysing Turkish

environment (Erol et al, 2010) that ranked the commitment as a less typical obstacle for reverse logistics.

As commitment is “one of the most important components for promoting the formation of new knowledge within an organization” (Nonaka, 1994, 17), the consequences for knowledge-intensive reverse logistic are more awkward. Therefore it is a task of senior managers to assign the resources and re-align the rewards, incentives and measures to develop cross-functional capabilities (Klapalová & Škapa, 2012).

Despite the fact that reverse logistics is knowledge-intensive activity, the application of knowledge management in reverse logistics is surprisingly rare (Sarkis, Zhu and Lai, 2011).

2 Research questions

The paper explores the relationships among customer orientation of reverse logistics, its effectiveness (focus of companies on RL-effectiveness), and the knowledge management. More specifically, both the extent of applied principles of knowledge management (i.e. the maturity of knowledge management in companies) and customer orientation is expected to increase effectiveness positively.

The study of Škapa & Klapalová (2012) suggested that the view of managers on reverse logistics is “narrow-focused”: The analysis of performance measurement systems revealed that companies monitored the measures that were related to efficiency of reverse logistics; whereas the effectiveness was monitored in substantially lesser extent. This might be a burden for companies’ effort in gaining more value from reverse flows (and in pursuing sustainable development) (Ravi and Shankar, 2005). As the effectiveness relates to customers and their needs, it is necessary to focus on customers’ orientation in the field of reverse logistics. For that reason the hypothesis is H1a formally introduced as follows.

Hypothesis no. 1a: The customer orientation of reverse logistics is positively linked to RL-effectiveness.

Because the prevalent part of reverse flow comes from the external environment of companies and because of stochastic character of this flow the companies’ reactions need to be very flexible. Therefore managerial competencies must be dynamic enough to react properly to the rapidly evolving environment. This flexibility and dynamism is directly linked to learning and to innovative behaviour. For this reason RL is a knowledge

intensive activity (Klapalová, Škapa, 2012). Thus we can assume the positive impact of knowledge management tools and their applications on performance of reverse logistics. This leads to the hypothesis H1b and H1c:

Hypothesis no. 1b: The maturity of knowledge management applied in the companies is positively linked to RL-effectiveness.

Hypothesis no. 1c: The maturity of knowledge management applied in the companies is positively linked to the customer orientation of reverse logistics.

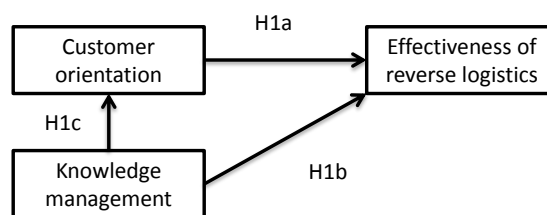


Figure 1 Suggested model

In the next step, further analysis is conducted with the aim to verify a broader context of this issue: The question is if there is a relationship between the character of motivation for reverse logistics and maturity/advancement of knowledge management system in companies. Thus, the hypothesis is defined as follows:

Hypothesis no. 2: There is a relationship between of types of motivations for reverse logistics and the advancement of knowledge management system.

The above hypotheses were verified by means of statistical testing using a primary data. Whereas the hypothesis 1a and 1b are tested together as one structural model, for testing of the H2 cluster analysis and χ^2 test were employed.

3 Research design

3.1 Data collection

For collecting of data, a questionnaire was designed. Its questions were adopted from works of Rogers and Tibben-Lembke (1998), Klapalová (2007), Wang and Ahmed (undated) and Škapa and Klapalová (2011) and it contained 28 main questions, which were in most cases refined in more detailed sub-questions. Only the questions analyzed in this paper are described here. The majority of presented findings are based on subjective

statements of informants due to the fact that many of our questions asked for the data that companies don't measure, collect and reprocess.

The identification of respondents covers a company name that the respondents represented; his/her job position, number of employees of the respective company and its location and classification of its main business activity. The effectiveness of reverse logistics was measured by two scale questions (the one covering the necessity, the other the usefulness); and an additional question was employed to inquire the impact of reverse logistics on the company profitability. The motivation was covered by 10 items (scale questions), two of which had a form of semi-opened question. Because of quantitative nature of this paper these two questions were left out of further analysis. The motive-items were applied from works of Rogers & Tibben-Lembke, (1998), De Brito; (2003), Škapa and Klapalová (2011).

A battery of 18 scale questions related to multiple issues of knowledge management; three of them measured a perceived maturity of knowledge management system within a particular company.

The analytical part relies on the application of statistical tools such as frequency count, crosstabs, χ^2 , ANOVA, structural equations modeling and cluster analysis. All the calculations were conducted in SPSS v.22 and SPSS AMOS v.21.

The scales ranged from 1 to 7 and were defined positively; higher scores denote strong agreement, high impact or high usefulness or high necessity. The univariate outliers' identification was skipped in case of these scale variables. The data did not fulfill the requirements of normality, which was tested visually and by means of Shapiro-Wilk test W. The problem of items – the negative skewness of data – was corrected by power and square root transformation as suggested by Tabachnick and Fidell (2006). As this transformation led to almost identical the results as calculation on the original data, the transformation was skipped and all the presented numbers come from non-transformed data.

3.2 Research sample

The collection of data was realized by means of personal interviews with representatives of companies operating on Czech market in the beginning of 2014. Due to research funding restrictions the convenience sampling was chosen: the respondents were

selected on principle of direct and indirect contacts of the researchers. This should not cause serious problems as the nature of the research study is explorative one.

The sample amounted for 162 cases, of which 67% belongs to services (according to respective core business activity) and the remaining 32% represents the manufacturing companies. Whereas the service group is quite homogenous (majority of cases operated in hospitality industry), the manufacturing group is mixed of businesses operating in mechanical engineering, chemical, food and construction industry. The detailed view on sample structure (Tab. 1) reveals that the majority of companies consist of small enterprises; it is due to the fact the prevailing services are small companies typically. For the subgroup of manufacturing companies, a typical representative is a medium sized firm.

Tab. 1 Structure of companies in the sample ($N=162$)

Industry	Small	Medium-sized	Large	Total
Manufacturing	32.1%	52.8%	15.1%	100
Services	85.0%	13.1%	1.9%	100
Total	67.5%	26.3%	6.3%	100

4 Results

4.1 The description of variables employed in the models

The analytical part relies on three latent variables – effectiveness of reverse flows, maturity of knowledge management, and motives, which was designed as multidimensional variable. All the three latent variables are constructed as reflective.

The effectiveness was designed as three item variable, as a combination of necessity, usefulness and the extent of profitability of reverse logistics activities (measured in per cent as impact of reverse logistics on overall profitability). However, the last item didn't correlate with the remaining two. The reason was revealed by a result that relates to question of performance measurement (also contained in our questionnaire): the data shows that 69% of companies don't measure the reverse logistics cost, which means that they are unable to indicate a reliable impact on profitability. Based on this reasoning the variable was left out from further analysis and the effectiveness was calculated from the two scales only.

The scores for both items suggest that companies perceive their reverse logistics in rather positive light, as slightly effective (both the median and mean are through the midpoint of the scale – 3.5; see Tab. 2). The left item, the impact in per cent, confirms this – the average value for the whole sample is 3.48% ($SD=15.79$).

The maturity of knowledge management is calculated from three items. The level of knowledge management is probably not optimal, which is suggested by median and mode – one item is even below the midpoint of scale. The customer orientation consists of three items; the remaining items about motivation for reverse logistics are used in connection to Hypothesis no. 2. As it is apparent from basic description of all motivation items (Tab. 2), in the whole sample, the customer related motives (i.e. customer orientation) are ranked higher than remaining motives ($Mdn = 6$ vs. 5 and 4).

4.2 Test of the structural model

In the first phase, the convergence validity is tested by four different measures: The standardized regression weights presented in Tab. 3 are higher than the recommended cut points of 0.7 (or 0.5 at least) (Hair et al, 2010). Cronbach alpha, Construct reliability, and AVE for all variables indicate acceptable convergence validity (Tab. 3), because the values are higher than the recommended cut points of 0.7, 0.7, and 0.5 respectively. Thus, we can accept the latent variables to be valid in terms of convergence.

The measurement model is tested by means of confirmation factor analysis for the three latent variables as depicted on Fig. 2. The fit of the measurement model is estimated by three indicators. The essential indicator of the statistical validity of the model is Chi-square, which should be non-significant for the sample of 162 cases and for 8 observed variables (Hair et al, 2010, p. 672). In this respect the model is less than perfect as $\chi^2(17, 162) = 33.895$, $p = .009$; such numbers might suggest that there is a difference between theoretical and observed covariance matrix. However the Chi-square test itself is not very reliable and therefore additional tests are used CFI and RMSEA. The calculated values of both speak slightly in favour of the model; they provide an argument that the suggested model might be accepted and might fit the empirical data. CFI = .969 (the recommended value is .97 and higher) and RMSEA = .079 (the recommended value is less .08). Of course, the fit is not perfect as both values are at their thresholds.

Tab. 2 Description of scales

Latent variables	Items (scales)	Median	Mean	Std. Deviation	N
Effectiveness of RL	Necessity of RL	5	5.02	1.61	161
	Usefulness of RL	4	4.37	1.59	161
Maturity of knowledge management	KM included in corporate strategy	5	4.76	1.66	157
	KM is planned and integrated with all processes	5	4.35	1.78	160
	Company has a system and rooms for knowledge sharing and mutual learning	3	3.23	1.72	156
Customer orientation	Customers' satisfaction	6	5.90	1.43	162
	Customers' loyalty	6	5.72	1.57	162
	Image	6	5.34	1.46	162
Remaining motives	Cost reduction	5	4.75	1.82	162
	Productivity increase	5	4.55	1.76	161
	Competitors' pressure	4	4.25	1.88	162
	Differentiation from competitors	5	4.75	1.81	162
	Compliance with legislation	4	3.88	1.95	160
	Corporate social responsibility	4	3.58	1.81	156

Note. For all items Range = 6

Tab. 3 Standardized regression weights for the items used in the model

	Estimate		Estimate
Effect1 <--- Effectiveness	.936	Km1 <--- Knowledge_m	.894
Effect2 <--- Effectiveness	.622	Km2 <--- Knowledge_m	.902
Co1 <--- Cust_orient	.901	Km3 <--- Knowledge_m	.598
Co2 <--- Cust_orient	.853		
Co3 <--- Cust_orient	.600		

	Effectiveness	Cust. orient	KM
Cronbach alpha	.736	.821	.751
Construct reliability (CR) Joreskog rho	.767	.835	.796
Average Variance extracted	.631	.634	.590

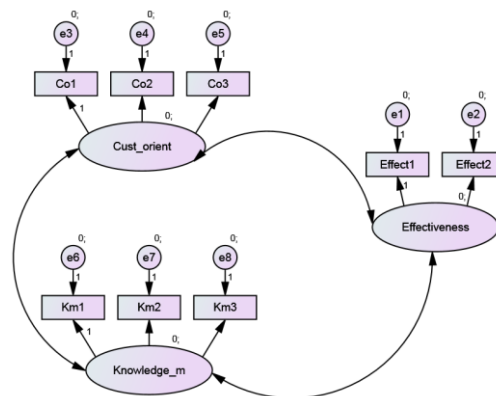


Figure 2 Measurement model

In the second steps, the structural model is computed (applying maximum likelihood approach) and the same procedures are used for its validity testing: χ^2 , CFI, RMSEA.

The value of Chi-square test $\chi^2(17, 162) = 35.083, p = .006$ suggests that the model is less than perfect and the supplementary indicators Comparative index fit (CIF= .964) and RMSEA = .081 are in harmony with the statement about the measurement model. I.e., these tests don't provide an unwavering support the proposed model in terms of its fit with the observed data. On the other hand, because of the CFI and RMSEA reach the threshold values, the model as a whole can be accepted and it is sensible to analyse the model's elements.

The structural relationships in the model are statistically significant at $p < .000$ except for the relation between Effectiveness and Customer orientation (hypothesis H1a), which is significant at $p < .05$ (Tab. 4). In other words, the H1a, H1b, and H1c hypotheses cannot be rejected; therefore they can be accepted provisionally. The standardized regression coefficients supply another piece of information (see Fig. 3): The highest coefficient was found between Effectiveness and Knowledge management (Beta = 0.40) – H1b. There is also modest relationship between Knowledge management and Customer orientation (Beta = 0.30). The Customer orientation and Effectiveness are linked with a weaker relationship (Beta = 0.20). The model explains 25.6 per cent of the variance in

Effectiveness and 8.7 per cent in Customer orientation; therefore the explanatory power of model can be interpreted as satisfactory.

Tab. 4 Regression Weights

			Estimate	S.E.	C.R.	P	Hypothesis
Effectiveness	<---	Cust_orient	,238	,100	2,384	,017	H1a - supported
Effectiveness	<---	Knowledge_m	,420	,090	4,664	***	H1b - supported
Cust_orient	<---	Knowledge_m	,262	,078	3,364	***	H1c - supported
Effect1	<---	Effectiveness	1,000				
Effect2	<---	Effectiveness	,659	,142	4,636	***	
Co1	<---	Cust_orient	1,000				
Co2	<---	Cust_orient	1,039	,099	10,465	***	
Co3	<---	Cust_orient	,681	,087	7,788	***	
Km1	<---	Knowledge_m	1,000				
Km2	<---	Knowledge_m	1,129	,112	10,087	***	
Km3	<---	Knowledge_m	,464	,094	4,923	***	

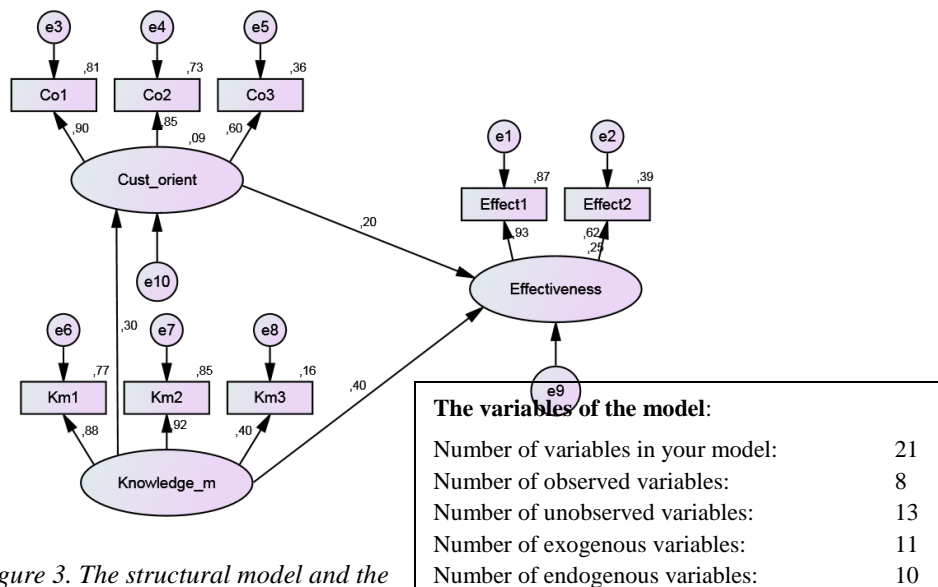


Figure 3. The structural model and the standardized regression weights

4.3 Results relating to the hypothesis 2

To test the H2 the exploratory analysis using a clustering method is applied in the first step. Its ambition is to identify a small number of companies' segments that would be internally homogenous in terms of the reverse logistics motives. In the next step, the link to the maturity of knowledge management is investigated.

The variables (items) representing the motives for reverse logistics (all listed in Tab. 5) entered the procedure of Hierarchical cluster analysis, so that the coefficients of agglomeration could be calculated. The Ward's methods based Squared Euclidian

distance was chosen for the clustering. This decision was done arbitrary and has reflected advantages and effectiveness of Ward's method as it was proved by Kamakura and Ozer (2000), or Vriens et al (1996). The coefficients of agglomeration together with the dendrogram suggest that an optimal number of clusters for our purpose is three. After that, classification of the companies into three clusters is done in k-means cluster procedure in SPSS. The final groups have varying frequencies: Cluster 1 consists of 15.4% cases; Cluster 2 of 37.2% and Cluster 3 of 47.4%. Only 156 cases are clustered, because 6 companies didn't answer the any of the questions about their motivation.

Tab. 5 Analysis of clusters in relation to motives

	Cl. 1	Cl. 2	Cl. 3	Mean for all	S.D. for all	F	<i>p</i>
Competitors' pressure	2,46	4,14	4,80	4,25	1,88	16,648	.000
Cost reduction	4,54	3,48	5,77	4,75	1,82	37,893	.000
Productivity increase	2,88	4,05	5,43	4,55	1,76	30,298	.000
Customers' satisfaction	3,67	6,03	6,45	5,90	1,43	59,443	.000
Customers' loyalty	3,38	5,86	6,27	5,72	1,57	50,934	.000
Image	3,29	5,24	5,99	5,34	1,46	49,801	.000
Differentiation from competitors	2,29	4,67	5,64	4,75	1,81	51,699	.000
Compliance with legislation	2,92	2,59	5,22	3,88	1,95	57,869	.000
Corporate social responsibility	2,75	2,40	4,78	3,58	1,81	51,770	.000
Motives together	28.17	38.47	50.34	42.51	9.67	195.756	.000

The affiliation to clusters is related to each of the motives: As it is apparent from Tab. 5 the means differs substantially among clusters. This fact is further confirmed by results of ANOVA, as all the tests are statistically significant at $p < .000$. The last line in Tab. 5 shows the index of all motives (calculated as the sum of all nine motives above) and the fact that it differs significantly among clusters. Because the nine motives should represent the most common motives of companies as documented in the literature, the index can be interpreted as an indirect measure of the extent of motivation (or interest) for reverse logistics.

The Knowledge management in Tab. 6 provides information of the maturity of knowledge management in relation to cluster membership. The three items used for estimation of latent variable (Maturity of Knowledge management) were transformed into

the single one, as an arithmetic average. The means of this new variable suggests that there is a statistically significant relationship between cluster-membership and the maturity of knowledge management – $F(2, 149) = 15.588, p < .000$. The post hoc Bonferroni test reveals that the differences are significant between Cluster 1 and Cluster 3 (Mean difference = -1.39, $p < .000$) and Cluster 2 and 3 (Mean difference = -1.04, $p < .000$).

The cluster membership is also linked to effectiveness of reverse logistics as measured by necessity and usefulness items (Tab. 6).

Tab. 6 Analysis of clusters in relation to knowledge management and effectiveness

	Cl. 1	Cl. 2	Cl. 3	Mean for all	S.D. for all	F	p
Knowledge management	3.62	3.98	5.01	4.41	1.40	15.588	.000
Necessity of RL	4.25	4.75	5.37	4.97	1.61	5.591	.005
Usefulness of RL	3.75	4.07	4.70	4.31	1.59	4.531	.012

5 Conclusions

The model about relationship among customer orientation, knowledge management and effectiveness was tested on the empirical data. Despite the fact that the model fit is less than perfect it can be acceptable and it confirmed the expected relationships. The explained variance of 25.6% in terms of effectiveness means that both variables can be interpreted as being the important factors. On the other hand, the link between the knowledge management and customer orientation is weaker. The statistic model calculated the impact in the extent of 8%, which means there are other, more important factors than knowledge management. Anyway, the results suggest that knowledge management affects the effectiveness by an indirect mechanism. It increases the customer orientation/focus of reverse logistics; which in turns positively influence the effectiveness. This can be substantiated by the fact that the effectiveness is not about doing the thing rights, but also doing right things. In context of business decisions, the right things mean the things with respect to customers – that it the customer orientation.

To improve the understanding of this phenomenon, the analysis was supplemented by cluster analysis. Based on the differences in motives for reverse logistics, the companies were divided into three groups. The first one, labelled as Cluster 1 consists of companies

that are less motivated for reverse logistics generally, which is depicted on Fig. 4 by bold line in the radar chart. Out of nine motives, there is one only that plays an important role – Cost reduction (M = 4.54); the others are close or below of scale cutpoints. The companies of Cluster 1 probably don't see the reverse logistics as the means for fulfilling any of their strategic goals. If they invest their energy into reverse logistics, it is with an ambition of reducing their cost only. The scores of perceived effectiveness of reverse logistics, which was measured by scales of necessity and usefulness, speak in favour of such interpretation. What is also evident is that the level of knowledge management system in the companies is less developed.

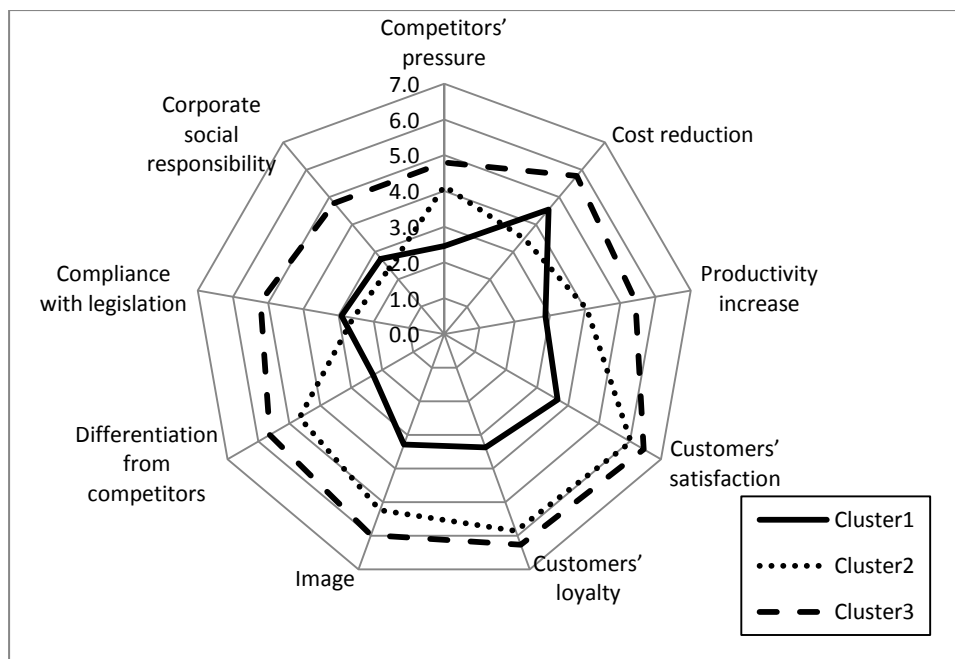


Figure 4 Clusters based on reverse logistics motivation

The Cluster 2 perceives reverse logistics in connection to marketing activities that relates to customers; the motives of internal efficiency are of less importance compared to motives such as customers' satisfaction, customers' loyalty, Image, and differentiation from competitors. We can label this approach as effectiveness oriented. The knowledge management system is more developed here.

The Cluster 3 doesn't focus (on or neglect any of) the motives. So, the approach is rather balanced. The score for knowledge management is the highest in this group. An

important fact is these companies rate the necessity and usefulness of reverse logistics with the highest scores.

These relationships lead to a conclusion that knowledge management is probably an important facilitator of reverse logistics programs. Several studies suggest that in many companies, reverse logistics still remains a unused potential that might bring additional competitive advantage, if managed properly; it means when there is a managerial commitment for this activity and when appropriate resources are assigned.

Thus, based on our study we suggest a proposition that in relation to reverse logistics, knowledge management is beneficial for two reasons: The principles of knowledge management can increase the awareness for reverse logistics among managers as a result of spreading the knowledge about reverse logistics and through better understanding of consequences of reverse flows for different departments (cross-functional understanding of this issue). This better understanding can lead to higher managerial commitment and to an increase of resource for reverse logistic. Both thinks enables to utilize the potential of reverse logistics better.

The second benefit of knowledge management stems from the nature of reverse flows; they are very unpredictable and require higher amount of information support as well as of knowledge for their effective reprocessing. In other words, this second benefit relates more to operative level of management.

Of course, the study has some limitations that diminish the general validity of results. The main limitations are connected to the research strategy – the explorative one: the sample is rather small and no random sampling was applied. Next burden is caused by single informant approach; the complex systems like a company should be describe by more than one person. The last thing is that presented data were collected as a part of a broader research, focusing on more topics. Therefore, the variables and constructs utilized in presented study were measured less precisely than they could have been theoretically; e.g. measurement of knowledge management maturity could have applied any of the theoretical maturity models. Despite of these flaws we believe that the analysis provides such coherent and convincing results that it is sensible to accept the findings.

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Knowledge management and waste management: current state and implications for future research

Michal Krčál *, Martina Rešlová

Department of Corporate Economics
Masaryk University
Lipová 41a, 60200 Brno, Czech Republic

** Corresponding author*

Structured Abstract

Purpose – The purpose of this article is to create a comprehensive review of existing research in the area of knowledge management of waste management. This study is part of a larger research project, which is aimed on knowledge management of reverse logistics. Waste management can be considered as a related field to reverse logistics, therefore the ways how the knowledge is managed in waste management can be important for reverse logistics as well. As the research regarding knowledge management of reverse logistics is undeveloped, it can be more developed in the field of waste management.

Design/methodology/approach – This study is based on qualitative content analysis which is appropriate for concept generation. The concepts were generated from knowledge management studies in the field of waste management. The sample of studies was created as follows. First, citation index databases (Web of Science, SCOPUS) were searched on keywords (knowledge management and waste management). Second, results of this query were refined according to content of abstracts. After that, refined set of articles was analysed by full text qualitative content analysis method. The analysis revealed categories which were compared with research topics of knowledge management and waste management.

Originality/value – This study is the first literature review of knowledge management of waste management. It enables further research of the topic by introducing a basic framework of concepts (codes) of knowledge management of waste management. The framework can serve as a starting point for future knowledge management research in waste management field. Practitioners can use the results of this study as a general body of knowledge of concepts of knowledge management of waste management.

Practical implications – The outcomes of this study have several implications. First, knowledge management research of waste management is significantly undeveloped. This should imply increase in studying of several topics, such as organizational learning, knowledge sharing and creation, knowledge management of re-use of waste and minimisation of was. Second, this study revealed misinterpretation of some crucial terms regarding knowledge management. Some analysed studies used terms data, information and knowledge interchangeably or did not defined the terms. This fact can lead to misinterpretation of the whole study and creates confusion in the research field.

Keywords – Knowledge management, Qualitative content analysis, Waste management, Review, Categories.

Paper type – Academic Research Paper

1 Introduction

In the knowledge society, importance of knowledge management (KM) is growing, and therefore, the attention of academia and practice should grow as well. Unfortunately, it seems that this is not the reality in the field of reverse logistics (RL) and waste management (WM). Our initial intention was to review studies focused on KM in RL with special attention on knowledge management systems (KMS). Primary keywords search queries ("knowledge management" AND "reverse logistics") revealed very scarce attention of this topic (only 10 search results in SCOPUS and 6 search results in Web of Science). Further refinement of search results regarding KMS was meaningless. Therefore, we tried to extend our search by using identified keywords by Škapa and Klapalová (2011) that are connected with RL in order to make reviews concerning KM in sub-disciplines of RL and related disciplines to RL in order to synthesize findings from this "partial" reviews.

Although *"reverse logistics is different from waste management as the latter mainly refers to collecting and processing waste (products for which there is no new use) efficiently and effectively. Reverse Logistics concentrates on those streams where there is some value to be recovered and the outcome enters a (new) supply chain"* (Brito and Dekker, 2004). Oxford Dictionary defines waste similarly as: *"Unwanted or unusable material, substances, or by-products"*. Therefore, strictly speaking De Brito and Dekker are right and by definition, WM is different from RL. However, the difference between RL and WM in practice is not so clear. Some categories of WM (e.g. solid or electronic waste) can be closely connected with recycling and reuse. Therefore, WM and RL can be considered more as relatives than as strangers. Because the main aim of WM, besides waste evasion, is turning wastes to non-wastes (Pongrácz, 2002), thus finding value in waste in order to utilize it further (see section 2.3).

Because of the absence of a specific review on the topic of KM in WM research field, the main goal of this study is to: explore published research that deals with KM in the

field of WM. This area has not been broadly researched so far, therefore, we decided to apply qualitative design of content analysis.

The paper has standard structure as follows. In section 2, basic concepts of KM regarding this research are discussed. Next, review on important issue of difference between information management and KM was conducted. For the purpose of specifying context to WM, literature review of this research field was done. In section 3, methodology is described. Section 4 presents overview of results that are presented in various tables. In section 5, results and findings of the study are discussed, commented, interpreted and compared with other research. In section 6, conclusions are drawn.

2 Literature Review

2.1 Knowledge Management

Process of defining KM is not straightforward, because no universal definition exists. We present several definitions of KM provided by (Dogan et al., 2011):

- KM is the effective learning processes associated with exploration, exploitation and sharing of human knowledge (tacit and explicit) that use appropriate technology and cultural environment to enhance an organization's intellectual capital and performance (Jashapara, 2004, p. 12).
- KM is the coordination and exploitation of organization's knowledge resources, in order to create benefit and competitive advantage (Drucker, 1999, p. 157 in Dogan et al., 2011).
- KM consists of processes to capture, distribute, and effectively use knowledge (Davenport and Prusak, 2000 in Dogan et al., 2011).

Several activities or processes regarding KM can be retrieved from definitions (list is enriched by processes from (Beljić et al., 2013)):

- exploration (capture, acquiring),
- creating,
- sharing (distributing),
- using (exploiting).

Besides defining KM, distinguishing between terms data, information and knowledge is crucial for understanding KM research. Literature on KM emphasizes that the relation among information, data and knowledge is often misunderstood. Davenport and Prusak

(2000 in Dogan et al. 2011) emphasise that these terms have different meaning and are not interchangeable. Dogan et al. (2011) bring summary of these three terms: data are defined as “*facts or things used as a basis of inference*”; information means “*systematically organised data*”; knowledge is considered as “*actionable information*” (Jashapara, 2004, p 14 -17).

Knowledge has several types. According to Alavi and Leidner (2001) it is essential to understand the concept of knowledge and knowledge taxonomies because distinction among the different types of knowledge might influence theoretical developments. Nonaka and Konno (1998) start with the primary distinction between two basic kinds of knowledge: tacit and explicit knowledge. Tacit knowledge is difficult to communicate, it is not easy to formalize it and share with others. It can include intuitions or subjective insights. Tacit knowledge has also two dimensions – technical and cognitive dimension. Technical dimension represents informal personal skills or it is usually referred as “know-how”. The cognitive dimension of tacit knowledge comprises values, ideals or beliefs that are deeply seated in humans. Explicit knowledge can be expressed in numbers, words and it is possible to share with in the form of manuals or data. Spender (1996) considers distinction between these types of knowledge vital because with different characteristics of knowledge is possible for researches to posit numerous different adaptation mechanisms.

Two different categorization of knowledge can be found. First, declarative (descriptive knowledge, know what) and procedural (knowing how to) knowledge can be distinguished. Second, tacit (cannot be articulated), implicit (can be articulated but has not been yet articulated) and explicit (has been articulated) knowledge can be distinguished. The relation between these two categories is such that tacit knowledge tends to be procedural and explicit (implicit) knowledge tends to be declarative. But all combinations of knowledge types exist. Considering knowledge creation and conversion, SECI model by Nonaka et al. (1996) can be used. It contains four dimensions (processes):

- socialization (tacit to tacit);
- externalization (tacit to explicit);
- combination (explicit to explicit);
- internalization (explicit to tacit).

2.2 Difference between information management and knowledge management

There is ongoing debate in KM research (Bouthillier and Shearer, 2002; Dogan et al., 2011; e.g. Al-Hawamdeh, 2002; Lopes and Morais, 2010) dealing with a problem what exactly KM is and how it differs from information management. This fact has important consequences not only for this study, but for entire research on KM, because when someone treats explicit knowledge as information (e.g. electronic manual from enterprise content management view), it is automatically matter of information management. But explicit knowledge can be also viewed as part of KM, and knowledge management systems can be viewed as a way how to capture tacit knowledge. Consequently, information management must be defined differently than KM. Dogan et al. (2011) simplified several definitions of KM (see fig. I) and information management (see fig. II) to logical models. As conclusion, knowledge (management) is more associated with humans (and their minds) whereas information has technological implications (Dogan et al., 2011). In other words, while the focus in information management is mostly on information and explicit knowledge, KM brings a new dimension, the need to manage tacit knowledge by focusing on people and enhance their capability by improving communication, information transfer and collaboration (Al-Hawamdeh, 2002).

Figure I: Scheme of knowledge management



Source: (Dogan et al., 2011)

Figure II: Scheme of information management



Source: (Dogan et al., 2011)

Information management can be therefore seen as part of KM. But when focus of the research is on information management without KM in mind, only technical perspective (usually of information and explicit knowledge) is researched, and thus it lacks entirely KM perspective. From this reason, only articles focused on KM were analysed, and articles that focused on information management were excluded (see section 3).

2.3 Waste Management

The Council Directive on waste (European Council, 1991) defined WM as: “*Waste management shall mean collection, transport, recovery and disposal of waste, including the supervision of such operations and after-care of disposal sites*”. Pongrácz and Pohjola (2004) bring summary of some waste definitions:

- *Waste shall mean any substance or object in the categories set out in Annex I which the holder discards or is required to discard* (European Council, 1991).
- *Wastes are materials other than radioactive materials intended for disposal, for reasons specified in this Table* (OECD, 1994).
- *Wastes are substances or objects, which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law* (European Council, 1993).

Pongrácz and Pohjola (2004) argue that WM cannot be viewed only as an approach how to dispose waste, but WM should be control of waste-related activities with the aim of protecting the environment and human health, and resources conservation. Waste-related activities include waste-creating processes, waste handling as well as waste utilization. The main aim of WM besides waste evasion is turning wastes to non-wastes (Pongrácz, 2002). This view comes from WM hierarchy, which includes waste minimization, re-use, recycling, incineration and disposal (Kirkpatrick, 1993). From this point of view, WM is much wider concept than standard "institutional" defined WM, and therefore WM is close to RL (as stated in section 1). The definition from Kirkpatrick is used for comparison of codes in analysed literature.

3 Methodology

3.1 Content Analysis

Content analysis is a method which might be used with qualitative or quantitative data and in deductive or inductive way. Qualitative content analysis is one of several methods which might be used to analyse text data and its aim is to classify selected text into categories (Weber, 1990 in Hsieh and Shannon, 2005). Krippendorff (2013, p. 24) defined it as „*a research technique for making replicable and valid inferences from texts to the context of their use*“. Elo and Kyngäs (2008) state that qualitative content analysis

provide broad description of the researched phenomenon and the outcome of the analysis itself might be a conceptual model or map.

Many authors (e.g. Cavana et al., 2001; Hsieh and Shannon, 2005; Elo and Kyngäs, 2008; Easterby-Smith et al., 2012; Krippendorff, 2013) specified certain steps for conducting a content analysis, the most common ones are:

1. formulating the research questions,
2. locating relevant texts,
3. selecting the sample,
4. outlining the coding process,
5. implementing the coding process,
6. developing coding categories,
7. mapping the relationships across,
8. analysing the results of the coding process.

Content analysis can be conducted by using software program (for instance NVivo) or manual coding can be used. While using manual coding, it is crucial to highlight each topic as it occurs and classify it as theme code; by using computer program (in comparison to manual coding) is possible to save some time because it is not needed to physically undertake these activities (Cavana et al., 2001). We have chosen to employ qualitative content analysis for two reasons. First, we wanted to explore the content of the text and evaluate its quality. Second, due to underdeveloped research on this topic, only few papers were published, and thus utilizing manual content analysis seems more suitable than using software tool.

For the purpose of this study, qualitative data and qualitative content analysis were used. Qualitative content analysis is a method which provides interpretation of the content of text data through the coding process whereby, in our case, is achievable to identify topics and themes emerging in the area of KM of WM. We followed the analytical process including eight steps which were mentioned above and this process enabled description and interpretation of the content and also included evaluation of quality of the content. The outcome of the whole analysis is conceptual model which contains researched categories and depicts research in the field (see tables 3, 4).

3.2 Goal

Our main goal is to explore published research that deals with KM specifically in the field of WM. By achieving this goal, we will be able to identify topics that are studied in KM of WM and also identify topics for future research. According to our goal we have specified three research questions:

- Which topics are studied within KM and WM field?
- How are the topics studied?
- Why are the topics studied?

These research questions correspond with four coding categories: WM, KM, methodology (how), purpose (why).

3.3 Sample

To find empirical studies on KM of WM, search in SCOPUS and Web of Science was carried out. We used a search query “knowledge management” AND “waste management”. We designed this query, because we assume that if the study focuses on our topic, the author(s) would include these words in keywords or at least mention it in title or abstract. These searches yielded 74 (SCOPUS), respectively 8 (Web of Science) search results. Results from SCOPUS and Web of Science were overlapping; therefore we had 71 articles for disposal. To assess these articles according to their relevance, following criteria were established:

- type of article,
- source of article,
- time of publishing,
- language,
- abstract content,
- occurrence of word knowledge in full text.

First, the article had to be original research, thus we exclude review and letter article. Through this restriction, we wanted to avoid any possible confusion of review findings. As there was no published review article on this topic, this criteria was not necessary in our case. Second, only scientific articles from conferences and journals were used, trade journals and book series were excluded. Third, we did not apply any time limits, thus all published articles in this area were considered as valid. The search was conducted at the beginning of January 2014; therefore, newly published articles since that time are not part

of the study. Fourth, only English language articles were used (no other language was in results). Fifth, the topic of the study had to be consistent with our goal; therefore the last two criteria were content of the abstract and occurrence of word knowledge in full text. Last criterion was in some cases difficult to assess, therefore in some cases, full text analysis had to be conducted. The final sample of articles that were analysed can be found with its basic characteristics in Table 2.

3.4 Procedure

Before coding procedure, having relevant articles (ensuring validity) according to our goal was necessary to ensure. We applied sequentially criteria mentioned in previous section according to their position in the list, having six stages of refinement. If an article did not meet a criterion during any stage, it was immediately rejected from inclusion, and was not assessed in next stage. During fifth and sixth stage of assessing (and later even during coding), we stumbled upon an issue mentioned in section 2. Some authors probably misinterpreted the meaning of terms data, information, explicit knowledge and tacit knowledge. From this reason, it was not easy to distinguish information management articles (to be excluded from analysis) from KM articles. When full text was available, keyword “knowledge” was searched in full text and context of usage and meaning of this term was examined. Illustration of some possible misinterpretation can be viewed in Table 5.

After sixth stage, 18 articles complied with all criteria. We did not have access to all full texts, thus coding procedure was divided into two separate parts: coding of full texts and coding of abstracts of articles without full texts.

For analysing full texts and abstracts, we applied qualitative design of content analysis. The reason is because we want to evaluate the quality of the text and interpret/describe the content. We did not use any software tool to automate the procedure, because small sample of articles allowed us to manage the procedure faster manually without the necessity to accommodate to software tool.

In order to code this extensive literature and to ensure inter-reliability of coding, both authors independently participated on process of coding and the whole procedure was completed by both authors without disagreement. However, most articles were not coded similarly, but the difference between codes was complementary and not contradictory (e.g. one author had more extensive codes). Occurring dissimilarities were caused mainly

by different background of both authors. The first author has pure management background, while the second author has business informatics background. After merging codes from both authors, refinement of codes was done by one author. In the case of uncertainty, how to merge codes, both authors discussed the issue in order to come to an agreement.

After code merging, one author, which is more skilled in qualitative research, started to build sub-categories from codes. Sub-categories were divided to four domains (topic, WM, KM, methods and purpose of the research). Sub-categories were consulted with and reviewed by the other author.

Next step was to compare KM sub-categories identified by content analysis with types of knowledge and with processes that are part of KM (as described in section 2).

Some abstracts of studies without full text (6 instances) lacked explanation of what kind of methods were applied or what was the purpose of the study. Thus, from these abstracts was not clear how the study was conducted or what was the initial purpose of the study. These parts of text were considered as inconclusive and they were not included in our coding scheme, even though the codes which fit the other category as WM and KM were included.

4 Results

4.1 Sample characteristics

From 18 articles, we were able to obtain 10 full texts for content analysis. The ratio of conference to journal papers is 11:7. The numbers of publication in particular years are displayed in Table 1.

Table I: Number of publication in years

1999	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	2	1	1	1	4	2	3	2	1

The most frequent conference, in which articles were published, is International Conference on Radioactive Waste Management and Environmental Remediation with 5 articles (almost half of all conference papers). Other conferences have only one published

article. Approximately half of conferences are from the WM field, the other half is aimed either on KM or information technologies.

The situation of articles published in journals is different from conferences. There is no journal which published more than one article. Most journals are from environmental issues field, except of one that aims on information and KM. Detailed information about articles can be found in Table 2 in appendix.

4.2 Results of Content Analysis

Our findings from the application of our categorization scheme to research into KM in the field of WM are summarized in Table 3 and 4 in appendix. These tables show topics which have emerged from our coding process. These topics were grouped categorically under established theories among those broader categories. The central categories are concurrent with research question which we have specified (see section 3) and they are:

- WM,
- KM,
- methods,
- purpose.

Within the WM category it is obvious that the radioactive waste management has deserved the most attention from scholars so far (7 instances). However, topics as waste water management and process of WM have received the second largest quantity of interest. Nevertheless, it is important to mention that we have recognized that different researches often conceptualize the same topic differently, which might cause misunderstanding in this area (see section 5). When considering what we have stated in the literature review about WM, there are many topics, e.g. waste utilization, waste-creating processes and incineration, which seem to have attracted less interest so far.

In category of KM, the most attention has been devoted to establish knowledge management system where the highest priority had been dedicated to creation and using of knowledge bases (7 instances). The other researched topics within this sub-category were KM practices and mechanism, knowledge sharing and assessing of KM. Only in one article the attention has been paid to organizational learning.

The vast majority of researchers have applied theoretical approach to research KM in the field of WM (6 instances). Nevertheless, some authors (5 instances) have employed

qualitative approach as case study or qualitative analysis of documents. Quantitative approach has not been broadly utilized (only 1 instance).

According to our coding scheme the main purpose of research in this area is to manage knowledge, which includes activities as structuring KM, supporting whole concept of KM and in one case is the purpose of having flexible and transparent. However, the most common reason is need to manage knowledge which usually has some specific focus. The second important purpose of conducting research in this area is to support decision process with accessible and convenient knowledge and technology tools (KMS).

4.3 Terms misinterpretation

As we suggested in section 2, terms information (management) and knowledge (management) can be misinterpreted. During analysis of full texts, we identified some misinterpreted or interchangeably used terms information and knowledge, and in some cases even data. This caused problems during analysis. Table 5 serves as a list of examples of some misinterpretations.

5 Discussion

Some results of our study suggest that research of KM in WM field is seriously undeveloped. First argument in favour of this fact is number of studies on the topic of this research. Only 18 studies in 15 years make roughly 1 study per year. This is in high contrast with approximately 41.000 studies on KM in SCOPUS and approximately 14.500 studies on KM in Web of Science. Supportive argument can be ration of conference to journal papers which is in favour of conference paper. On conferences, usually first stages of research are presented. Second argument for undeveloped research of KM in WM field is used methodology analysed in content analysis. Most research designs were theoretical or qualitative. This corresponds with the premise that the topic of KM of WM is under researched, because undeveloped research is usually typical by theoretical (conceptual) research designs or qualitative approach.

Different conceptualization of the same topic was identified, which might cause misunderstanding and misinterpretation (see section 3 and 4). Thus, we would encourage researchers to think more carefully about whether they use appropriate terms which adequately reflect underlying theory. This phenomenon occurred both in WM and KM

category. But more severe problems can be caused in the KM context than in WM context, because in WM context, it was more about using synonyms (e.g. radioactive waste and nuclear waste), however in KM context, terms with entire different meaning were used interchangeably (e.g. information and knowledge).

According to identified possible misinterpretations in table 5, some conclusions and questions can be drawn. Is constructing of knowledge-bases matter of KM or information management? Knowledge-base contains structured and unstructured information. This information is used by users of knowledge-base for constructing knowledge. Therefore, from our point of view, knowledge base automatically does not mean that KM is involved, because in terms of constructing and designing knowledge-bases, only information management perspective is concerned. KM is involved, when knowledge-base starts to be used for knowledge creation or conversion. Bigger problems can be caused by interchangeable using of information and knowledge. Although these two terms are connected with each other, their meaning differs deeply (see section 2.1 and 2.1). When terms and concepts are not grounded in theory (or even not defined at all as in some articles), their interpretation and further analysis is complicated or not possible. Therefore, our recommendation for future studies is to always employ in theory defined concepts.

Implications of our findings in coding category of WM come from comparison of sub-categories from content analysis and theory from literature review. First, KM research in the field of WM should focus more on parts of WM hierarchy introduced by Kirkpatrick (1993). The focus of research, in compliance with Pongrácz and Pohjola (2004), should be targeted more on KM of re-use, recycling and waste minimization and not only on disposal.

The fact that only in one article, the attention was paid to organizational learning, which is from our point of view one of the most important category of KM research, implies (as stated above) that development of KM research is not satisfactory. Our analysis revealed that great attention is paid to articles focused on KMS. As this complies with development of information technology and its spread in organisations, these articles were the most problematic articles regarding misinterpretation of terms data, information and knowledge. Their nature and background is usually technological, and they employ more from information management perspective than from KM perspective.

6 Conclusions

The goal of this paper was to explore published research that deals with KM specifically in the field of WM. We have used content analysis to fulfil this goal. The most important finding of this study is the fact that research of KM in the field of WM is seriously undeveloped. The supportive evidence to this statement comes partially from sample characteristics and its size, and from analysed category aimed at employed research methodology.

Another important finding is misinterpretation and low theory grounding of concepts and terms regarding KM. Some authors are using terms information and knowledge interchangeably, possibly without knowing the difference and implications of such misinterpretation. When using other studies, alignment between concepts and terms is important (and it is the very basis of academic nature), otherwise it has no point of using research of others, when it is not clear, what are they writing about.

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Appendix

Table II: Characteristics of articles (part I)

Conference	Title	Type	Full text	Year	Authors
International Conference on Solid Waste Technology and Management	Knowledge based enterprise-wide administrative information model	C	n	1999	Brown
International Symposium on Information Technologies in Environmental Engineering	Implementation of a Web-based knowledge management system	C	n	2005	Thannhauser and Eimer
International Conference on Information Technology and Applications	Conceptual nuclear decommissioning knowledge management system design	C	f	2005	Chou et al.
Joint International Topical Meeting on Mathematics and Computations and Supercomputing in Nuclear Applications	A challenge for computing in the 21st century: Radwaste knowledge management	C	f	2007	Umeki
International Conference on Radioactive Waste Management and Environmental Remediation	Overview of the JAEA knowledge management system supporting implementation and regulation of geological disposal in Japan	C	n	2009	Umeki et al.
International Conference on Radioactive Waste Management and Environmental Remediation	Practical application of the KMS: 2 site characterisation	C	n	2009	Semba et al.
International Conference on Radioactive Waste Management and Environmental Remediation	Challenges for the JAEA KMS: Fostering inventive design and problem solving	C	n	2009	Makino et al.
International Conference on Radioactive Waste Management and Environmental Remediation	Practical application of the KMS: 1) total system performance assessment	C	n	2009	Makino et al.
International Conference on Radioactive Waste Management and Environmental Remediation	Integrating history and measurement into a case for site release	C	n	2011	Bartlett et al.
International Conference on Service Oriented Computing and Applications	Structuring and representation of scientific knowledge for a transfer through an electronic knowledge-book	C	f	2011	Jmal et al.
European Conference on Knowledge Management	Knowledge management practices: A framework proposal	C	f	2012	Freitas et al.

Table II: Characteristics of articles (part I)

Conference	Title	Type	Full text	Year	Authors
Journal of Environmental Planning and Management	Assessments of sustainable waste management alternatives: How to support complex knowledge management	J	f	2006	Soederberg and Kain
Journal of Cleaner Production	Diffusion effect and learning effect: an examination on {MSW} recycling	J	f	2010	Chen and Chang
Waste Management	Healthcare waste management in Asia	J	f	2010	Prem Ananth et al.
International Journal of Environmental Technology and Management	Sustainable deconstruction and the role of knowledge-based systems	J	n	2008	Jain et al.
Environmental Modelling and Software	Supporting decision making in urban wastewater systems using a knowledge-based approach	J	f	2011	Aulinas et al.
Water Science and Technology	A knowledge management methodology for the integrated assessment of {WWTP} configurations during conceptual design	J	f	2012	Garrido-Baserba et al.
Interdisciplinary Journal of Information, Knowledge, and Management	Environmental knowledge management of finnish food and drink companies in eco-efficiency and waste management	J	f	2013	Bejić et al.

Table III: Categorization scheme (part I)

Codes	Sub-category	Category
<p>Planning waste management system (Soderberg and Kain, 2006) Waste sector (Thamhäuser and Eimer, 2005; Brown, 1999)</p>	<p>Process of Waste management</p>	<p style="text-align: center;">WM</p>
<p>Healthcare waste management (Prem Ananth et al., 2010)</p>	<p>Healthcare waste management</p>	
<p>Waste wood management (Jmal et al., 2011)</p>	<p>Waste wood management</p>	
<p>Disposal of municipal solid waste (Chen and Chang, 2010) Municipal solid waste management (Freitas et al., 2012)</p>	<p>Municipal waste management</p>	
<p>Nuclear waste disposal (Umeki, 2007; Umeki et al., 2009) Nuclear decommission in lifecycle of nuclear facilities (Chou et al., 2005)</p>	<p>Radioactive waste management</p>	
<p>Repositories of radwaste management (Makino et al., 2009a; Semba et al., 2009) Radioactive waste management (Makino et al., 2009b)</p>	<p>Wastewater management</p>	
<p>Wastewater life cycle, Water treatment plant (Garrido-Baserba et al., 2012) Urban wastewater system (Aulinas et al., 2011)</p>	<p>waste management from product life cycle perspective</p>	
<p>Re-use, recycling recovery (Beljić et al., 2013)</p>	<p>Waste management in construction industry</p>	
<p>Solid waste in construction industry (Jain et al., 2008)</p>		

Table IV: Categorization scheme (part II)

Theme	Research into knowledge management specifically in the field of waste management					
Category	KM		Methods		Purpose	
Sub-category	Organizational learning	Knowledge management system	Theoretical approach	Quantitative approach	Qualitative approach	
	Organizational learning (Chen and Chang, 2010)					
	Knowledge base (Garrido-Baserba et al., 2012; Umeki, 2007, Aulinas et al., 2011; Bartlett et al., 2011; Brown, 1999; Umeki et al., 2009; Semba et al., 2009)					
	Acquisition, classification, storage, transform, disseminate and discovery knowledge (Chou et al., 2005)					
	Processing knowledge (Soderberg and Kain, 2006)					
	KM practices and mechanisms (Freitas et al., 2012)					
	Knowledge sharing (Thannhäuser and Eimer, 2005)					
	Assessing of KM (Prem Ananth et al., 2010; Makino et al., 2009a; Makino et al., 2009b)					
	Theoretical modelling (Chou et al., 2005; Garrido-Baserba et al., 2012; Umeki, 2007; Aulinas et al., 2011; Brown, 1999)					
	Descriptive overview (Umeki et al., 2009)					
	Mathematical model (Chen and Chang, 2010)					
	Interviews and discussion documents (Beljić et al., 2013; Soderberg and Kain, 2006)					
	Case study (Aulinas et al., 2011; Freitas et al., 2012)					
	Qualitative analysis of documents (Prem Ananth et al., 2010)					
	Being flexible and transparent (Makino et al., 2009)					
	Structure knowledge (Umeki, 2007; Bartlett et al., 2011)					
	Support KM (Chou et al., 2005)					
	Need to manage knowledge (Beljić et al., 2013; Prem Ananth et al., 2010; Freitas et al., 2012; Thannhäuser and Eimer, 2005; Brown, 1999; Umeki et al., 2009; Makino et al., 2009b; Semba et al., 2009; Jain et al., 2008)					
	Decision support (Beljić et al., 2013; Chou et al., 2005; Garrido-Baserba et al., 2012; Jain et al., 2008, Aulinas et al., 2011; Makino et al., 2009a)					
	Sustainability through KMS (Soderberg and Kain, 2006)					
	Performance by organisational learning (Chen and Chang, 2010; Makino et al., 2009a)					

Table V: Possible misinterpretations in articles

Article	Possible misinterpretation
Chen and Chang, 2010	Through a designed or planned system, employee in the organization can acquire valued knowledge , generate and share the information .
Aulinas et al., 2011	In order to systematize the reasoning process, the knowledge in the UWS domain can be described by means of multiple strata each one containing a specific type of knowledge . The reasoning process can then be expressed by the various relationships between these layers, as a process that takes information from these different levels.
	Capturing and managing the huge quantity of data/information that has to be considered is an intrinsic factor that makes environmental systems a sophisticated domain. Organizing this data in a naive way can impact the efficacy of any knowledge-based system. Another intrinsic factor is the variety of data sources , which can result in inconsistent, uncertain or incomplete knowledge bases when different data sources are considered.
Garrido-Baserba et al., 2012	This global approach is based on a hierarchy of decisions that uses the information contained in knowledge bases (KBs) with the aim of automating the generation of suitable WWTP configurations for a specific scenario.
	The second compatibility knowledge base (C-KB) contains information about the different interactions amongst the treatment technologies
Umeki, 2007	Knowledge Management (KM) is a term commonly used in many areas of technology but, in general, focus is on conventional approaches to systematic handling of technical information .

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Reverse flows as the source of knowledge for zero waste performance – integration of knowledge, quality, innovation and reverse logistics management

Alena Klapalova

Department of Corporate Economics, Faculty of Economics and
Business Administration, Masaryk University
Lipová 41a, 62800 Brno, Czech Republic

Structured Abstract

Purpose – Reverse flows consist of material, financial, information, knowledge, services and waste flows and should be handled as the resources that have more or less tangible and intangible value. Without the understanding of reverse flows as the valuable resources both efficiency and effectiveness problems arise that have negative impact on sustainable development of business. The primary goal of every enterprise is to minimise the emergence of some of these flows (especially material ones) since significant part of them turn into the waste for disposal. This means that enterprises should follow zero waste strategy. There are several business functions as well as fields of study which role is to help to follow such strategy. Nevertheless the statistics concerning the growing volumes of reverse flows and especially waste (e.g. municipal and industrial waste) show that despite the effect of consumerism there is the potential gap in the needed integration of those functions and fields of study. The purpose of this paper is to gain better understanding of the interrelationships among several business functions which integration supported with appropriate management approach should lead to zero waste performance. Design of the conceptual framework with the knowledge management as the basis for the integration and some empirical evidence of its functionality are presented in this paper.

Design/methodology/approach – Extensive literature review of knowledge management and quality, innovation and reverse logistics management was carried out to design conceptual framework. This framework was tested through the empirical survey of 130 enterprises. Data acquired from the structured questionnaire were analysed with the aim to find out the existence and character of hypothetical relations among the elements of proposed conceptual framework.

Originality/value –The results of the survey represent one of the first attempts to find empirical support for the role of knowledge management as the integrator for quality management, innovation management and reverse logistics. Proposed conceptual framework takes rather broad perspective, considering points of contact among these business functions and the existing theoretical knowledge in order to facilitate zero waste strategy.

Practical implications – The proposed conceptual framework has both theoretical and managerial implication. It contributes to the existing management literature by identifying and highlighting the intersections of those parts of quality, innovation and reverse

logistics management that should be interconnected for accomplishing zero waste and to minimise reverse flows and show the role of knowledge management.

Keywords – Reverse logistics, Knowledge management, Quality management, Innovation management, Zero waste performance.

Paper type – Academic Research Paper

1 Introduction

There are many processes that help to minimise waste or eliminate the formation of waste. From the internal processes value management, product and process design, or more broadly innovation management or quality management, from processes that overlap the borderlines of companies supply chain management and logistics together with reverse logistics and for instance demand management belong to the most important areas (Andersson et al., 2006; Heidrich et al, 2009; Mossman, 2009; Scott, 2009).

Several decades yet the theory devoted to the issue of knowledge management and even much longer history of theory building concerning innovation and waste management has been developed but despite of this fact there is a gap in integration of the interest and existing knowledge among these three fields of study and practice. Knowledge management seems to be strongly ignored and neglected by academicians dealing more or less broadly with waste issues. Waste management is the complex problem solving area and to offer efficient and effective solutions it requires also the knowledge from multidisciplinary, interdisciplinary and transdisciplinary points of view, predominantly from experts on quality and innovation management. Nevertheless theory is almost silent and only fragmented knowledge is available (e.g. Sharma, and Vredenburg, 1998; Lapré et al., 2000; Bowen et al, 2001; Ameri and Dutta, 2005; Söderberg and Kain, 2006; Orsato et al, 2007; Egbu and Renukappa, 2008; Vachon and Klassen, 2008; Genchev et al., 2010; Sarkis, 2012) are available.

There is strong need for research and investigation of best practices, approaches, barriers, triggers focused on knowledge management and its application and progress in managing waste with the inspiration from and for innovation and quality management while especially these fields are very rich – on individual basis – in the sense of disposing with many methods, tools and techniques that can be applied across each other field to solve various problems with waste.

There are several aims which this paper is focused on. The first one is to offer the review of current state of theoretical knowledge about integration of five areas – reverse

logistics and waste, quality, innovation and knowledge management. The second one is to introduce the suggestion of conceptual framework as the base for further investigation of integrated areas. And third is to present some findings of the empirical survey to make an “entry evidence” of conceptual framework functionality. Two research questions were formulated for the empirical survey, namely: 1. Is there some relation and probably also the impact of the existence of quality management system on knowledge, innovation and waste management? And 2. What relations can exist between knowledge, quality, innovation and waste management?

2 Theoretical background and conceptual framework

Waste represents enormous and globally still growing share of reverse flows. There is no agreed definition of reverse flows. From existing literature it can be concluded that as reverse flows flows of products, packaging, waste, materials, raw materials, in process inventory, components but also related flow of information and money that are returned from any forward supply chain link to some point for further disposal may be termed (De Brito, 2003; Quesada Fernández, 2003; Rogers & Tibben Lembke, 1999; Thierry, Salomon, Nunen, & Wassenhove, 1995). According the report of McKinsey (2011) 10 million tons of material in companies every day is designated to be waste and 70% of this volume goes to landfill which is the terminate mode of disposal.

Reverse logistics (or reverse supply chain management) deal with waste as one part of other reverse flows. To clarify the essence of reverse logistics for instance Vogt et al (2006, s. 234) define reverse logistics as:

"Reverse logistics is the management of all the activities involved in goods, demand information, and money flowing in the opposite direction of primary logistics flow. It involves reducing the generation of waste, as well as managing the collection, transport, disposal, and recycling of both hazardous and non-hazardous waste in a way that maximises the long-term profitability of the business."

This definition enables relatively broad understanding of the environment in which reverse logistics operates because it does not exclude internal business processes from the angle of vision. What we mean with this is that waste emerges in many internal processes and must be handled somehow that is mostly provided also by internal logistics. Nevertheless the prevalent view on reverse logistics is connected to the external relations of companies.

Empirical research shows that not all companies are able and capable to manage waste, or the outcomes from processes that are evaluated as waste although a substantial part of it need not to be reckoned as waste (Eurobarometer, 2012). There are of course many reasons explaining such situation. One of them can refer to knowledge management as the central point which have linkage and effect (and mutual effect) with other areas of management.

There is probably no doubt to claim that waste is created from resources that companies have and spend to produce some value. If resources and produced value turn into waste, companies must cope with problems and try to find solution what to do with waste. Nevertheless this is reactive way solving consequences. What is much better is to be proactive and try to detect and eliminate reasons or causes and discover possibilities how to utilise unavoidable waste as opportunity. Otherwise waste can be very costly and works as lost opportunity (Knott, 2009).

If and how waste can be minimise, eliminate or evaluate as an “old-new” resource or new input for the company itself or for some stakeholder and so help to sustain, keep old one or gain a new competitive advantage depends especially on the other group of resources, namely knowledge, capabilities and competencies of managers, owners, employees (e.g. (Barney, 1991, Grant, 1991).

Prahalad and Hamel (1990) call these resources as group learning – in the meaning of connecting and sharing of individual knowledge and competencies across organizations together with perfect coordination among functional activities (Day, 1984, p. 2). Amit and Shoemaker (1993) state that specifically capabilities are developed mostly in the functional areas (as the consequence of specialization and the possibility of layering, deepening and widening of knowledge and skills) but also at the corporate level by the combination of diverse physical, human and technological resources.

But what serves as the starting point is the existence of people with knowledge and capabilities and competencies. For the case of waste management as one example (and the primary example for this paper) it means that if there are such people they are able to perceive waste as resource and they are also able to look for and find solution for its minimisation and elimination in both the internal and external environment. This is the case of so called dynamic capabilities/competencies (Teece et al, 1997) and often the „superior knowledge“ and probably capability and ability) as well that lead to more effective and efficient internal resource utilisation in comparison with the purchase and/or acquisition of external resources (Priem and Butler, 2001)..

Searching for new possibilities and new combinations is connected to innovation behaviour (Hunt and Morgan, 1996). Walker (2004) writes about „innovation capabilities”. This is one tight link between knowledge and innovation management. But innovation capabilities can be jointed to the concept of learning within continuous improvement. According Mukherjee et al (1998, in Linderman et al, 2004) there are two categories of learning in the frame of continuous improvement activities - so called conceptual learning, i.e. „know why“ and operational learning, i.e. „know how“. As Linderman et al state this understanding of learning and knowledge is based on so called technical knowledge what means to comprehend the effects of inputs on outputs. When dealing with waste Linderman et al also cite study of Lapre et al (2000) – verifying results of previous study of MacDuffie (1997), focused on waste minimisation activities in one company and on long-term effect of learning on these activities. According the results of both studies only those projects, which composed „know why“ and „know how“ in lead to positive outcomes in waste minimisation (Linderman et al., 2004). Continuous improvement is concept that belongs to quality management. One other example of quality management and learning linkage is Shewhart or Deming cycle PDC(S)A (Plan, Do, Check, resp. Study, Act), that was called by Deming as learning cycle (Linderman et al, 2004).

There are many other examples of relations between quality management, waste management itself and as the part of reverse logistics, innovation management and knowledge management in the practice of companies. One of quality management purpose is to prevent waste creation also by knowing what customer needs and wants. Customer in the point of view of quality management can be also the internal one – as the receiver of inputs from preceding value creator – internal supplier (Juran et al, eds., 1998). This means that quality management should detect information for product innovation and design and with this stream also the information for process design and innovation. If and how this is provided is also the result of knowledge management. When considering the role of reverse logistics and for instance that one which covers external supply chains, reverse logistics should bring many information and knowledge about why, where, when, how much and what type of waste emerge that again can be turned into some innovation of products and processes. Nonetheless as for instance Wadhwa et al (2006) conclude is that knowledge management in reverse logistics that would lead to innovation is not well understood, well researched and also in many companies not well practiced in average except of some examples from recycling and

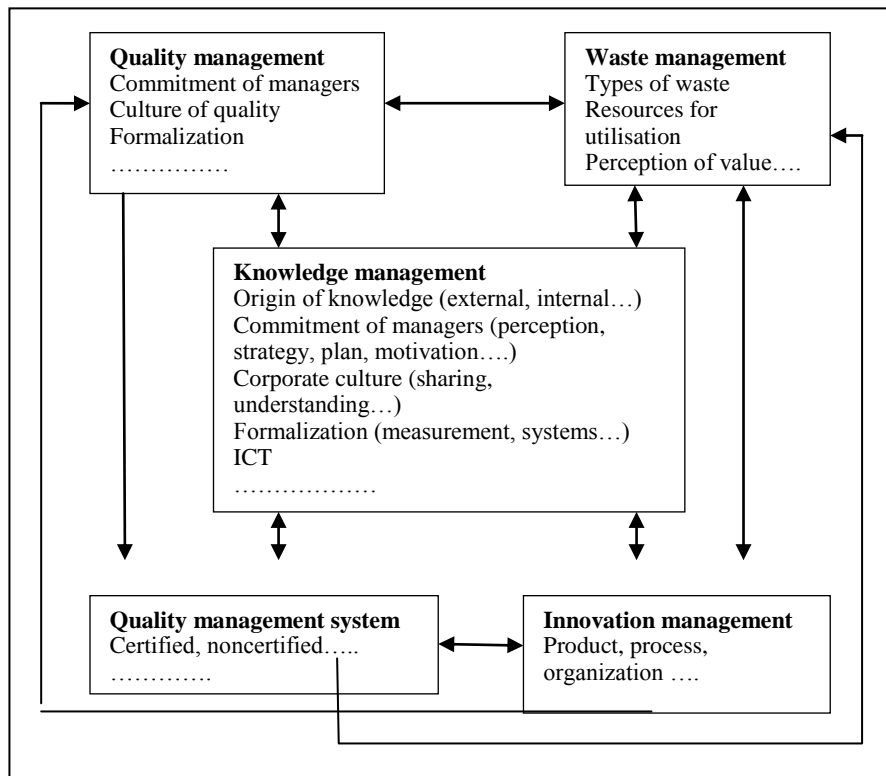
green product and process design (Pohlen and Farris, 1992; Orsato et al, 2007; Henriksen et al., 2012).

Our review also shows that probably the only one existing academic work that deals with the integration of reverse logistics, quality management (Total quality management - TQM) and innovation is the paper of Mihi-Ramírez and Arteago-Ortiz (2007). Some other scarce examples less or more concentrated on the integration of all or at least two or three mentioned areas are for instance: Harms (2011) – supply chain, knowledge management and environmental sustainability, Robinson et al (2006) – knowledge management and environmental sustainability, Schiuma and Carlucci (2012) – knowledge management and product innovation or some other papers of Mihi-Ramirez and his co-authors (2011; 2013) – knowledge management and reverse logistics, resp. green supply chain management.

3 Conceptual framework

The ideas from theoretical review presented in preceding paragraphs enter into the proposed conceptual framework displayed in Figure 1 and outlined further.

Figure 1: Conceptual framework



Conceptual framework is not static; on the contrary it is opened to other relevant concepts, areas of concern, issues of management etc. In its illustrated form presented in this paper it covers those elements that can be regarded as the most typical or the most general for all individual “macroelements”, i. e. basic concepts. Some of the elements and their relations are empirically tested for the purpose of this paper as the outcomes of the first analysis coming from our research.

Conceptual framework indicates also basic relations and directions of relations. Most of the relations are bidirectional, only two of them are unidirectional. Both concern quality management system. The idea behind it lies in the presumptions that quality management determines if and what quality management system will be and the existence of some system influences quality management only negligibly if anyhow. The same is with quality management system and waste management. Nevertheless this is point for further research and study as well as for discussion.

4 Methodology of survey and analysis

Since year 2009 longitudinal empirical research on various aspects of reverse logistics management in the Czech Republic has been realised by author of this paper and her colleagues. Findings from interviews as well as from some answers to some open questions embodied in questionnaires that were employed in the course of research showed that there are several issues in practice of managing reverse flows worth of deeper concern. Among them link between reverse logistics, quality management, innovation and knowledge (although not explicitly referred to management) has revealed as one of solutions for handling with reverse flows of material, packaging, goods and waste. This was the impulse to start to deal with this theme and some points were integrated into the investigation in the year 2012. Nevertheless, the literature review which has been done from this year lead to the need to research the problem into more depth and broaden especially the issue of knowledge management for the research in the year 2013. The main goal was to get started to look into this linkage and try to find expected relations and association of the linkage mentioned by several respondents and interviewers during the previous years of research and to test outlined hypothetical relations indicated in the conceptual framework (presented above).

Data from 162 questionnaires from the same number of companies were analysed for the purpose of this paper. Since there are more aims related to the research and despite broader space given to knowledge management, issues of quality management,

innovation management and waste management are covered much narrower. The logic behind it lies in the exploratory character of survey and in the goals for next years with the focus particularly on more dimensions of all four areas and their linkages.

The level of knowledge management in companies was measured through 16 statements covering various areas of knowledge management. Respondents were asked to evaluate perceived level by choosing one point on 7-points scale from 1- “I do not agree absolutely” to 7 – “I agree absolutely”. Level of reverse logistics management knowledge was measured with one question utilizing 7-points scale as well where 1 stands for the answer “knowledge of reverse logistics is considerably **higher** than knowledge of forward logistics” and 7 stands for the answer “knowledge of reverse logistics is considerably **lower** than knowledge of forward logistics”. Waste management directly and innovation management non-directly were involved in two of these questions and for the issue of waste and innovation management also one other individual order scale question was formulated. This question examines how much of existing waste companies use as the inspiration for their innovation activities with 7-points scale where 1 stands for “no share” and 7 for “100% share”.

For the investigation of quality management area three questions entered from the questionnaire into the analysis. One question is described below in the text as it had to be recoded for the purpose of analysis. Both two other questions are again 7-points order scales. The first one explores real implementation level of Total Quality Management philosophy in the practice of company and the second one real level of implementation of established quality management system in the practice. Point 1 represents answer “not at all” and point 7 answer “fully implemented”.

In this paper no causality was probed just simple bivariate relations. Following broad propositions were formulated to verify assumptions about relations from conceptual framework:

1. Companies with established quality management system are more likely to evaluate their knowledge management higher than companies without quality management system.
2. There will be positive relationship of knowledge management involvement and quality management involvement.
3. There will be a positive relationship of knowledge management involvement and waste and innovation management involvement.

For data analysis several statistical methods were involved. While the assumption of sampling distribution normality was deviated for whole sample as well as for split sample

into separate groups based on results of Kolmogorov- Smirnov (K-S) test (for all scores K-S test were highly significant) nonparametric tests were applied.

To obtain results to first research question and Proposition No 1 (looking for expected differences in answers to knowledge, waste and innovation management issues when companies have and have not established quality management system) Man-Whitney U test was employed. Existence and non-existence of quality management system were used as independent binary variable. This variable was created as the new one after recoding the semi-opened question searching for the type of quality management system, where several types of standardized system were proposed together with the ability to mark the answer “own company system”. If respondents did not choose any of the answers and they also did not mark anything or they marked 1 on the scale from another question which investigates the level of real implementation of established quality management system, these answers got 0 as binary variable. Another binary variable was 1 for companies which have some established system.

Second statistical method applied to obtain answers to the second research question and for Proposition No 2 and 3 was Spearman’s Rank correlation test for non-normally distributed data measuring relationship of two ordinal scales. We used SPSS IBM statistical software (version 22) for data analysis.

5 Empirical findings

5.1 Descriptive statistics

From 162 companies 106, i.e. 56,4%, belong to the service industry (mostly from HORECA sector, i.e. hotels, restaurants and cafés) and 56, i.e. 34,6% to other industries. 106, i. e. 65,4% companies are with the number of employees the small ones (1 – 49 employees), 34, i.e. 21% companies are middle (50 to 249 employees) and 22, i. e. 13,6% are big companies (250 and more employees). In 39 companies (24,1%) there is no existing quality management system, the rest 123 companies (75,9%) have some system (with certification, e.g. ISO 9001, ISO 14001, HACCP or without certification in the form of own system).

Table 1 shows results of Means (together with frequencies and Standard deviations) to the scale questions. Waste as the source of ideas for innovation is employed at the very low rate – 40,1% of companies in ample are not inspired by waste to innovate at all (54,1% of companies without any quality management system and 35,8% of companies

with some quality management system). Level of knowledge how to manage reverse logistics is lower than level of knowledge of forward logistics, but the Mean (4,362) indicates that the situation is not “so bad”. Companies do not implement very much the philosophy of Total Quality Management in their practice as it is evident from the Mean related to this issue (just 3,105 from 7-points scale). Nevertheless if they have any quality management system the level of its real implementation is smoothly better (Mean 4,106) although Standard deviation shows bigger differences in answers.

From all sixteen questions that investigate knowledge management the highest level of answers in average was found in cases when:

- a) companies apply knowledge management to solve problems with errors and waste minimisation endeavour (Mean 4,811);
- b) when needed knowledge is acquired through employees training and qualification improvement (Mean 4,800) and
- c) when knowledge management is incorporated into company strategy (Mean 4,764).

On the contrary the lowest level of knowledge management was detected when:

- a) companies purchase needed knowledge (Mean 3,019);
- b) in the case of evaluation the role of information system as the tool that should help with knowledge and ideas search, acquisition, categorisation and sorting (Mean 3,158); and
- c) when respondents should give the rate of agreement with the utilisation of specific measures for knowledge management quality assessment (Mean 3,166).

Measurement of knowledge is probably of less use within companies as the result for another statement related to this area is also below the average – namely the Mean for the statement “level of knowledge management is monitored, measured and assessed on a regular basis” which is 3,231.

Also the Means for such dimensions of knowledge management as: 1. the individual self-training of every employee (Mean 4,443) and 2. conscious planning of knowledge management within all processes in companies (Mean 4,350), 3. attitude of managers to knowledge management perceived as of strategic important (Mean 4,321), 4. sharing of knowledge and information (Mean 4,323) and 5. Benefits of information technologies for obtaining needed information about the environment (Mean 4,323) are relatively high above the average which implicate the role of managers and employee commitment and understanding of knowledge management as the tool for improvement (see Table 1).

Nevertheless it seems that companies are more focused on their own internal milieu and probably less formalized distribution of information and knowledge within companies. This can be explained by the prevalent size of companies (small) and

character of business (not high tech knowledge) that need neither special structures and system for knowledge management nor specific knowledge which have to be gained from the external experts.

Table 1: Descriptive statistics (frequencies, Means and Standard deviations) for surveyed variables

variable	innovative ideas from waste	level of knowledge of reverse logistics (inverse scale)	real implementation level of TQM	real implementation level of QMS	knowledge acquisition is a part of individual self-training of every employee
N	157	160	162	123	158
Mean	2,344	4,362	3,105	4,106	4,443
SD	1,5554	1,3198	1,8199	2,0115	1,7540
variable	knowledge management is a part of company strategy	knowledge management is consciously and planned integrated into all company processes	needed knowledge is acquired through employees training and qualification improvement	needed knowledge is acquired by purchase	needed knowledge is acquired by sharing with partners
N	157	160	160	160	160
Mean	4,764	4,350	4,800	3,019	3,712
SD	1,6646	1,7811	1,7762	1,5025	1,6306
variable	specific measures are used for knowledge management quality assessment	level of knowledge management is monitored, measured and assessed on a regular basis	in company there are systems and spaces for knowledge exchange among people and for learning from each other	employees often share ideas with other people with common interests although they work in different departments/ areas	our information system helps with knowledge and ideas search, acquisition, categorisation and sorting
N	157	158	159	158	158
Mean	3,166	3,231	3,797	3,874	3,158
SD	1,6166	1,7296	1,9213	1,7122	1,8426
variable	thanks to information and knowledge sharing we often find new ideas that can be utilised for company development	thanks to the information technologies we have access to various information and knowledge related to the environment, e.g. competitor,	managers evaluate knowledge as the strategic resource critical for the company existence	knowledge management is focused on errors and waste minimisation	employees who brings new ideas that lead to reverse flows minimisation are remunerated

		market changes etc.			
N	158	158	159	159	159
Mean	4,323	4,278	4,321	4,811	4,031
SD	1,6978	1,7038	1,7254	1,5718	2,0296

5.2 The impact of quality management system existence on differences in knowledge management dimensions, knowledge of reverse logistics and innovation from waste management

Table 2 reports findings of nonparametric Mann-Whitney tests of differences between companies that have and have not any quality management system and impact of the existence or non-existence on (or relation with) investigated dimensions of knowledge management, knowledge of reverse logistics and level of waste utilisation for innovation. It is obvious that except two variables to have or not to have quality management system manifest substantial statistically significant differences in observed indicators. Existence of such system does not have substantial relation with the level of knowledge of reverse logistics management and knowledge acquisition in the form of individual employees training effort. Statistically significant difference was not found also with the information system as the tool for environment information and knowledge gathering however p value is just slightly above 5% significance level ($p=0,056$). Medians explain differences more illustratively

Table 2: Differences between companies in knowledge and innovation management dependent on existence/nonexistence of quality management system

variable	innovative ideas from waste	level of knowledge of reverse logistics (inverse scale)	knowledge acquisition is a part of individual self-training of every employee	knowledge management is a part of company strategy	knowledge management is consciously and planned integrated into all company processes
U	1701,000	2274,500	2067,500	931,000	1006,000
Sig.	0,025	0,856	0,589	0,000	0,000
MD (n)	1,00	4,00	5,00	3,00	3,00
MD (e.)	2,00	4,00	4,00	5,00	5,00
variable	needed knowledge is acquired through employees training and qualification improvement	needed knowledge is acquired by purchase	needed knowledge is acquired by sharing with partners	specific measures are used for knowledge management quality assessment	level of knowledge management is monitored, measured and assessed on a regular basis

U	1320,500	1793,000	1562,500	1037,000	986,000
Sig.	0,000	0,046	0,003	0,000	0,000
MD (n)	4,00	2,00	3,00	1,00	1,00
MD (e.)	5,00	3,00	4,00	4,00	4,00
variable	in company there are systems and spaces for knowledge exchange among people and for learning from each other	employees often share ideas with other people with common interests although they work in different departments/ areas	our information system helps with knowledge and ideas search, acquisition, categorisation and sorting	thanks to information and knowledge sharing we often find new ideas that can be utilised for company development	thanks to the information technologies we have access to various information and knowledge related to the environment, e.g. competitor, market changes etc.
U	1297,500	1343,000	1277,000	1418,000	1703,500
Sig.	0,000	0,000	0,000	0,002	0,056
MD (n)	2,00	3,00	2,00	3,00	4,00
MD (e.)	4,00	4,00	3,00	5,00	5,00
variable	managers evaluate knowledge as the strategic resource critical for the company existence	knowledge management is focused on errors and waste minimisation	employees who brings new ideas that lead to reverse flows minimisation are remunerated		
	U	1613,500	1298,000	1369,000	
	Sig.	0,012	0,000	0,000	
	MD (n)	3,50	4,00	2,50	
	MD (e.)	5,00	5,00	5,00	

5.3 The association of measures within quality management, knowledge management dimensions, knowledge of reverse logistics and innovation from waste management

Spearman Rank Order Correlation test proved at the significance level 0.05 that there is an association between two measure of quality management and measure of waste and innovation management as well as between two measures of quality management and several measures of knowledge management (see Table 3). All presented associations are positive. Stronger positive association were discovered with measure that evaluated the level of TQM implementation in practice of companies in view of the fact that the number of companies that could reply to the second measure of quality management was substantially lower. Correlation coefficients are relatively small (and very small) however this fact can be explained by the number of cases (162, or about 130 and about 32 for individual measure respectively).

Results of the Spearman correlation coefficients indicate the strongest associations (significantly approved by p values) between TQM level of implementation and the level of:

a) use of specific measures for knowledge management quality assessment ($r=0,498$, $p=0,000$);

b) agreement with the statement that information system helps with knowledge and ideas search, acquisition, categorisation and sorting ($r=0,412$, $p=0,000$);

c) agreement with the statement that knowledge management is a part of company strategy ($p=0,383$, $p=0,000$);

d) agreement with the statement that knowledge management is monitored, measured and assessed on a regular basis ($r=0,363$, $p=0,000$);

e) agreement with the statement that knowledge management is consciously and planned integrated into all company processes ($r=0,363$, $p=0,000$);

f) agreement with the statement that in company there are systems and spaces for knowledge exchange among people and for learning from each other ($r=0,360$, $p=0,000$);

g) knowledge management is focused on errors and waste minimisation ($r=0,276$, $p=0,000$).

For all of these measure except one also statistically proved association was found with measure of the level of quality management system real implementation. The only one exception concerns letter d) in the items introduced above what reports little bit controversial situation. One of requirements for any management system (and all certified quality management system) is to monitor measure and evaluate the system. It could be expected that if company provides such activity for one area, it probably would provide it also for another area, especially if both are logically interrelated. On the other side, p value is not significant at 0,05 level ($p=0,056$), but it indicates that there is some relation, just not strong.

Measure of association between waste and innovation management (1 variable) and quality management (TQM) shows also statistically significant result, nevertheless correlation index is very small ($r=0,188$) with p value 0,018. For another quality management measure the association is not statistically proved ($p=0,280$).

No association was found with both measures of quality management and 4 measure of knowledge management as well as 1 measure of reverse logistics knowledge. The 4 measures of knowledge management are connected to the statements: a) knowledge acquisition is a part of individual self-training of every employee, b) needed knowledge is acquired by purchase, c) needed knowledge is acquired by sharing with partners and d)

thanks to the information technologies we have access to various information and knowledge related to the environment, e.g. competitor, market changes etc. The first result can be influenced by the size of companies again. The individual self-training of every employee can be regarded as natural with or without any quality management effort, philosophy “enforcement” or system involvement. This is supported also by Medians for companies that have some quality management system (MD=4,00) and which do not have (MD=5,00) as introduced above. Missing associations in the case of two variables linked to the external acquisition of information and knowledge, regardless of the relative high Means showing relative average utilisation of the way how to obtain needed information and knowledge, can be evidence of absencing mental linkage of managers between their perception of what knowledge management can involve and quality management content. Another explanation can be that quality management may be reckoned as more internal matter of companies without just very low impact of knowledge flow from some external stakeholders.

If analysing just quality management system implementation level (1 variable) even more no-associations were detected (despite the existence when TQM issue is employed) where p value cannot be considered as significant at level 0,05 (the most of all calculations are realized at level 0,05 as stated above) nevertheless as significant at level 0,10. They are linked to the statements: a) innovative ideas from waste, b) employees often share ideas with other people with common interests although they work in different departments/areas and c) thanks to information and knowledge sharing we often find new ideas that can be utilised for company development.

Table 3: Association between quality, knowledge, waste and innovation management measures

variable	innovative ideas from waste	level of knowledge of reverse logistics (inverse scale)	knowledge acquisition is a part of individual self-training of every employee	knowledge management is a part of company strategy	knowledge management is consciously and planned integrated into all company processes
r (TQM)	0,188	-0,066	-0,011	0,383	0,363
Sig.	0,018	0,406	0,892	0,000	0,000
r (QMS)	-0,099	-0,035	0,021	0,237	0,288
Sig.	0,280	0,705	0,812	0,009	0,001
variable	needed knowledge is acquired through employees	needed knowledge is acquired by purchase	needed knowledge is acquired by sharing with partners	specific measures are used for knowledge management	level of knowledge management is monitored, measured and

	training and qualification improvement			quality assessment	assessed on a regular basis
r (TQM)	0,244	0,154	0,137	0,498	0,363
Sig.	0,002	0,152	0,083	0,000	0,000
r (QMS)	0,161	-0,052	-0,106	0,290	0,174
Sig.	0,075	0,567	0,245	0,001	0,056
variable	in company there are systems and spaces for knowledge exchange among people and for learning from each other	employees often share ideas with other people with common interests although they work in different departments/ areas	our information system helps with knowledge and ideas search, acquisition, categorisation and sorting	thanks to information and knowledge sharing we often find new ideas that can be utilised for company development	thanks to the information technologies we have access to various information and knowledge related to the environment, e.g. competitor, market changes etc.
r (TQM)	0,360	0,204	0,412	0,177	0,085
Sig.	0,000	0,010	0,000	0,026	0,286
r (QMS)	0,217	0,128	0,294	0,133	-0,010
Sig.	0,016	0,158	0,001	0,144	0,915
variable	managers evaluate knowledge as the strategic resource critical for the company existence	knowledge management is focused on errors and waste minimisation	employees who brings new ideas that lead to reverse flows minimisation are remunerated		
r (TQM)	0,202	0,276	0,264		
Sig.	0,011	0,000	0,001		
r (QMS)	0,156	0,156	0,170		
Sig.	0,085	0,084	0,060		

When splitting the file into one with companies that do not have any quality management system and into the one with companies that have some system also differences in correlation of knowledge management measures were detected. We introduce here just the results with coefficient above 0,600 and one finding with coefficients above 0,500 which seems to be interesting. Strong association was ascertained in the group of companies which do not have any system between variable *“knowledge management is a part of company strategy”* and variable *“knowledge management is consciously and planned integrated into all company processes”* ($r=0,747, p=0,000$) and between the second variable and variable *“thanks to information and knowledge sharing we often find new ideas that can be utilised for company*

development” ($r=0,754$, $p=0,000$). In this group also association between knowledge acquisition from partners and variable “*employees often share ideas with other people with common interests although they work in different departments/areas*” was detected ($r=0,536$, $p=0,000$) and also variable “*thanks to information and knowledge sharing we often find new ideas that can be utilised for company development*” ($r=0,778$, $p=0,000$). This was not the case in the group of companies with existing system of quality management or rather found association of the first pair was relative weak when considering correlation coefficient ($r=0,351$) although p value proves significance ($p=0,000$). No association was found with second pair. What was nearly the same for both groups is the strength of correlation between variable „*knowledge management is a part of company strategy*” and variable “*knowledge management is consciously and planned integrated into all company processes*” ($r=0,692$, $p=0,000$). And finally strong association was discovered between both variables concerned measurement of knowledge management for this group ($r=0,633$, $p=0,000$) but also for the group with no system ($r=0,585$, $p=0,000$).

With all of these associations we have to point out to differences in Medians introduced in Table 2 which give picture better explaining and supporting these results.

4 Summary of findings

Findings support the importance of attitude and commitment of managers to knowledge management which is reflected in the strong positive association to quality, waste and innovation management. Specifically the incorporation of knowledge management into the strategies and plans seems to be very important together with understanding of the effects of knowledge sharing (both spontaneous and formalized) and measurement of knowledge management. Another conclusion stemming from the survey is the perception of value contained in some form in waste as a part of knowledge management effort and also the motivation of employee to share and develop mutual knowledge. Total quality management as the way of continuous learning has stronger association with knowledge and waste management in comparison to the existence of quality management system. But also the existence-non-existence of quality management system examination confirm the positive role of existence and its closer relation with knowledge and innovation management as well as waste management.

5 Limitations of empirical survey

The major limitations of survey lie in the number of responses which cannot support the relevance of the conceptual framework sufficiently. Number of responses does not allow using more sophisticated statistical tools – or in other words – results of statistical analyses (and not only of more sophisticated) cannot be generalized. Another limitation relates to the multipurpose character and design of questionnaire. All four researched issues (knowledge, innovation, waste and reverse logistics management) should be investigated more deeply and not just through very limited range of variables. Structure of sample with the prevalence of small companies and from HORECA sector also reduces the validity of results to be considered as the typical picture of reality and to be accepted as the solid foundation for the framework. Nevertheless they can serve either for the imagination of a picture how reality can be and for comparative studies for the same and/or different industries and sectors.

6 Conclusions and further research opportunities

As it was stated in the previous text the presented conceptual framework can serve as the very general basis for further research. There are many directions that can bring many new knowledge helping to enrich both theory but also the practice. Our empirical survey has brought some evidence about the importance of the existence of quality management system for knowledge, waste and innovation management. But – as introduced in limitations – there is much to investigate also in case of quality management system in the frame of multiple relations to much more diverse knowledge and innovation management issues with or without direct linkage to waste management. The framework itself can be filled in with the area of human resource management in the context of managing waste and managing innovation. Or as another suggestion the role of various stakeholders and knowledge flows for waste an innovation management can be examined.

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Intellectual Capital Reporting at Italian Universities

Daniela Sangiorgi, Benedetta Siboni*

Department of Management
University of Bologna
Via Capo di Lucca, 34
40126 – Bologna – Italy

* *Corresponding author*

Structured Abstract

Purpose – Intellectual capital (IC) plays a crucial role in the university sector, which could be considered a proper knowledge institution (Ramirez and Gordillo, 2014). In Italy IC report is not mandatory for universities. Nevertheless, several institutions include IC information within their social reports (Ricci *et al.*, 2014). The purpose of the research is twofold. First, it aims to investigate the amount and nature of IC voluntary disclosure in Italian universities' social reports, as well as to examine the influence of the size of universities in IC reporting. Second, it aims to examine the internal perspective of Italian universities' General Directors on IC management and disclosure.

Design/methodology/approach – This study answers to Bezhani's (2010) call for comparative research, by applying the same methodological approach. Content analysis (Krippendorff, 2004) has been used to determine the amount and the nature of IC disclosure in a group of 17 Italian university social reports issued before February 2013. In addition, an on-line questionnaire has been submitted to all university General Directors, in order to investigate the internal perspective of Italian universities on IC disclosure and the opportunity of establishing an IC mandatory report in universities.

Originality/value – To our knowledge, no previous research has been conducted on IC reporting with regard to Italian universities yet. Thus, the current paper contributes to creating new expertise with concern to IC reporting in the university sector. Also, it gives insights into General Directors' views on IC management and disclosure as well as on IC mandatory reporting. Finally, the study fosters international comparative research on IC reporting in universities by providing the Italian picture.

Practical implications – This work encourages Italian universities to enquire on the benefits achieved by IC reporting. Moreover, the paper gives recommendations for additional IC reporting indicators with regard to the university sector, in order to provide a comprehensive assessment of IC assets. Furthermore, the study prompts policy-makers to enquire on the utility of mandatory IC reporting by universities. In doing so, it opens up new horizons, both for future research and policies.

Keywords – Intellectual Capital, University, Social Report, Italy, Content Analysis.

Paper type – Academic Research Paper

1 Introduction and background of the study

Starting from the new century a number of critics of traditional financial reporting have pushed academics and practitioners to propose alternative frameworks for organisation reporting. Such frameworks have been grouped in two main categories (Guthrie *et al.*, 2007): Social, environmental and sustainability frameworks, oriented to give an account of the external impacts of organisational activity from a stakeholder's perspective; and Scorecard and intellectual capital frameworks, oriented to put the measurement of knowledge intensive resources within a strategic context.

In such a context, managerial literature on Intellectual Capital (IC) has experienced a significant growth in the last decade (e.g. Guthrie *et al.*, 2012; Serenko and Bontis, 2013). Nevertheless, there is still a lack of agreement within literature upon the definition of IC (Leiner, 2004; Beattie and Thomson, 2007). However, there has been wide agreement upon the fact that IC can be conceived as the amount of not-tangible internal and external resources available for combining tangible, human and financial resources in order to produce value for stakeholders and obtain a sustainable competitive advantage in organisations (Zambon, 2001; Lev and Zambon, 2003).

Recent studies have traced a three-stage development of IC research (Guthrie *et al.*, 2012; Dumay and Garanina, 2013). The first one ranges from the end of 1980s to the late 1990s. It focused on raising awareness and agreement on the meaning of and the necessity to measure and report on IC. Parallels, guidelines and standards for measuring and managing IC in organisations have been proposed (e.g. Edvinsson, 1997; Stewart, 1997). The second stage, in 2000s, continued to refine guidelines for IC management and reporting in organisations. Furthermore, several studies examined the impact of IC in financial performance and value creation. Also, several classifications of IC were proposed by literature (e.g. Petty and Guthrie, 2000; Marr and Chatzkel, 2004). Finally, the third stage of IC, which is currently emerging, is featured by research critically examining IC in practice (Guthrie *et al.*, 2012).

In addition to the development that IC has experienced in the literature several initiatives have been put in place to support the dissemination of that concept within organisations managing and reporting practices. The initiatives that have gained the widest diffusion (Chiucchi, 2004; Fabbrini and Ricciardi, 2007) and that have been strongly backed and accredited from both the international literature and practice were produced by Governments (DATI, 2000; DMSTI, 2003; FMEL, 2004; METI, 2004; SKE,

2005) and by the European Union (Meritum, 2002; ICU - OEU, 2006; RICARDIS – European Commission, 2006; InCas, 2008).

In particular, a call for a European standard for IC reporting and documenting the value of intangible assets was formulated in 2000 by a group of experts working on a project devoted to the knowledge-based economy and financed by the European Union (Cowan and Van de Paal, 2000).

Sometimes initiatives and literature have used different IC classifications (Canibano *et al.*, 2000). Despite that, “*they are all similar with respect to the way IC is measured and valued*” (Leitner, 2004, p. 131). The most popular classification for IC (Leitner, 2004) has been proposed by Meritum (2002) which distinguishes IC in human, structural and relational capitals, where the human capital represents the knowledge owned by employees, that hence they take with them when leaving the organisation. The concept of structural capital represents the knowledge that remains inside the organisation at the end of the working day, because it is embedded in a system of cultures, organisational routines, procedures, databases, etc. Lastly, relational capital refers to all resources activated in the external relationships that the organisation entertains with customers, suppliers, and research partners.

Drawing on the global importance that managerial literature, the European Union and several Governments have assigned to IC, in the last decade also the university sector has been involved in IC management and reporting practices (Ramirez and Gordillo, 2014). In this way the Austrian Government required a mandatory IC report from all universities starting from 2006 (UG, 2002).

Also, OEU (2006) states that “*IC reporting may become mandatory for universities in the near future probably due to the fact that they are considered critical institutional actors in national innovation systems within the knowledge-based economy*” (p. 229). Moreover, Sánchez and Elena (2006) highlight that “*If a knowledge-based economy is mainly characterised by the production, transmission and dissemination of knowledge, universities are unique in all these processes*” (p. 530). Also, Leitner (2004) observes that “*A university’s most valuable resources are its researchers and students with their relations and organisational routines; their most important output is knowledge*” (p. 129). In the university context “*human capital is the knowledge of the researchers and non-scientific staff of the university. Structural capital comprises the routines and processes within an university, an often neglected infrastructure of theirs. Relational*

capital comprises the relationships and networks of the researchers as well as the entire organisation” (Leitner, 2004, p. 133). In doing so, IC has been considered both the result of an organisation’s research and development activities, and the driver that enables the creation of greater value from those activities (RICARDIS - European Commission, 2006).

In particular, Leitner (2004) highlighted the following benefits that potentially can emerge from the mandatory IC report at the Austrian universities. First, IC report provides information for university management in order to develop suitable strategies and objectives (for instance in relation to whether and how to invest in the training of scientists, with whom to co-operate, which research programs should be emphasised, etc.) and to learn about the university knowledge-production process. Second, IC report increases transparency by providing external stakeholders with information about the development and productive use of IC. Among the other stakeholders, the policy-makers in such a way can get information to rank or benchmark universities and get information about the strengths and weaknesses of the science system in order to formulate the national science and education policy. Furthermore, funding agencies, industrial firms, students, etc. might benefit from IC report in order to get information about the IC which is a good indicator of the university future potential performance. This is also of interest for funding agencies that spend their research grants based on peer-reviewed research proposals. Third, a standardised model for IC report allows both university management and external stakeholders to make comparisons between different disciplines and between entire universities.

By contrast, possible difficulties in elaborating IC report have been identified by Leitner (2004) as follows. First, the necessity to define clear goals and evaluation criteria, which are related to the goals and interest groups, in a specific context where there is no agreed definition about outputs and their evaluation. Second, in the university sector there is an intrinsic difficulty on evaluating outputs since they produce important impacts on society and the territory that are difficult to measure and that can be estimated only over a long period of time. In addition, several universities’ outputs belong to the category of credence goods, which are goods that cannot be evaluated only by users *via* direct experience, but which need a broader evaluation from the academic community (Fia and Sacconi, 2013; Sacconi and Tamborini, 2013). Third, the necessity to define commonly accepted definitions and indicators for comparisons on the international level. Fourth, the

necessity for reviewers and funding agencies to learn how to interpret this new kind of information.

Drawing from such assumptions a number of studies have called for research with reference to IC managing and reporting in the university sector (e.g. Sánchez *et al.*, 2009; Bezhani, 2010; Siboni *et al.*, 2013a).

A research published by Bezhani (2010) enquired about IC disclosure by UK universities. The study found that IC disclosure was at its early stage: there were no specific documents devoted to IC disclosure and within annual reports only a little information was found with reference to IC. Furthermore, the research investigated the vision of the university Directors of Finance regarding the IC reports and the opportunity to require mandatory reporting of IC for UK universities. It was found that the university Directors of Finance were not aware of the Austrian mandatory IC report. Most of them agreed on the benefits related to such kind of reporting for external purposes. Also, several universities agreed upon the internal benefits related to IC report.

In order to answer the calls for research and intending to take place in the third stage of development of the IC (Guthrie *et al.*, 2012), the purpose of the current study is twofold. First, it aims to investigate the amount and nature of voluntary IC reporting in Italian universities in order to assess the importance given by these institutions to IC disclosure, and examines the influence of the size of universities in IC reporting. Second, it aims to give insights into the internal perspective of Italian universities on IC management and disclosure, as well as on the opportunity of establishing IC mandatory report.

The paper is organised as follows: section 2 outlines the principal initiatives for IC management and reporting at universities; section 3 presents the research method; section 4 illustrates the results of the analysis; section 5 provides conclusions and discusses the limitations of the research.

2 Initiatives for Intellectual Capital Management and Reporting at Universities

Drawing from the strong promotion undertaken by the European Union to disseminate IC managing and reporting practices within organisations, four main initiatives devoted to universities have been proposed. These are: University Act (UG, 2002), RICARDIS

(European Commission, 2006), ICU Report (OEU, 2006), and Italian Public Administration Law (D.lgs. 150/2009).

2.1 University Act

Austrian universities are legal entities in public law subjected to supervision and founded by the Federal Government. They are regulated by the University Act (UG, 2002) which refers to the paradigm of performance agreements. The performance agreement is an instrument that defines duties for both the universities and the Federal Government and assigns the global budget to universities for a period of three years (UG, 2002, art. 13). By the 30th of April each university has to produce a performance report that states the achievements of such a contract. The basic budget (i.e. the funding of each university) is negotiated by universities and the Federal Government on the basis of four parameters: needs, demand, performance, and social goals (UG, 2002, art. 13, para. 4). In addition, up to the 20% of total funding over the year is allocated on the basis of a list of performance indicators reported by each university.

Moreover, the University Act requires universities to produce an IC report for the past calendar year. *“While the performance report only deals with the topics addressed within the performance contract, the idea behind IC reports is to give universities the opportunity to report on their full range of activities without restrictions”* (Leitner, 2004, p. 132). The IC report has to be prepared by the University Rectorate and approved by the University Council. The document has then to be sent to the Ministry of Education, Science and Culture and published on the online University Gazette, in order to give it public access.

The IC report presents at minimum the following items in order to illustrate the knowledge-production process within universities (UG, 2002, art. 13, para. 6)¹:

1. the university’s activities, social goals (provided by the Ministry) and objectives and strategies (autonomously defined);
2. an account of IC belonging to the university, broken down into human, structural and relationship capital;
3. the processes implemented for elaborations of the performance agreement, including outputs and impacts set out.

In addition to the IC report referred to the whole university, each university can decide to produce separate IC reports on departmental, institutional or disciplinary levels,

as well as an IC report for other stakeholders that addresses the information needs of students or industrial partners, etc.

At the end of the IC report there is the evaluation of the impacts, which inform about deals with the achievements of the performance process with references to different stakeholders. Impacts are measured by a list of financial and non-financial indicators that are defined by the Ministry according to various academic disciplines (Leitner, 2004).

2.2 RICARDIS

In 2004 the European Union Directorate General for Research and Technological Development set up a group of experts (called RICARDIS) that was charged with elaborating a proposal for measures to stimulate the reporting of IC in research intensive organisations. In particular, the aim of the group of experts was to elaborate recommendations to: (1) guidelines for research intensive SMEs; (2) investors and other private stockholders on how to evaluate IC reports; (3) public policy makers on how to stimulate organisations to report on their IC.

The finding of the work of the group has been included in RICARDIS (European Commission, 2006) that states that IC is “*the result of, and the prerequisite for, successful R&D*” (European Commission, 2006, p. 10). It reviews existing regulations, models, methods and guidelines for reporting on IC, while it does not propose any new method. Furthermore, RICARDIS (European Commission, 2006) lists seven recommendations to stimulate reporting of IC over organisations. One recommendation is devoted to supporting IC report in higher education and research organisations, especially in universities with strong research programmes. That sector has been identified as playing a crucial role in participating in the efforts to develop IC reporting cultures and strategies, acknowledging the importance that it assumes in the period of important transformation led by the Bologna Process² and the emergence of the third mission which emphasises relationships with industry, public authorities and the general public. In such organisations, IC report has been conceived as a document for increasing their competitiveness and attractiveness, as well as assisting their internal management and relations with society.

2.3 ICU Report

In June 2004 the Observatory of the European University (OEU) was set up, within the PRIME Network of Excellence funded by the European Commission, with the aim to create management tools for the governance of research activities, as well as to develop a common framework for comparisons among universities and research institutions. In 2006, the Observatory issued a Strategic Matrix and a related Methodological Guide (OEU, 2006). The Strategic Matrix provides the higher education sector with an analytical and comprehensive framework to choose their strategic position in terms of research activities. The Matrix is organised via five thematic dimensions (funding, human resources, academic output, third mission, governance) and five transversal strategic issues (autonomy, strategic capabilities, attractiveness, differentiation profile, and territorial embedding). Also, it lists 141 indicators conceived to assist the management of universities and research institutions to compare performance over time and with different institutions.

The Methodological Guide (OEU, 2006) shows the results of the application of the Strategic Matrix in several universities, and discusses the handling of data. Moreover, it proposes a guide for the formulation of the IC report in universities and research institutions (namely, ICU Report). The ICU Report is intended to represent a sector level of standardisation, proposing specific sector indicators for universities and research institutions. It aims both to improve the universities' internal management and to disclose information to external stakeholders on the organisation's abilities, resources and commitments linked to the key determinant of its value. The ICU Report proposes to disclose information that universities should already gather, although not systematically or on a regular basis and usually spread over various documents.

The ICU Report (OEU, 2006) consists of the following three sections (by referring to Meritum, 2002 and DMSTI, 2003):

- *Vision of the institution* – that describes the organisations' strategy, objectives and the key intangibles to achieve those objectives;
- *Summary of intangible resources and activities* – which lists intangibles that need to be improved or acquired to fulfil the vision, as well as initiatives in process or planned with these objectives in mind;
- *A system of indicators for the intangible resource and activities* – which lists a set of 43 resource indicators for measuring IC in universities. They were chosen from the

141 indicators listed by the Strategic Matrix. The indicators are classified into the IC taxonomy of human, organisational and relational capital, and then organised under different headings corresponding to the strategic objectives that universities are expected to have.

No activity-related indicators were included in the list. This is because indicators were selected on the basis, on one hand, of comparability and feasibility of the gathering of data in universities and, on the other hand, of the willingness on the part of university authorities to disclose information (hence becoming reluctant to disclose sensitive information on strategic activities). For this reason the ICU Report represents an initial step for defining a common framework for IC report in universities, that needs further development in order to become a proper common framework (OEU, 2006; Sánchez and Elena, 2006).

2.4 Italian Public Administration Law

In 2009 the Italian Ministry of Public Administration issued a law (D.Lgs. 150/2009) inspired by the New Public Management approach (Hood, 1995; Lapsley and Miller, 2004; Pollit and Bouckaert, 2004) intended to prompt the introduction of a managerial culture focused on performance and driven by strategies and objectives by improving transparency, efficiency and effectiveness in public sector organisations. Universities, as a part of the broad public sector, are subjected to that law.

Among the other provisions, such law required state organisations (hence also state universities) to include information on IC both in the planning stage and in the reporting stage. Particularly, the framework suggested by the law states that *“to make the measurement systems even more effectively organizations can adopt a strategic map [...] A strategic map is used to link objectives to indicators, intangible resources to tangible indicators and indicators to targets. It can also be used as a means for communicating the strategy both within the organization, and towards external stakeholders.”* (CIVIT, Resolution no. 89/2010, p. 8). Where *“the use of typical intellectual capital indicators facilitates the understanding, even towards the outside, both of the quality and quantity of available human capital”* (CIVIT, Resolution no. 112/2010, para. 3.4.2., p. 16).

Drawing from this the framework identifies four categories for IC management (CIVIT, Resolution no. 112/2010 – Annex). The first category consists of the information capital, which represents the amount of all information flows and information systems,

shared and formalised knowledge at the disposal of organisations. The second category consists of the organisational capital, which is the result of the combination of culture, leadership, teamwork and alignment. The third category is the relational capital, which is the level of trust enjoyed by an organisation and its staff, and the intensity and quality of their relationships with their stakeholders. The fourth category is the human capital, which represents the sum of knowledge, skills, and talents of the staff of an organisation, at a particular time. However, the framework does not provide a comprehensive list of indicators to measure IC. It just gives a list of 21 examples of indicators for measuring human capital with reference to employee and organisational well-being, and gender (CIVIT, Resolution no. 112/2010 – Annex–Tab no. 2).

4 Research Method

The purpose of the current research is twofold:

- first, it aims to investigate the amount and nature of voluntary IC reporting in Italian universities in order to assess the importance given by these institutions to IC disclosure, and examines the influence of the size of universities in IC reporting;
- second, it aims to examine the internal perspective of Italian universities on IC management and disclosure as well as on the opportunity of establishing IC mandatory reporting.

In Italy research and teaching activities are considered public good and public responsibility (Italian Constitution, article no. 33), and are delivered by state and non-state universities approved by the national Ministry of Education. In the 2012-2013 academic year the university system comprised 96 universities, classified into 67 state and 29 non-state (CINECA, 2013). State universities are public entities funded by the national government for up to about 90% of their total needs. On the contrary, non-state universities are funded by the government for up to about 10% of their total needs, and therefore have a higher autonomy in establishing fees (Del Sordo *et al.*, 2011). Both state and non-state universities have scientific, teaching, organisational, financial and accounting autonomy (Agasisti, 2009).

The study applies the methodological approach used by Bezhani's (2010) research, which combines qualitative and quantitative research methods. In particular, content

analysis (Krippendorff, 2004) has been used to determine the amount and the nature of IC disclosure in a group of Italian university Social Reports (SRs).

Content analysis is “*a technique for gathering data. It involves qualitative and quantitative information into pre-defined polices in order to derive patterns in the presentation and reporting of information*” (Guthrie and Abeysekera, 2006, p. 120). It assumes that the volume of disclosure represents the relative importance of such disclosure (Unerman, 2000).

Consistently with Bezhani (2010) the unit of analysis chosen for analysing IC disclosure in Italian SRs was sentences. The content analysis recorded (1) if the IC indicators of the coding instrument were found in SRs, while (0) was recorded for indicators not found in the documents analysed (Annex 1). In addition for each IC indicator that was found in SRs the typology of information according to Bezhani (2010) classification was recorded. The analysis has been applied by one of the authors, who is an expert in the method; also, a reliability test was undertaken by the other author, also an expert in the method, on a pilot sample of SRs and no major issues of difference were reported, showing that the coding was sufficiently reliable.

We decided to analyse SRs for four reasons. First, because the Italian regulation does not require a specific mandatory document for reporting IC. Second, in conformity to GBS (2008)³ that identifies SRs as the documents devoted to include IC disclosure rather than to elaborate a stand-alone IC report. Third, in accordance to previous studies which have highlighted that SRs in Italy include IC information, both with references to universities (Veltri and Nardo, 2008; Nardo, 2014) and to companies (Cinquini *et al.*, 2012). Fourth, because several studies (Bontis, 2003; Abeysekera and Guthrie, 2005; Dumay and Cai, 2014) suggested to analyse reports other than the annual report, as research undertaken up to date found very few information on IC in the latters.

University SRs in Italy are conceived as tools to report on a university’s mission, values, results, resources, and to compare results against objectives, considering that they have a social mission and are funded with public money (Siboni *et al.*, 2013b). SRs have two main functions (Speziale and Zanigni, 2007; Meneguzzo and Fiorani, 2009): accountability and stakeholder governance. In particular, if we focus on the university as an institution, the social report is a document that concerns the creation of IC. Universities produce both internal outcomes, able to increase the human and organisational/structural capital and external outcomes and impacts, which create

relational capital. If we focus on the stakeholders governance function “*the social report is not only a document that describes the creation of intellectual capital, but also a proper system of governance that leads the strategic relationships among the university and its stakeholders*” (Speziale and Zanigni, 2007, p. 197).

For the purpose of the current analysis, SRs have been found by checking all state and non-state universities’ websites in February 2013. In particular, we found 20 SRs available for on-line download, including 17 documents reporting the comprehensive universities’ activities and 3 documents referred to specific university branches or projects. These latter documents have not been included in the current research because they would provide just a partial representation of university activities and therefore would have undermined the results of the research.

The coding instrument used for the content analysis is the one developed by Bezhani (2010), which derived from the Austrian University Act (Annex 2). It is organised in IC categories (No. 8) and IC indicators (No. 39). In addition, consistently with Bezhani’s (2010) study, we submitted an on-line questionnaire to all university’s General Directors, in order to investigate the internal perspective of Italian universities on IC disclosure and the opportunity of establishing IC mandatory report in universities. That decision also responds to the studies of Nurunnabi *et al.* (2011) and Dumay and Cai (2014) which claim that content analysis should be supplemented with other data sources collected by applying mixed methods (such as survey and interviews) in order to obtain a broad range of insights on IC reporting practice.

As shown in Table 1 the group of 17 SRs analysed represents about the 18% of Italian universities.

Table 1 lists the universities analysed according to five categories:

- Mega Universities, which are the universities with more than 40,000 students enrolled;
- Big Universities, which are the universities with students ranging from 20,000 to 40,000;
- Medium universities, which are universities with students ranging from 10,000 to 20,000;
- Small Universities, which are the universities with fewer than 10,000 students enrolled;

- Other Universities, which includes the SRs belonging to institutions of higher education and non-state universities.

Table 1: Characteristics of the SRs

University	Reporting Year	No. of Pages	Students (No.) 2011/12 year	Lecturers (No.) 31/12/2011	FFO 2011	Censis University Ranking A. Y. 2011/12
Mega Universities (more than 40,000 students) No. 11						
Università degli Studi di Firenze	2006	61	53,222	1,912	241,993,659	4
Università degli Studi di ROMA "La Sapienza"	2010	85	113,040	4,110	521,034,988	6
Università degli Studi di Bari Aldo Moro	2009	207	56,305	1,602	189,192,305	9
Big Universities (from 20,000 to 40,000 students) No. 15						
Università degli Studi di Pavia	2010	232	21,349	1,025	124,610,530	1
Università degli Studi di Cagliari	2008	74	28,676	2,023	122,987,798	4
Università degli Studi di Genova	2008/2010	196	34,209	1,368	181,044,768	5
Università degli Studi di Salerno	2009/2010	111	37,050	991	112,178,277	10
Medium Universities (from 10,000 to 20,000 students) No. 17						
Università degli Studi di Trieste	2009	318	18,126	709	96,995,473	2
Università degli Studi di Macerata	2011	124	10,116	308	36,902,849	6
Università degli Studi del Salento	2009/2010	181	19,426	670	80,364,052	10
Università degli Studi di Ferrara	2010	372	16,977	637	76,081,965	12
Università "Ca Foscari" Venezia*	2011	132	17,559	530	71,085,481	13
Small Universities (fewer than 10,000 students) No. 11						
Università degli Studi del Sannio di Benevento	2010	129	6,190	201	22,322,125	6
Università degli Studi Insubria Varese-Como	2007	158	8,719	383	40,268,160	7
Università degli Studi del Molise	2011	187	8,346	308	28,937,738	8
Other Universities						
Scuola Superiore di Studi Universitari e Perfezionamento Sant'Anna	2003/2004	177	NA	102	26,466,218	NA
Libera Università di Bolzano	2010	43	2,338	158	NA	NA

*Named as Sustainability Report

For each social report Table 1 shows in the first column the name of the university, in the second column the reporting year, in the third column the number of pages of SRs analysed, in the fourth, fifth and sixth column data on the size of the universities, measured respectively by three main aspects that are (Siboni *et al.*, 2013b): number of students and teachers, the amount of public funding received – FFO. Lastly, the seventh column indicates the position held by the universities analysed in the Italian Censis University Ranking (2013)⁴.

5 Results of the analysis

The current research examines the amount and nature of voluntary IC disclosure in Italian universities' SRs and investigates and gives insights about the internal perspective of university General Directors about IC management and disclosure. With reference to the former this paragraph illustrates: (1) the incidence of IC categories disclosed; (2) the frequency of IC category disclosed; (3) the typology of IC information disclosed (Discursive Forma, Numeric Form, and Quantified in Euro); (4) a ranking of incidence of IC categories disclosed based on the size of university analysed. The latter shows the results of a survey submitted to all universities.

Table 2 illustrates the incidence of IC categories disclosed by the SRs. The incidence has been calculated based on the total observations from the 17 SRs analysed, out of the total possible observations. The first column lists the IC categories (No.=8). The second column shows the sum of the indicators within the coding instrument (No.=39). The third column illustrates the observations from all the 17 SRs (No.=325). The fourth column gives the amount of potential observations from all the SRs (i.e. 17 SRs x 39 = 663). The last column displays the total index, giving the percentage of IC indicators of the coding instrument reported within the SRs. Out of the total 663, 325 were disclosed - that is 49.02% of the possible IC indicators that could have been reported by the 17 SRs.

Table 2: Incidence of IC categories in SRs

Management Challenges	Number of IC Categories (A)	Observations from all 17 ^s SRs (B)	Total possible observations (17 x A = C)	Total Index (B/C)
A. Human capital	10	80	170	47.06%
B. Structural capital	1	14	17	82.35%
C. Relational capital	8	72	136	52.21%
D. Research	7	48	119	40.34%
E. Education	5	39	85	45.88%
F. Commercialising	4	35	68	51.47%
G. Knowledge transfer to the public	2	20	34	58.82%
H. Services	2	18	34	52.94%
Grand Total	39	325	663	49.02%

As shown in Table 2 all the 8 IC categories were disclosed with an incidence ranging from 40.34% to 82.35%. The largest IC category is Structural Capital (82.35%), followed by Knowledge Transfer to the Public (58.82%), Services (52.94%), Commercialising (51.47%), Relational Capital (52.21%), Human Capital (47.06%), Education (45.88%),

and Research (40.34%). This suggests that the Italian universities' SRs have a focus on IC that ranks on average about 50%. Moreover, surprising is the minor role played by relational capital, that is instead the category that generally gains the main attention within IC disclosure (Dumay and Cai, 2014; Bezhani, 2010).

Table 3 illustrates the frequency of IC indicators reported. In the first column we listed the IC categories. In the second column we presented the sum of IC indicators. In the third and fourth column we listed the total citations reported from all SRs via absolute and percentage value.

Table 3: Frequency of recorded items

Categories	Indictores	Absolute Value (No.=1,824)	%
A. Human capital	A.1 Number of academic staff total	66	3.62%
	A.2 Number of research staff	39	2.14%
	A.3 Number of full-time professors	18	0.99%
	A.4 Teaching assistants	31	1.70%
	A.5 Fluctuation of scientific staff	26	1.43%
	A.6 Fluctuation of scientific staff (not employed)	5	0.27%
	A.7 Growth of scientific staff	31	1.70%
	A.8 Growth of scientific staff (not employed)	6	0.33%
	A.9 Average duration of scientific staff	5	0.27%
	A.10 Expenses for training	7	0.38%
Sub-Total A		234	12.83%
B. Structural capital	B.1 Investments in library and electronic media	60	3.29%
Sub-Total B		60	3.29%
C. Relational capital	C.1 Research grants abroad	6	0.33%
	C.2 International scientists at the university	17	0.93%
	C.3 Number of conferences visited	5	0.27%
	C.4 Number of conferences hosted	50	2.74%
	C.5 Number of employees financed by non-inst. funds	9	0.49%
	C.6 Number of activities in committees etc.	88	4.82%
	C.7 Hit rate EC research programs	250	13.71%
	C.8 New co-operation partners	295	16.17%
Sub-Total C		720	39.47%
D. Research	D.1 Publications (referred)	18	0.99%
	D.2 Publications (proceedings etc.)	1	0.05%
	D.3 Publications total	28	1.54%
	D.4 Number publications with co-authors from the industry	2	0.11%
	D.5 Habilitation	2	0.11%
	D.6 PhDs	62	3.40%
	D.7 Non-institutional funds (contract research etc.)	61	3.34%
Sub-Total D		174	9.54%
E. Education	E.1 Graduations	48	2.63%
	E.2 Average duration of studies	14	0.77%
	E.3 Teacher per student	13	0.71%
	E.4 Drop-out-ratio	10	0.55%

	E.5 PhDs and Master's theses finalised	10	0.55%
Sub-Total E		95	5.21%
F. Commercialising	F.1 Number of spin-offs	75	4.11%
	F.2 Employees created by spin-offs	2	0.11%
	F.3 Income generated from licences	35	1.92%
	F.4 Number of licences granted	69	3.78%
Sub-Total F		181	9.92%
G. Knowledge transfer to the public	G.1 Hits internet site	10	0.55%
	G.2 Lectures (non-scientific)	146	8.00%
Sub-Total G		156	8.55%
H. Services	H.1 Measurement and lab services and expert opinions	190	10.42%
	H.2 Leasing of rooms and equipment	14	0.77%
Sub-Total H		204	11.18%
		1,824	100%

As illustrated in Table 3, on one hand the frequency of IC categories is quite variable and varies from 'C' (39.47%) to 'B' (3.29%). With regards to IC indicators, we have found that all IC indicators on the coding instrument were reported. Nevertheless, generally speaking they obtained a very low frequency of reporting. In fact, only three IC indicators obtained a frequency over 5%. These are: New co-operation partners (16.17%), Hit rate EC research programs (13.71%), Measurement and lab services and expert opinions (10.42%) and Lectures (non-scientific) (8.00%).

Table 4 reports on the typology of information disclosed.

Table 4: Typology of recorded items

Typology	Absolute value	%
1 – Discursive Form	741	40.63%
2 – Numeric Form	651	35.69%
3 – Quantified in €	432	23.68%
Grand Total	1,824	100.00%

Table 4 shows the three-range scale used for content analysis (Discursive Form, Numeric Form, and Quantified in Euro) (first column), via absolute value (second column), and related percentage (third column).

As shown in Table 4, the 1,824 observations ranged from about a minimum of 24% of information quantified in Euro to about a maximum of 40% of information reported in discursive form. This result is consistent with the Bezhani (2010) study that found that most disclosure was in discursive form followed by numeric and quantified in currency. Also, a similar prevalence in discursive information has been found with reference to social report and planning documents in Italian public sector organisations (Mazzara *et*

al., 2010; Siboni *et al.*, 2013a; Farneti and Siboni, 2011). A possible explanation for the lack of financial information could be related to the fact that the Italian universities' funding system is mainly derived from the Ministry of Education, and therefore the universities are able to know how many financial resources are available only after the Ministry's funding allocation law.

Finally, Table 5 shows the analysis of the influence of the size of the universities (defined on the basis of the ranking of the universities shown in Table 1) on the amount of IC disclosure, in order to evaluate a possible relationship between university size and completeness of IC disclosure.

As emerged in Table 5 no relationship between the university sizes and the completeness of IC disclosure has been found. In fact, the total index showing the incidence of IC disclosure ranked from a minimum of 33.33% (referred to a Mega University) to a maximum of 74.36% (referred to a Medium University).

Table 5: University size and amount of IC disclosed

University	Censis University Ranking A.Y. 2011/12	IC Disclosure Total Index
Mega Universities (more than 40,000 students) No. 11		
Università degli Studi di Firenze	4	46.15%
Università degli Studi di ROMA "La Sapienza"	6	33.33%
Università degli Studi di Bari Aldo Moro	9	74.36%
Big Universities (from 20,000 to 40,000 students) No. 15		
Università degli Studi di Pavia	1	48.72%
Università degli Studi di Cagliari	4	35.90%
Università degli Studi di Genova	5	56.41%
Università degli Studi di Salerno	10	41.03%
Medium Universities (from 10,000 to 20,000 students) No. 17		
Università degli Studi di Trieste	2	64.10%
Università degli Studi di Macerata	6	46.15%
Università degli Studi del Salento	10	35.90%
Università degli Studi di Ferrara	12	74.36%
Università "Ca Foscari" Venezia*	13	38.46%
Small Universities (fewer than 10,000 students) No. 11		
Università degli Studi del Sannio di Benevento	6	61.54%
Università degli Studi Insubria Varese-Como	7	64.10%
Università degli Studi del Molise	8	53.85%

Finally, with reference to the second aim of the current research, related to the investigation of internal perspective of Italian universities on IC management and disclosure, in January 2014 an online questionnaire was submitted using Qualtrics Survey Software to all the university Director Generals (Annex 3). Just 15% of universities

answered to the survey by the deadline of 15th March 2014, therefore we have submitted a reminder of the survey fixing a new deadline for 15th May 2014. Thus, with reference to this second part of the paper the collection of data and related analysis is still in progress.

6 Conclusion

The last decade has witnessed an increasing relevance for IC at universities. In this path, a series of initiatives have been issued by the European Union and by several national governments in order to promote IC report at universities. Particularly, the Austrian Government in 2002 issued a law requiring universities and research intuitions to produce IC reports (UG, 2002). That law intends IC reports to be used as both a management tool and a disclosure report for external stakeholders. In such a context the IC report provides information about the university's activities, social goals, objectives and strategies, as well as an account for IC (broken down into human, structural and relationship capital).

In Italy IC report is not mandatory. Nevertheless, case study analysis undertaken by Italian literature (Ricci *et al.*, 2014) found IC disclosure within universities' SRs.

The current work analyses a group of 17 SRs issued by Italian universities in order to investigate the amount and the nature of IC disclosure. That analysis was undertaken in order to answer the call for comparative study made by Bezhani (2010).

With reference to the amount of IC information the current analysis found that Italian universities' SRs present an incidence of disclosure that involves several IC categories, ranking from about 40% to about 80%. Within IC categories disclosed, Structural Capital has gained the most attention, while Research was less mentioned. On the contrary, Bezhani's (2010) study found in general a very low disclosure for IC within UK universities annual reports. Also, Bezhani's (2010) study found that the most cited IC category was Research.

With reference to the typology of IC information disclosed, our study found that most IC information within SRs was discursive, however, with a limited variability among the different typology of information (Discursive Form, Numeric Form, and Quantified in Euro). This result is consistent with the Bezhani (2010) study, which found a similar prevalence of discursive IC information; nevertheless it deviates with reference to the variability of IC information since Bezhani's (2010) study found a wider variability among the different typology of information.

Finally, with regard to the size of universities, our study found that there are no factors relevant to explain differences in reporting IC disclosure. This result is aligned with the one found by Bezhani (2010).

Such results suggest that SRs could be considered a more appropriate document for finding information about IC rather than the annual reports, which have been criticised also by previous studies that have questioned whether that such documents are the more appropriated for including IC information (Bezhani, 2010; Dumay and Cai, 2014).

The conclusions of the current study, however, are affected by two major limitations. First, the group of documents analysed is small and does not represent all Italian universities but just the ones that have issued a voluntary social report. Second, in Italy an agreed guideline for shaping SRs does not exist and therefore each organisation decides on its own the information to include within such documents.

Despite the limitations highlighted above, we believe that this work represents a valuable initial step in assessing IC disclosure from Italian universities.

Notes

¹ Such structure has been designed on the basis of the experience of IC report undertaken by the ARC - Austrian Research Centers (Leitner, 2004).

² It is a process started in Europe in the ninetens in order to increase the quality of the research system and to make universities more comparable, competitive, dynamic, and transparent. This process has resulted in the introduction of a common system of degrees, an increase in the mobility of students, lecturers and researchers, the promotion of high quality teaching, and the creation of a European dimension for higher education. Accordingly, the university sector of all the countries which have joined the Bologna Process have experienced a season of university reforms aimed at increasing the autonomy of universities, introducing new funding formulas, giving a central role to performance measurement and efficiency, leading to the creation of national accreditation agencies and promoting the use of new managerial tools (Sánchez et al., 2007).

³ The GBS is a group composed of some Italian academics, researchers and practitioners on social reporting, which issued in 2008 a guideline for reporting on IC within the social report (GBS, 2008) addressed to profit, nonprofit and public organisations. This guideline assumes that IC must represent a section included within social and sustainability reports, since it shares the same multidisciplinary nature, requiring, as a consequence, similar metrics. Moreover, the guideline states that to measure IC there is no universally valid list of indicators, but it is necessary to measure stocks and modifications of its categories over time. It addressed both, and each organisation has to identify key intangibles in relation to its strategy and context, describe actions and commitments on their improvement, and evaluate their contribution to the achievement of its social vision.

⁴ The Censis University Ranking is an Italian university ranking developed each year by Censis, which is a very popular Italian research institute in social sciences, through the definition of a score based on:

- services (number of meals provided for members, number of posts and contributions accommodation for members residing outside the region);
- grants and contributions (expenditure of universities and institutions of the right to education for students in the total enrolment);
- structures (classroom seats/members; places Libraries/members; places laboratories /subscribers);
- website (score assigned to the websites of the universities on the basis of features and content);
- internationalization (registered foreigners on total enrolment, students who have spent a period of study or training abroad on the total number of members; Foreign students who have spent a period of study at the university of total members; expenditure of universities and institutions, the right to study in favour of the mobility of the total reported net of registered).

⁵ The number of observations is given by the total number of times in which each action and initiative has been cited at least once in all 17 SRs.

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Appendix

Annex 1: Example of content analysis compiled worksheets

Category (No. 8)	Indicator (No. 39)	Element Recorded (Yes=1; No=0)	Type of information (Discursive: 1; Numeric: 2; Quantified in €: 3)	Ref. page	Summary of Typology	Categories mentioned at least once	Sum of Categories mentioned at least once	Total detected Indicators	Sum of Indicators as per Categories
A	A1	1	2	20		1	3	1	5
	A2	1	2	20		1		2	
		1	2	40					
	A3								
	A4								
	A5	1	2	38		1		2	
		1	2	38					
	A6								
	A7								
	A8								
A9									
A10									
B	B1						0	0	0
C	C1						4	0	15
	C2								
	C3								
	C4	1	2	46		1		1	
	C5								
	C6	1	1	12		1		4	
		1	2	22					
		1	1	41					
		1	1	42					
	C7	1	3	21		1		1	
C8	1	2	13		1		9		
	1	1	23						
	1	1	24						
	1	1	31						
	1	1	46						
	1	1	46						
	1	1	46						
	1	1	46						
	1	1	46						
D	D1						3		4

	D2								
	D3	1	2	21		1		1	
	D4								
	D5								
	D6	1	2	30		1		2	
		1	2	30					
	D7	1	3	21		1		1	
E	E1	1	2	29		1	3	2	6
		1	2	29					
	E2								
	E3	1	2	38		1		1	
	E4								
	E5	1	2	30		1		3	
		1	2	31					
		1	2	31					
F	F1	1	1	23		1	3	6	11
		1	2	25					
		1	2	25					
		1	2	25					
		1	2	25					
		1	1	24					
	F2								
	F3	1	3	23		1		3	
		1	3	23					
		1	3	23					
	F4	1	1	22		1		2	
		1	2	23					
G	G1	1	2	48		1	2	1	8
	G2	1	1	31		1		7	
		1	1	42					
		1	2	46					
		1	2	46					
		1	1	48					
		1	1	48					
		1	1	48					
H	H1						0		0
	H2								
		49		1	19	18	18	49	49
				2	25				
				3	5				
					49				

Annex 2: Coding Instrument (Bezhani, 2010)

Category (8)		Indicator (39)	
<i>A</i>	<i>Human capital</i>	A1	Number of academic staff total
		A2	Number of research staff
		A3	Number of full-time professors
		A4	Teaching assistants
		A5	Fluctuation of scientific staff
		A6	Fluctuation of scientific staff (not employed)
		A7	Growth of scientific staff
		A8	Growth of scientific staff (not employed)
		A9	Average duration of scientific staff
		A10	Expenses for training
<i>B</i>	<i>Structural capital</i>	B1	Investments in library and electronic media
<i>C</i>	<i>Relational capital</i>	C1	Research grants abroad
		C2	International scientists at the university
		C3	Number of conferences visited
		C4	Number of conferences hosted
		C5	Number of employees financed by non-inst. Funds
		C6	Number of activities in committees etc.
		C7	Hit rate EC research programs
		C8	New co-operation partners
<i>D</i>	<i>Research</i>	D1	Publications (referred)
		D2	Publications (proceedings etc.)
		D3	Publications total
		D4	Number publications with co-authors from the industry
		D5	Habitation
		D6	PhDs
		D7	Non-institutional funds (contract research etc.)
<i>E</i>	<i>Education</i>	E1	Graduations
		E2	Average duration of studies
		E3	Teacher per student
		E4	Drop-out-ratio
		E5	PhDs and Master's theses finalised
<i>F</i>	<i>Commercialising</i>	F1	Number of spin-offs
		F2	Employees created by spin-offs
		F3	Income generated from licences
		F4	Number of licences granted
<i>G</i>	<i>Knowledge transfer to the public</i>	G1	Hits internet site
		G2	Lectures (non-scientific)
<i>H</i>	<i>Services</i>	H1	Measurement and lab services and expert opinions
		H2	Leasing of rooms and equipment

Annex 3: The Online Questionnaire

Default Question Block

Si ringrazia per aver scelto di partecipare all'indagine, la compilazione del questionario Le richiederà al massimo 5 minuti.

Le informazioni da Lei fornite verranno trattate in modo strettamente confidenziale e i risultati della ricerca saranno divulgati sotto forma aggregata allo scopo di fornire un quadro generale degli atteggiamenti riguardanti le aree oggetto di questa indagine.

Prima Parte

Informazioni generali sull'Istituzione e sul Compilatore

1.1 Si prega di fornire i dettagli relativi all'istituzione e alla posizione lavorativa ricoperta dal Compilatore

Istituzione:	<input type="text"/>
Nome e Cognome del Compilatore:	<input type="text"/>
Settore/Area organizzativa di appartenenza:	<input type="text"/>
Ruolo ricoperto all'interno dell'Istituzione:	<input type="text"/>
Contatti (Indirizzo email o numero di telefono):	<input type="text"/>

Seconda Parte

La gestione del Capitale Intellettuale

2.1 Indicare quali degli elementi di seguito elencati rientrano nel concetto del Capitale Intellettuale (è possibile selezionare più opzioni):

- capitale umano (competenze, titoli di studio e formazione ricevuta, capacità, know-how, esperienza, motivazione, capacità di adattarsi, tolleranza, soddisfazione e lealtà dei dipendenti, ecc.)
- capitale relazionale (Immagine/brand commerciale, fidelizzazione dei clienti, soddisfazione dei clienti, rapporti con i fornitori, capacità negoziale, ecc.)
- capitale strutturale (sistemi di documentazione e mansionari, routine, procedure, banche dati, software, utilizzo generalizzato delle tecnologie informatiche, capacità di apprendimento organizzativo, ecc.)
- tutti gli elementi sopra indicati
- nessuno dei precedenti

2.2 Nella Sua Istituzione è presente una figura organizzativa dedicata alla gestione del Capitale Intellettuale?

- Sì
- No
- Altro, specificare:

2.3 La Sua Istituzione si è dotata di una mappa formale delle componenti del Capitale Intellettuale presenti al suo interno?

- Sì
- No
- Altro, specificare:

2.4 Nella Sua Istituzione, le informazioni sul Capitale Intellettuale sono utilizzate per (è possibile selezionare più opzioni):

- la pianificazione degli obiettivi futuri
- la valutazione delle prestazioni individuali e organizzative
- il confronto delle prestazioni dell'Istituzione rispetto ai concorrenti
- la rendicontazione obbligatoria per legge
- la preposizione di una rendicontazione volontaria
- tutti gli elementi sopra indicati
- nessuno dei precedenti

Terza Parte

La rendicontazione del Capitale Intellettuale

3.1 La Sua Istituzione predispone uno o più documenti autonomi di rendicontazione del Capitale Intellettuale?

- Sì
- No
- No, però dedica una specifica sezione del Bilancio Sociale al Capitale Intellettuale
- Altro, specificare:

3.2 Nella Sua Istituzione è presente una posizione organizzativa dedicata esclusivamente alla rendicontazione del Capitale Intellettuale in tutte le sue componenti?

- Sì
- No
- Altro, specificare:

3.3 Dal 2006 la rendicontazione del Capitale Intellettuale è diventata obbligatoria per le Università austriache. Pensa che anche per le Università italiane dovrebbe essere introdotto un obbligo di questo tipo?

- Sì
- No
- Altro, specificare:

Eventuali commenti in riferimento alla precedente domanda (3.3)?

Quarta Parte - Finalità interne della Rendicontazione del Capitale Intellettuale

Selezionare l'opzione che indica il livello di accordo rispetto a ciascuna delle seguenti affermazioni

4.1 Supportare la pianificazione strategica

Totamente in Disaccordo Disaccordo Né in Disaccordo, né in Accordo Accordo Totalmente in Accordo

4.2 Pianificare le carriere

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.3 Supportare una formazione integrativa e continua

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.4 Assicurare una gestione/aggiornamento/diffusione sistematica della conoscenza all'interno delle istituzioni

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.5 Creare una cultura specifica all'interno dell'istituzione

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.6 Fidelizzare la propria forza lavoro

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.7 Rendere l'istituzione più flessibile

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.8 Stimolare l'innovazione

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Quarta Parte - Finalità Esterne della Rendicontazione del Capitale Intellettuale

Selezionare l'opzione che indica il livello di accordo rispetto a ciascuna delle seguenti affermazioni

4.9 Conformarsi alla legislazione

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.10 Attrarre finanziamenti

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.11 Attrarre e mantenere convenzioni con aziende ed enti pubblici

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.12 Dimostrare che l'istituzione applica le tecnologie più innovative nella propria gestione

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.13 Integrare i dati finanziari per consentire una migliore valutazione della performance gestionale

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.14 Verificare il posizionamento dell'istituzione rispetto ai principali concorrenti

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.15 Attrarre nuova forza lavoro

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.16 Attrarre più studenti

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.17 Dimostrare che la conoscenza e le risorse umane rappresentano il patrimonio più importante per l'istituzione

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.18 Dimostrare di essere un'istituzione innovativa

Totalmente in Disaccordo	Disaccordo	Né in Disaccordo, né in Accordo	Accordo	Totalmente in Accordo
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Attenzione! Premendo avanti il questionario verrà automaticamente inviato e non sarà più possibile compilarlo, salvo richiesta di riapertura inoltrata via mail inviata a: daniela.sangiorgi5@unibo.it

Factors affecting the effectiveness of knowledge interactions between university and industry: the case of Italy

Guido Capaldo

Department of Industrial Engineering, University of Naples Federico II
University Address: Piazzale Tecchio 80, 80125 Napoli

Nicola Costantino, Roberta Pellegrino *

Department of Mechanic, Mathematic and Management
Politecnico di Bari, Viale Japigia, 182 - 70126 Bari, Italy

Pierluigi Rippa

Department of Industrial Engineering, University of Naples Federico II
University Address: Piazzale Tecchio 80, 80125 Napoli

** Corresponding author*

Structured Abstract

Purpose - This paper presents the preliminary results of a research aimed at mapping the knowledge interactions between universities and industries in Southern Italy. We focused on a specific type of knowledge interactions, namely “research services”, that are activities that firms give to universities and that are regulated by specific contracts establishing objectives, deliverables and available financial resources. They include both research contracts and consulting activities. Despite the fact that research services, especially in technological departments, cover a significant percentage of the research funding in universities and results of these activities are also useful for the firms, allowing them to solve specific technological problems, scarce attention has been reserved to them by researchers.

Design/methodology/approach – Research services are characterized by high relational involvement of the parties, which strongly collaborate over more limited period of time if compared to other knowledge interaction types. To study this phenomenon, we adopted case studies approach. Two big Italian universities were the focus of our research. Main aim was the analysis and comparison of different recent “research services” activities carried out in the last two years. In the first phase of this explorative research, researchers from engineering department from University of Naples Federico II and from Politecnico of Bari and entrepreneurs that interacted with those researchers were interviewed. In the second phase, a cross-case analysis was developed, aimed at identifying recurring categories of data in all the analyzed case studies, namely variables affecting interactions positively, from the researchers’ and firm’s standpoints; and suggestions to facilitate the diffusion of research service initiatives between universities and firms, as expressed by firms and researchers.

Originality/value – This methodology puts in evidence some interesting elements that can contribute to the success and growth of knowledge interactions between firms and universities.

Practical implications – The outcomes of the analysis provide some managerial implications that can be useful for agencies supporting the innovation diffusion among firms and firms systems, for defining new policies and action plants aimed at making the knowledge interaction faster and more effective and therefore improve the innovation processes within firms.

Keywords – Knowledge interactions, University-industry relations. (*max 5 words*)

Paper type – Academic Research Paper

1 Introduction

In recent years, the “third mission” of the universities, namely the research collaborations between universities and firms, has increasing its importance, thus pushing many governments to introduce new policies aimed at encouraging the development of university-industry collaborations. In parallel, several studies have analyzed “knowledge interactions” between firms and universities. Most of the studies focused on different types of interactions or “channels” (Agrawal, 2001; Schartinger et al., 2002; Perkmann and Walsh 2007); the characteristics that affect the propensity to collaborate with firms, in terms of university departments and researchers’ features (D’Este and Patel, 2007; Schartinger et al., 2002) and in terms of firms’ features based on their ability to utilize externally generated scientific knowledge, such as the one transferred from universities (Agrawal, 2001).

In particular, the literature review on studies on this field has revealed two “open issues”. First, referring to the type of knowledge interaction, most of the works focused on research partnerships, that are “formal collaborative arrangements among organizations with the objective to co-operate on research and development activities” (Perkmann and Walsh, 2007). Less attention has been reserved to the “research services”, namely activities that firms give to universities and that are regulated by specific contracts establishing objectives, deliverables and available financial resources. They include both research contracts and consulting activities. In consulting activities, researchers exploit their existing expertise that is used to solve well-known problems, while in research

contracts, firms commission academic researchers to explore specific, previously unresearched aspects of a problem (Perkmann and Walsh, 2007).

Research services have lower costs respect to other types of knowledge interaction between universities and firms, but are more numerous, especially in technological departments. In Italy, they cover more than 30% of the research funding. Furthermore, they are characterized by high relational involvement of the parties, which strongly collaborate over more limited period of time if compared to other knowledge interaction types. The results of these activities are useful for both the firms, allowing them to solve technological problems, and the researchers, having the opportunity to apply their knowledge to new contexts and cases. Generally, the results of these activities are only submitted to committing firm without evidence on university websites. This explains why “an unknown share of these activities is not reported to department and university administration” (Perkmann and Walsh, 2007). Despite of the importance and diffusion of these types of interactions, the literature review on studies on university - industry interactions reveal that they rarely focus on these types of interaction (Hall et al., 2001).

Second, referring to the knowledge interactions effectiveness, most of the studies focus on the effectiveness on the side of the university, by analyzing the outputs of the research produced, directly or indirectly, by the collaboration, such as the number of scientific publications jointly written with firms; the number of Ph.D. theses jointly developed with firms, etc. To the best of authors' knowledge, no study analyses knowledge interaction effectiveness on the side of the firm (Stevens and Bagby 2001; Fontana et al. 2006; Perkmann and Walsh, 2007).

In this paper, we want to contribute to the growing literature on university-industry linkage by filling these gaps, namely by developing a research on a specific type of knowledge interactions, i.e., research services, and studying this interaction also from the side of firms. With this main aim, we developed an explorative research based on multiple case studies referring to 10 “research services” experiences between two big Italian universities, University of Naples Federico II and Politecnico of Bari, and Small Medium Enterprises (SME) located in the same area.

By conducting a cross case analysis, we find the most frequent categories of data in terms of: i) factors influencing interactions' effectiveness, as perceived by researchers and by firms; and ii) suggestions for improving interaction's effectiveness, from researchers and firms.

The outcomes of the analysis provide some managerial implications that can be useful for agencies supporting the innovation diffusion among firms and firms systems, for defining new policies and action plants aimed at making the knowledge interaction faster and more effective and therefore improve the innovation processes within firms.

2 Knowledge interactions between university and industry

Existing literature states the hypothesis that incremental innovation (and not just the radical one) can be achieved through interaction and collaboration between organizations (Chapman and Corso, 2005), and in particular through the direct interaction between the creators of knowledge and its users (Bessant and Venables, 2008). This is not just limited to large firms (Albors et al., 2005). In addition, it was shown that in the context of strategic management of knowledge, there has been a lack of practical guidelines to assist the management of knowledge transfer (Chilton and Bloodgood, 2008). There is a large body of research on the benefits of a possible collaboration between businesses and universities (Agrawal, 2001; Scharfetter et al., 2002; D'Este and Patel, 2007) but the absence of a more critical literature reflects the relative immaturity area of "knowledge management".

The universities play a crucial role in the society in that they are devoted to the production and transfer of knowledge. In this, they play three major roles within an innovation system (Smith, 1995). First, they engage in a general process of scientific research and thus affect the technological frontier of the industry in the long run. Secondly, the knowledge they produce is directly applicable to industrial production (prototypes, new processes, etc..). Thirdly, the universities provide important inputs to the process of industrial innovation in terms of human capital, both through training of graduates who become industrial researchers, both through the mobility of staff from universities to firms.

The emergent concept of open innovation (networked, interactive innovation) (Chesborough, 2003), however, suggests that the relationship between academia and industry - rather than generic links - play a more important role in the generation of innovations.

The links between university and industry and their impact on innovation processes have been analyzed in various academic communities (Agrawal, 2001; Hall, 2004; McMillan and Hamilton, 2003; Mowery and Nelson, 2004; OECD, 2002; Poyago-

Theotoky et al., 2002). Several studies investigate factors that have supported the growth of the connection between academia and industry, such as the change in the legislative environment (Mowery and Nelson, 2004), the public-private research partnerships (Stiglitz and Wallsten, 1999), and increasing political pressure for universities in order to improve national economic competitiveness (Greenaway and Haynes, 2000). The increasing linkage between university and industry is evidenced by several trends: an increased propensity for patenting by universities (Nelson, 2001), an increase in the proceeds from licensing universities (Thursby et al., 2001), a growing number of university researchers engaged in entrepreneurial projects (Shane, 2005), and the diffusion of technology transfer offices supporting the industrial collaboration and science parks (Siegel et al., 2003).

Recent studies show that a high rate of interactions between universities and industry lead to high economic performance in different countries (see *Executive Opinion Survey*, World Economic Forum, 2012). According to the data provided by the *World Competitiveness Index* (Report 2012), the countries that recorded the highest values of the degree of university-industry collaborations (UK, U.S., Germany and Japan) lead to an important growth of the internal GDP if compared to those countries with the lowest rate in the collaboration degree between universities and industries.

The university-industry collaboration can be enhanced through different modes - formal or informal - as well as the exchange of knowledge can occur through different types of channels (Schartinger et al., 2002). The analysis of these different types of channels is crucial in order to properly investigate the nature of the different types of interactions and the analysis of the factors that, at the regional level, may affect the volume and effectiveness of interactions.

The channels used to transfer knowledge depend on the characteristics of knowledge, such as the degree of codification, tacit or explicit nature and rooted in technological artifacts.

The different types of knowledge interactions represent different strategies to keep up with the two main requirements that affect the processes of industrial innovation: to ensure the efficiency of research (this covers a wide range of skills, reduction of costs and risks, exploitation of synergies, appropriation of the return of research) and gain access to scientific and technical opportunities (high quality researchers, research networks, tools, new knowledge, and so on) (Hicks et al., 1996; Katz and Martin, 1997).

The intensity of the flows of knowledge varies by type of knowledge interaction. Knowledge flows from academia to industry are assumed to be stronger in the case of interactions that are based on frequent face to face contacts. This seems to be particularly suitable for joint research projects, joint publications, mobility of academic researchers, and the creation of new spin-off companies. Furthermore, different types of knowledge interaction are associated with different types of personal relationships. Finally, the types of interaction differ in relation to the direction of the flows of knowledge associated.

A common feature of all the knowledge interactions is that they imply a certain flow of knowledge, whose exact scope, quality and effect is uncertain. This is a typical problem in this particular area of research. The creation of knowledge and its dissemination are intangible assets, which are difficult to measure. They are certainly not measurable in terms of what we normally think of as static variables (Grupp, 1990). Because of the intangible nature of knowledge flows, empirical studies face considerable difficulties in their identification and measurement.

3 The explorative research

The methodological approach adopted in this paper is an explorative research based on multiple case studies.

We chose the case study methodology for following reasons:

- the exploratory issue of our research aimed at explaining the presumed causal links between researchers and entrepreneurs/managers behaviors and success of research services experiences
- the need to understand in depth the phenomenon of knowledge interaction between firms and researchers
- the fact that such understanding encompasses important contextual conditions that are highly pertinent the phenomenon of study in the research (Yin 2009).
- research services, which are the focus of this research, are generally not reported on university departments websites or on reports/documents, thus justifying the study of the cases through interviews.

Data collection and analysis were made on the basis of following steps:

a) preparation of the check list for the interviews, which are aimed at exploring objectives leading the interaction, from firms and researchers' standpoints; factors

influencing interactions' effectiveness as perceived by firms and researchers; suggestions for improving the interaction effectiveness, by firms and researchers.

b) interviews for each selected case, conducted to a researcher or the research group manager and to the entrepreneur or the project manager designed by the firm. The process of interviewing consisted of eliciting the following information:

- Story of the interactions (aim, management and results)
- Perceptions of the two parties on the weakness and strengths of the interactions
- Opinions and suggestions by the two parties on initiatives that could foster the success of interactions between universities and firms

c) cross-case analysis, which was aimed at identifying recurring categories in all the analyzed case studies. In particular, these categories refer to: variables affecting interactions positively, from the researchers' and firm's standpoints; and suggestions to facilitate the diffusion of research service initiatives between universities and firms, as expressed by firms and researchers.

3.1. Sample

The sample analyzed in the study consists of 10 knowledge interaction cases between universities and firms in Italy, 5 cases related to University of Naples Federico II and 5 cases related to Politecnico of Bari.

The cases were selected according to the following criteria:

- *Types of interaction.* We focused on a specific type of interaction, the *research services*. This term refers to "paid-for services performed by university researchers for external clients" (Perkmann and Walsh, 2007). Research services include both research contracts and consulting activities. Contrarily to other types of interaction, which allow some degree of "academic freedom", research or consulting contracts define specific objectives and deliverables. Particularly, in the course of consulting activities researchers exploit their existing expertise for finding solutions to specific problems arisen in firms' technological and organizational contexts, while in the case of contract research firms commission researchers to explore specific and unresearched aspects of technological or organizational problems.
- *Success of interaction.* The sample that we analyzed includes only successful interactions, where the term "successful" refers to experiences ended within the

planned schedule and with full satisfaction of both parties. The choice of considering only successful cases is motivated by the aim of the research devoted to highlight strengths, on both the firm's side and the university's side.

- *Similarity of geographical contexts.* Both the universities that we analyzed are located in the Southern Italy, in Campania the University of Naples Federico II and in Puglia the Politecnico of Bari. They are two geographic contexts having some basic similarities, such as: the limited presence of large and medium firms, if compared to the number in North Italy; the high and increasing unemployment rate characterizing both regions; the presence of high qualified scientific and technical universities; an increasing number of small firms operating in knowledge-based sectors (software, biotech, consulting, etc). In both regions universities have assumed a growing role, both as suppliers of skilled professionals and as knowledge producers in emerging fields.
- *Similarities in the characteristics of departments and researchers.* Previous researches (D'Este and Patel, 2007) highlighted that university department characteristics (such as size, number of researchers, research fields, etc.) and researcher individual characteristics (ages, academic status, etc.) influence researchers disposition to set up networks with potential users of their researches. For this reason, with the aim of comparing the results of the 10 cases, we selected departments that do research in engineering fields and mostly on the industrial engineering field, with an average size of about 55 units of scientific personnel. Furthermore, in selecting research services experiences, we considered the age of researchers (35-40 years old) and their academic status (almost all the researchers interviewed are assistant professors).
- *Similarity in field of science/scientific disciplines.* All the selected case studies refer to research services experiences in the field of industrial engineering (Aerospatial, Mechanical, Managerial) or information.
- *Period.* We selected only experiences carried out and concluded in the last two years.

Table 1 and 2 describe the characteristics of the 10 selected cases of knowledge interaction for Politecnico of Bari and University of Naples Federico II, respectively.

Table 1. Description of selected case studies at Politecnico of Bari

n r	Knowledge Interaction's focus	Dept	Field of science	Firm's industrial sector	Interaction type
1	Maintenance management of productions systems	Industrial Eng.	Eng.	Automotive	Consulting
2	Aluminum alloys for new prototypes realization	Industrial Eng.	Eng.	Automotive – stamp construction, Body in White production	Research contract
3	Innovative technologies	Industrial Eng.	Eng.	Mechanics	Research contract
4	Electric motors for aeronautic use	Industrial Eng./Informatics	Eng.	Aeronautics	Research contract
5	Logistics optimization	Industrial Eng.	Eng.	Sofa production	Consulting

Table 2. Description of selected case studies at University of Naples Federico II

n r	Knowledge Interaction's focus	Dept	Field of science	Firm's industrial sector	Interaction type
1	Energy efficiency	Industrial Eng.	Eng.	Energy	Research contract
2	Building energy balance	Civil Engi.	Eng.	Construction	Consulting
3	Quality of work performance increase	Industrial Eng.	Eng.	Aerospace	Consulting
4	Systems refrigerants replacement	Industrial Eng.	Eng.	Engineering	Research contract
5	Consortium accounting	Industrial Eng.	Eng.	Service	Consulting

4 Results analysis

The results of the interviews with firms' managers and researchers are reported in the Appendix. In particular, as previously explained, for each case we investigated the opinions of firms' managers and researchers focusing on the following three key aspects:

1. Objectives leading the interactions
2. Interactions' strengths as perceived by researchers and managers
3. Suggestions for improving interactions' effectiveness

After the within-case descriptive analysis (see Appendix), a cross-case analysis took place, following the guidelines set out by Eisenhardt (1989), Miles and Huberman (1994), and Patton (2002). The comparison of the ten case studies made it possible to examine similarities and differences across multiple cases, and to identify cross-case patterns also

essential for enhancing the generalizability of conclusions drawn from single cases (Voss et al., 2002).

In order to identify common and frequent categories of data, we focused on two of the three key aspects, which were object of analysis in each case study, namely i) factors influencing interactions' effectiveness, as perceived by researchers and by firms; and ii) suggestions for improving interaction's effectiveness, from researchers and firms. We do not address this analysis for the first aspect, that is the objectives of the knowledge interaction, since the specific type of the knowledge interaction that we considered (i.e., research services) has generally well-defined objectives.

We first realized a coding process of the results of each case. Codes are defined as tags or labels for assigning units of meaning to the descriptive or inferential information compiled during a study (Miles and Huberman, 1994). Concepts that are found to pertain to the same phenomenon are grouped to form categories, which are higher level, more abstract concepts which must be developed in terms of their properties and dimensions.

The results of the cross case analysis are summarized in following tables (Tables 3-6).

First of all, it is interesting to note the similarity of findings in the two geographic groups, confirming the validity of the initial hypothesis about the similarity of the two universities and geographical contexts.

Going into details of the findings, Tables 3 reports the factors influencing interactions' effectiveness, as perceived by firms. As the frequency of answers in each category of data shows, the majority of firms (over 5 out of 10) has declared that variables mostly positively affecting the interaction are the researchers' motivation and commitment, interpreted as respect of time of meetings and deliverables by researchers.

Table 3. Factors influencing interactions' effectiveness, as perceived by firms

Category	Bari	Naples	TOT
The research group supported the identification of the specific technological problems to be addressed	3	3	6
Researchers' effort, commitment and motivation	4	5	9
Objectives and schedule sharing	1	4	5
Objectives, activities, deliverable and time planned with researchers	2	3	5
Coherency of time of activities, between firm and researchers	2	3	5
Researchers respected time of meetings	3	4	7
Researchers respected deliverables	4	4	8

Researchers monitored the work in progress	3	3	6
Researchers developed an adequate communication and reporting system for the firm	2	1	3
Financial budget coherent with effort	1	1	2

Table 4 shows the factors influencing interactions' effectiveness, as perceived by researchers. As data show, the researchers perceive as determinant for the success of the interactions the clear understanding of the technological problem to be addressed by the firm. This is coherent with the type of knowledge interaction that we are analyzing, namely the research services, that are regulated by specific contracts, with well defined issues. In line with the firms' opinion, the researchers perceive also important the commitment of the firm, the possibility of planning objectives, deliverables and schedule together with the firm as well as the ability of firm to facilitate the access to data by researchers.

Table 4. Factors influencing interactions' effectiveness, as perceived by researchers

Category	Bari	Naples	Tot
The firm has a clear understanding of the specific technological problems to be addressed	4	3	7
Commitment of entrepreneur of top management	4	3	7
The firm has designed a project manager with adequate technical skills	3	3	6
Objectives, activities, deliverable and time planned with firms	3	3	6
Coherency of time of activities, between firm and researchers	1	1	2
Availability of data and information	3	3	6
Firms respected time of meetings	3	3	6
Financial budget coherent with effort	2	1	3

Table 5 reports the suggestions for improving interactions' effectiveness, provided by firms. The most frequent category (over 5 out of 10 cases) is the organization of periodic meeting with firms.

Table 5. Firms' suggestions for improving interactions' effectiveness

Category	Bari	Naples	TOT
The department website could facilitate the access to information on technological skills to be used in innovation processes	3	2	5

Use of Social Network to facilitate the diffusion of research results, thus increasing collaborations with industrial world	1		1
Organize periodic meeting with firms to present research projects and ideas	4	4	8
Build a shared set of research themes that are interesting for both parties	3	1	4
Strengthen collaboration with researchers in order to participate to national or European funding	3	2	5

Finally, Table 6 summarizes the findings on the researchers' suggestions for improving interactions' effectiveness.

As the data show, among the most important elements to improve the effectiveness of the interaction with the firm (based on the most frequent category of data), the researchers put the organization of periodic meetings among firms and universities, in line with the opinion of firms. At the same level of importance, the researchers identify also the diffusion of the research findings within the industrial world and the participation to national or European funding with firms.

Table 6. Researchers' suggestions for improving interactions' effectiveness

Category	Bari	Naples	TOT
Improve the communication strategies on the research done within the department	5	3	8
Improve the department's website	3	2	5
Use of Social Network to access to research results achieved by researchers in the department	0		0
Organize periodic meetings among firms and universities in order to present research ideas and projects	4	4	8
Build a shared set of research themes that are interesting for both parties	3	2	5
Strengthen collaboration with firms in order to participate to national or European funding	5	3	8

5 Discussion and implications

Although this is an explorative research that does not allow a generalization of the results that is always acceptable, the findings of this study highlight some interesting elements that could be taken into account in developing university policies aimed at increasing research services activities.

The findings of the cross-case analysis, in fact, suggest that it would be valuable to invest on three important aspects:

- strengthening the contact opportunities between firms and researchers, also by using online forum
- diffusing and divulging research results within the industrial world
- exploit national or European research funding

As for the first element, in all the 10 selected cases, the researcher has been known by reading one publications of his or during conferences and meetings. Very rarely the contact between researcher and firm has been created by the university department website or has been promoted by institutions/offices supporting the technological transfer.

The contact, that, generally speaking, can be *direct* (entrepreneur and research meet each other occasionally during a conference, meeting or working seminar) or indirect (the entrepreneur knows the possibility of revenging help by the researcher in addressing technological problems by reading one of his papers/reports) is therefore mainly occasional. In other words, the university-industry interactions that, according to the findings of our study, culminate in effective collaborations are mainly interactions without any forms of brokerage.

The research findings therefore suggest that it would be useful that policies for SME innovations support and increase the contact opportunities between the two worlds.

This consideration can be used to understand (with all the needed cautions due to the small number of cases analyzed) the failure or insuccess of some of the recent policies for supporting SME innovation and technological transfer from the university to industry. In particular, we refer to those policies that base on the central role of the intermediation or brokerage between the innovation demand expressed by SME and the technological knowledge offer by researchers. This intermediation service is generally carried out by specific agencies or experts.

The leitmotiv therefore should be “multiply the contact occasions between the two parties”, namely define policies supporting and facilitating the contact between parties and making the information flow more complete and effective. Living in a virtual world, this contact could be also created “virtually” through online forum that could allow SME to meet a researchers’ community in order to obtain solutions to several R&D problems (an example is the experience of InnoCentive (www.innocentive.com)).

As for the second element (that is the diffusing and divulging research results within the industrial world), very often entrepreneur “meets” or knows a researcher by reading one of the scientific papers published by the researcher on international journals.

Therefore, a question raises spontaneously: how to facilitate the understanding by entrepreneurs of technological issues that could be interesting for pushing innovation within their firms, considering the two challenges represented by the limited time that entrepreneurs can devote to this activity, and the scarce popularity of scientific papers?

One of the possible proposal to address this open question could be the following:

- classify the scientific journals, where researchers publish their papers, on the basis of technological areas that could be object of interest for specific industrial sectors
- define, along with a sample of entrepreneurs, a set of criteria for selecting paper that could be interesting for them
- Periodic analysis of journals content
- Develop synthetic “abstracts” that highlight aspects that could be relevant for firms (such as product innovation, process innovation, management systems, energy savings, etc.)
- Publish abstract in apposite sections of department websites

All these suggestions could potentially be very useful for the entrepreneur since he/she could gather more information, of better quality and geared towards firms’ needs.

Finally, as for the last aspect of strengthening firm-university collaboration in order to participate to national or European funding, it is provided as suggestion for improving effectiveness by researchers. This confirms that in a panorama of decreasing resources, researchers see the collaborations with firms as a good chance of accessing to new channels for funding research.

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Appendix. Results of individual case studies

A) Objectives leading interactions, from firms and researchers' standpoints in cases of Politecnico of Bari

nr	Firms' objectives	Researchers' objectives
1	Advanced techniques for optimizing the maintenance management of productions systems	Apply research method and knowledge of the research group to new contexts Exploit new cases to develop new methods and research projects Develop new research streams and projects jointly with the firm Funding research through new ways Improve the reputation of the research group in the industrial sector
2	Study the super-plastic behavior of some aluminum alloys with the aim of optimizing the Blow Forming process with the realization of new prototypes	Have new contexts and cases to apply scientific knowledge already strengthened and developed
3	Development of innovative technologies	Exploit a real case study to formulate research hypothesis, objectives and methodology Apply scientific knowledge of the research group to new contexts Use real case issues to develop new research projects Improve scientific reputation Create occasions to let the industry know the research group
4	Develop highly efficient electric motors for aeronautic use	Exploit real cases to test research hypothesis and knowledge already developed by the research group Possibility of develop new knowledge by using real issues faced by industries Possibility of starting new research activities Possibility of exploiting new funding channel of research activities Foster product innovation and take out a new patent Improve the scientific image of the research group through the joint work with the industry
5	Develop software for optimizing logistics and solving tridimensional problems of Container Loading and Vehicle Routing	Solve industrial issues through the application of knowledge and skills of the research group, thus creating new occasions to develop new knowledge and research projects

B) Objectives leading interactions, from firms and researchers' standpoints in cases of University of Naples Federico II

nr	Firms' objectives	Researchers' objectives
1	Increasing the energy efficiency of a large existing property	Replication of previous empirical scientific research in new contexts Refinement of previous research experiences through the recalibration of existing models Possibility of increasing scientific knowledge and methodological
2	Define the energy balance of the building, locate the technological redevelopment, to evaluate each project technical and economic opportunities, improving the conditions of comfort and security, reduce management costs	Application of new methods and models to real-life contexts Ability to identify new lines of research funding Ability to develop new theoretical and methodological knowledge increases

3	Better governance changes imposed by the market by increasing the quality of work performance	Increase the level of knowledge modeling Identification of new forms of research funding Realization of application instances to improve the scientific reputation
4	Assessing the possibility of replacing the refrigerants used in air conditioning systems (operating with the refrigerant R22) in order to reduce energy consumption	Development of new networks to access new sources of funding Entificare new channels for research funds Identification of novel contexts of application for the calibration of models and tools for investigation
5	Define a unitary system of accounting for all the companies in the consortium (definition of revenue centers, cost centers, intermediate, cost objects and relations among them)	Search for new forms of financing Relations with major enterprises to increase the reputation of the research group at external organizations and associations Application of models and methods in new application contexts

C) Factors influencing interaction's effectiveness as perceived by researchers and managers in cases of Politecnico of Bari

nr	Firms' opinion	Researchers' opinion
1	Research were highly motivated Do the tasks according to plan consistent t with the research group availability The research group respected the time of meetings The research group realized the deliverables, according to the contents and time planned	Identification of the specific technological issue by the firms Interest by the firm in the research activity The firm identified a project manager with adequate technical skills
2	The research group was helpful in supporting the identification of the problems to be addressed Researchers had a strong commitment to doing the activity The research activities were adequately planned The meeting were respected The deliverable were realized as planned The research group carefully monitored the woks in progress The research group adequately reported the activities done to the firm	The project manger designed by the firm had a clear understanding of the technological problem to be solved The project manager had a strong commitment in the project The firm choose a project manager with adequate professional skills The project objectives, deliverables and timetable have been planned together with the project manager Both the firm and the research group planned coherently research activities to be done The firm allowed researcher to access data and information needed The firm respected the time of the project and meeting The financial resources to do research activities were adequate
3	Competence of the research group in identifying and formulating the scientific problem High commitment by researchers The activities planning (time and content) was shared by the firm and researchers Meetings were planned adequately Researchers respected deliverables The researchers monitored and reported the activities during their execution	Clarity of the technological problem to be solved by the firm Commitment by the firm Competency and skills of the project manager selected by the firm objectives and activities were planned jointly by parties Easiness of gathering data and information The firm respected the schedule of meetings
4	Researchers supported the firm in identifying the scientific problem The researchers showed great effort in doing the research activity The time and objective were defined together The research group collaborated in planning objectives, activities and time The researchers respect the deliverables The researcher constantly monitored the activities done	The firm formulated the rproblem to be addressed Top management commitment Skills of the project manager Objectives were jointly defined Availability of information The firm participated to the scheduled meetings Budget proportional to the effort required

	The financial budget was coherent with the effort required	
5	<p>Researchers supported the firm in defining adequately the problem object of study</p> <p>Researcher were strongly involved in the process</p> <p>Researchers defined objectives and time</p> <p>Researchers supported the firm in planning the activities</p> <p>Researchers respect the deliverables</p> <p>Researchers monitored adequately the works ion progress</p>	<p>The firm well knew the problems</p> <p>Interest and commitment by the top management in research activities</p> <p>Activities planned together with researchers</p> <p>Data available</p> <p>Active participation to meetings</p>

D) Factors influencing interaction's effectiveness as perceived by researchers and managers in cases of University of Naples Federico II

nr	Firms' opinion	Researchers' opinion
1	<p>The research group has joined our firm in the project at every stage</p> <p>Researchers were very involved in the project</p> <p>There has always been alignment in respect of time of the project, both in the planning phase that at run</p> <p>The project has been kept under control by researchers in respect of timing and results</p>	<p>The company has shown interest to collaborate actively</p> <p>The company has partners who have made collaboration easy and efficient</p> <p>The company carefully to respect the time of project</p>
2	<p>Competence and dedication of the research group</p> <p>Ability to maintain parity between the objectives of the project on the implementation phase of the same</p> <p>The research group has always respected the times and project deliverables</p> <p>Timely and proper conduct of the project</p> <p>Efficient use of communication tools</p>	<p>Competence and dedication of the research group</p> <p>Ability to 'maintain parity between the Objectives of the project on the implementation phase of the same</p> <p>The Research Group Has always respected the times and project deliverables</p> <p>Timely and proper conduct of the project</p> <p>Efficient use of communication tools</p>
3	<p>Precise organization of the activities to be carried out</p> <p>Ability of the research team to support the company in the development of each phase of the project</p> <p>Compliance by the research group of the design requirements</p> <p>Good ability of the research team to observe the state of progress of the project</p> <p>Good planning of the necessary financial resources to carry out the project</p>	<p>The company has clearly identified the technological problem to be addressed</p> <p>The top management has always shown the present and attentive to the development of the project</p> <p>The company has selected a project manager able to communicate promptly with the research group</p>
4	<p>The research group has supported at every stage of the business</p> <p>The research group has complied with the times so as to project</p> <p>The research group has supported the company in defining the objectives of the project</p> <p>Researchers met all the deadlines</p> <p>The researchers monitored and used a proper system of communication on activity</p>	<p>The company has always had a clear objective of the collaboration</p> <p>The company respected the development of the project on time and within the costs constraints</p> <p>The company has always shown great willingness to provide any information necessary</p> <p>The company has always been present at all meetings and meetings for the development of the project</p>

5	<p>Research group has joined the firm in identifying the technological problem</p> <p>The research team has played with dedication all project activities</p> <p>Research group has always shared time and objectives of the collaboration with professionalism</p>	<p>The company has stated from the outset and clearly the problem of object technology collaboration</p> <p>The commitment from the top management has always been alive</p> <p>The company has made available a trained and competent human capital</p>
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E) Suggestions for improving interaction's effectiveness, by firms and researchers, in cases of Politecnico of Bari

nr	Firms' suggestions	Researchers' suggestions
1	<p>Organize meeting between firms and researchers</p> <p>Identify research themes that are interesting for both universities and firms</p> <p>Exploit national and European funding to collaborate with universities</p>	<p>Improve the strategies of research communications by the department</p> <p>Improve the department's website</p> <p>Organize periodic meetings with the industry</p> <p>Develop a list of research streams that are interesting for both parties</p> <p>Participate to projects financed by national and European funding</p>
2	<p>Share a set of research activities with the firms</p> <p>Exploit public funding to support the research</p>	<p>The department should invest on the communication of research done by research group</p> <p>Improve the website to divulgate the research done within the department</p> <p>Collaborate with firms to define new research project financed with public funding</p>
3	<p>Access to technological knowledge through universities' websites</p> <p>Match the scientific interests of universities and firms</p> <p>Strengthen collaboration with universities</p>	<p>Improve the communication of the research by the department</p> <p>Organize periodical meetings between universities and firms</p> <p>Exploit public funding to develop research projects</p>
4	<p>Facilitate the access to information on the research done by the department through the website</p> <p>Search new ways of funding research projects</p>	<p>The department should facilitate the access to information on the research</p> <p>Enrich the website</p> <p>Organize periodic meetings with firms</p> <p>Define a set of common interests between universities and firms</p> <p>Develop research projects with firms</p>
5	<p>Improve the website of the university</p> <p>Meetings with universities as a way of exchanging research ideas and projects</p> <p>Collaborate with firms</p>	<p>Divulgate the research activities done within the department</p> <p>Organize meetings with firms to share research projects</p> <p>Listen to the needs of firms and consequently develop research projects to be financed by national and European funding</p>

F) Suggestions for improving interaction's effectiveness, by firms and researchers, in cases of University of Naples Federico II

nr	Firms' suggestions	Researchers' suggestions
1	<p>Use departmental websites to access information on the specific skills of researchers</p> <p>Using communication tools to disseminate and communicate such social interactions</p>	<p>Using the most effective means of communication on the part of departments</p> <p>Increase the degree of interaction between research and industry in order to intercept the largest sources of funding</p>

2	Using the most effective tools of communication on the part of departments Increase the degree of interaction between research and industry in order to intercept the largest sources of funding	Increase visibility by departments outside of its powers Largest organization of events in which researchers and entrepreneurs can meet
3	Organization of meetings between companies and researchers Creating catalogs of technological expertise of researchers Development of partnerships for participation in invitations to national and European funding	The department should use the best tools of communication with the outside Should be organized regular meetings in which entrepreneurs and researchers can initiate collaborations
4	Organization of meetings between researchers and entrepreneurs Development and dissemination of a repertoire of skills and research topics of common interest between researchers and companies	Improving the website of the university / department Increase opportunities where they meet researchers and entrepreneurs
5	Improve communication on the part of departments Step up meetings with researchers	The department should make the most effective strategies of communication with the outside Increased participation in bids for funding in partnership with business

Urban living labs: learning environments for collective behavioural change¹

Grazia Concilio *, Francesco Molinari

Dipartimento di Architettura e Studi Urbani
Politecnico di Milano
Via Golgi 39, 20134 Milano

* *Corresponding author*

Structured Abstract

Purpose – Urban Living Labs (ULLs) are emerging as user driven, open innovation environments characterized by a strong emphasis on knowledge creation. In ULLs innovation arises by the activation of collective awareness and individual learning processes, which ultimately lead to large-scale behavioural change. How this takes place is often the result of complex and concurrent dynamics of several distinct elements of the socio-spatial system that we see embedded in a city or neighbourhood.

This paper aims at exploring the link between knowledge production and behavioural change, using concept of “triple loop learning” (Tosey et al., 2012) as theoretical lens.

Design/methodology/approach – How triple loop learning occurs in ULLs is the fundamental question of our research. There must contexts transformed into proper learning environments, where people reflect together while individually engaging on the co-design of solutions that are then collectively implemented and assessed.

In order to explore the LLs potential for urban innovation, the authors adopt the SECI model (Nonaka and Takeuchi, 1995) to map “triple loop learning” and link learning cycles to behavioural changes referring to the results of the Periphèria project funded under the CIP (ICT-PSP) program.

Originality/value – Innovation systems have been, and still are, widely studied and analysed in the perspective of sustainability. Similarly, it is widely shared that cities, and in general urban systems, are the most promising environments to respond to the global challenge of sustainability by appropriately developed solutions. Despite the above, little attention has been paid to the links between innovation and durable behavioural change in urban communities. The paper aims at filling in this gap by highlighting the importance of shared experiments, typical of ULLs, in driving (triple-loop) learning processes able to make innovation sustainable, from the individual up to the collective scale.

Practical implications – The paper aims at strengthening the value of ULLs and social innovation in support of public service improvement and/or radical change in groups and societies. The resulting methodological framework can be easily translated by public administrators in the perspective of public services innovation. ULLs, in fact, are demonstrating to be highly productive environments, dense in opportunities for collective

¹ This article builds on some results of the EU-funded project Periphèria (CIP ICT PSP Programme - Grant Agreement No. 271015). The usual disclaimer applies to the funding institutions.

learning: here learning is not limited to the most active citizens but also involves local government representatives, who can continuously check their own way to interpret public roles by testing new opportunities for sustainable development together with the citizens, thus becoming direct agents of innovation.

Keywords – Urban Living Labs, Social Innovation, Public Service, Collective Learning, Behavioural Change.

1 Introduction: the cognitive value of Urban Living Lab environments

Urban Living Labs (henceforth: ULLs) are rapidly emerging as user driven, open innovation environments. The essence of the living lab approach (Eriksson et al., 2005) is to integrate users in the development and testing of new products and services in their daily lives. By so doing, users become active parties in the solution development process, providing relevant feedback on prototypes in real-life-like working conditions (Ståhlbröst and Holst, 2013). In a ULL, users are typically city residents and other community stakeholders; the issues of varying nature and complexity tackled by the new prototypes are normally related to public service delivery or local development policies (Juujärvi and Pesso, 2013); and the citizens actively engage in the co-design of solutions together with civil servants and policy makers (Concilio and Rizzo, 2012).

Therefore, a ULL can be defined as a creative community of people (Mulder, 2012) producing innovation at urban level with the support of a number of methods and tools (Friedrich et al., 2013) helping to co-create value out of the experience of interaction (Pallot, 2009) between the citizen/customer and the public/private service provider (Prahalad and Ramaswamy, 2004). How this takes place is often the result of complex and concurrent dynamics of several distinct elements of the socio-spatial system that we see embedded in a city or neighbourhood. Therefore, innovation in such environments has a prominent socio-spatial nature, which is more likely to take on a distinct pattern than individual or social creativity (i.e. the structured or unstructured idea generation pathway of a single actor or social group).

In this paper, we would like to emphasize the connection between the communitarian interactions that make up a ULL, the generation of new knowledge as dependent on (or influenced by) these experimental interactions, and the co-creation of sustainable value for and by the participant actors.

To this end, we adopt the “triple-loop learning” concept (Tosey et al., 2012), seen as a level of awareness and knowledge that is beyond, and probably superior, to Argyris and

Schön's (1978) single- and double-loop learning conceptualisations. We will specifically argue that, while individually engaging on the co-design of new and innovative solutions (for instance, a new public service or the improvement of an existing one), people reflect together and integrate individual with collective experiences, making the communitarian dimension become as relevant and valuable as the individual one. Additionally to that, when turning to experimental implementation and assessment of prototype solutions in a ULL context, we speculate that people become subject to transformational shifts in what they see as the most desirable ways of community living, which induces transitory or permanent changes in their individual and collective behaviour.

Willing to provide evidence in support of the above statements, which we summarize as highlighting "the cognitive value of ULL environments", we organise the remainder of the discussion as follows:

- In Section 2, we explore the relationship between knowledge creation and the innovation processes holding a specific character of "situatedness" (Gero, 1998). We do so by mapping the ULL design, discovery and implementation activities onto the four processes making up the SECI model as originally proposed by Nonaka and Takeuchi (see Takeuchi and Nonaka, 1986; Nonaka, 1991; Nonaka and Takeuchi, 1995). SECI are the initials of Socialization, Externalization, Combination and Internalization, which constitute the successive stages of an iterative learning path, moving from tacit to explicit knowledge and vice versa, and involving individual as well as groups of people within an organisation.
- In Section 3, we use the triple-loop learning concept to describe how the dynamics of reflection and discussion, rather than the mere information used or provided as part of the co-design activity within a ULL, foster the creation of relational capital at micro scale, which triggers behavioural change in a similar way to that described by Döös and Wilhelmson (2011), i.e. as the consequence of a shared distribution of experimental tasks.
- In Section 4, we collect evidence from the Periphèria project, a 30-month Pilot B action funded by the European Commission under the CIP ICT PSP Programme (November 2010 - May 2013), which aimed at deploying convergent Future Internet platforms and services for the promotion of sustainable lifestyles within and across emergent networks of "smart" peripheral cities in Europe. Periphèria used the Living Lab approach shifting technology research and development out

of the closed laboratories and into the real world to demonstrate that, when citizens are involved in public service co-design activities (typical of ULLs), behavioural changes can occur in the direction of sustainability.

- Section 5 draws some conclusions and implications for future work, particularly concerning the scalability analysis of the socio-digital innovations developed in the ULL environments.

2 Mapping service co-design onto the SECI model

According to Marc Pallot (2009), a Living Lab is a user-centred open innovation ecosystem integrating concurrent research and innovation processes within a business-citizens-government partnership. From a procedural point of view, it can involve four main activities, in a cyclically recurrent or increasingly mature fashion, namely Co-creation, Exploration, Experimentation and Evaluation. According to the P2P Foundation (2011), the concept of Co-design is directly related to, or is a specific instance of, Co-creation. In particular, by Co-design it is usually made reference to collective creativity being applied across the whole span of a product, service or technology development process.

In our own view, Co-design can be looked at as a spiral process made up of Design, Implementation and Discovery activities (the latter often resulting from the assessment of consequences of received feedbacks), like the following diagram exhibits. While Design or Implementation per se typically lead to service ideation or artefact making, Co-design as a whole implies something more, namely the generation of new knowledge (Manhães et al., 2010). Thus, we might characterize Co-design as a particular form of knowledge creation (Evenson and Dubberly, 2011).

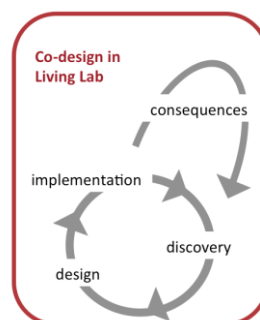


Figure 1 – Co-design in Urban Living Labs

In ULLs, where Co-design is key to innovation, this production of new knowledge is a collective activity (Concilio and Celino, 2012). In addition, knowledge production is more practice based than theory driven there (Juujärvi and Pessa, 2013).

Potentials for learning dynamics have hardly been noted by extant literature on technology or policy driven Living labs (Bergvall-Kareborn and Stahlbrost, 2009; Svensson et al., 2010), while they are more familiar to relational economic geography scholars (Sunley, 2008) as well as marketing practitioners (Prahalad and Ramaswamy, 2004). The link between knowledge production and learning is not obvious and needs to be explored operationally. To this end, we adopt the well-known SECI model proposed by Nonaka and Takeuchi as a framework for describing co-design activities in a learning perspective.

According to these authors, ongoing knowledge creation is the source of continuous innovation and continuous innovation is the source of sustained competitive advantage. The dynamics according to which knowledge is created and an organisation can learn over time, move from tacit knowledge to explicit knowledge and vice versa according to four main processes¹:

- Socialization (tacit to tacit) “is the process of converting new tacit knowledge through shared experiences in day-to-day social interaction”;
- Externalization (tacit to explicit) is a process whereby “tacit knowledge is articulated into explicit knowledge...so that it can be shared by others to become the basis of new knowledge”;
- Combination (explicit to explicit) is a process whereby “explicit knowledge is collected from inside or outside the organization and then combined, edited, or processed to form more complex and systematic explicit knowledge... The new explicit knowledge is then disseminated among the members of the organization”;
- Internalization (explicit to tacit) is a process whereby “explicit knowledge created and shared throughout an organization is then converted into tacit knowledge by individuals... This stage can be understood as praxis, where knowledge is applied and used in practical situations and becomes the base for new routines.”

¹ *Quotations are from Nonaka and Takeuchi (1995)*

SECI are exactly the initials of these four processes, which particularly occur within a shared context that the authors call “Ba” and that “enables a dialectic process among the actors” of a given organisation. The latter can be regarded as “an organic configuration of various Ba, where people interact with each other and the environment, based on the knowledge they have and the meaning they create”.

Now we think that the Co-design concept can be mapped onto the SECI model as per the following scheme (see Figure 2). In particular, Design and Implementation activities are respectively overlapping the Socialization - Externalization and the Combination – Internalization sequences. For instance, in ULLs, quite often the Design phase starts with a Socialisation process, or the individual realisation of the shared context (or “Ba”) that defines the socio-spatial system of reference for the Living Lab experimentation. In turn, the Implementation phase usually starts with a Combination process, focused on the results of the small experiments carried out towards the end of the Design, which become early initiatives of Implementation. As far as Discovery is concerned, differently from Design and Implementation, this is represented as transversal to the four SECI processes. However, in the practice of Co-design, Discovery is often revealed during the processes of Combination and Internalization.

This mapping exercise of Co-design onto the SECI model has been experimentally tested during the Periphèria project, within six urban pilots, as explained in section 4 below.

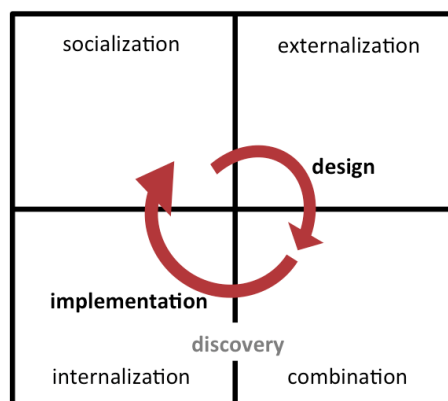


Figure 2 – Co-design mapped onto the SECI model

Successive iterations of Co-design form a spiral, with each loop amplifying the knowledge created to a higher level of penetration and accommodation within the

individual, group, organisational and communitarian dimensions. This complies with both the SECI model and the interpretative framework proposed by Evenson and Dubberly in 2011.

3 From the learning experience to actual behavioural change

While the previous section has argued that the collective experimentations taking place in ULLs are knowledge productive, and ignite learning processes at individual and collective level, it remains unclear whether and to which extent the generation of this new knowledge creates sustainable value for the participant actors and the entire community.

Our interpretation, based on the evidence collected within the Periphèria city pilots (Concilio and Celino, 2012; Concilio and Rizzo, 2012), is that whenever new solution prototypes for urban problems are co-created with a strong contribution by the citizens, a virtuous learning mechanism is activated, in accordance to which the same people who reflect and discuss together on possible initiatives having a social nature and value for the community (city or neighbourhood), then adapt their current and future behaviour, in a transitory or permanent way, making the scope and purpose of their previous engagement inform and shape future attitude towards the public “thing”.

Such learning mechanism is particularly evident in ULLs, where:

- Co-design of new urban services and policies is done with and by the people, not merely for the people;
- Concrete (real-life) trials of service and policy innovations are planned and executed;
- Experience sharing and exchange prevails over mere information (feedback) delivery from trial users to developers;
- Citizens feel “owners” of the socio-technical solutions co-created, together with technology providers and policy makers;
- Behavioural changes (may) follow right from this experience of “appropriation”.

We see clear points of convergence between our vision and the most popularly used of Argyris and Schon’s theories, double-loop learning (Argyris and Schön, 1978; Argyris, 1993). This emphasises that reflecting upon the effects of someone’s action may result in important changes in behaviour as a consequence of recognising eventually unfavourable

or beneficial implications of that individual action. In the ULL case, the involvement of citizens and stakeholders in the co-design of solutions to acknowledged issues of varying nature and complexity, related to public service or local development, brings to a broader level of reflection and discussion on the consequences of collective, as well as individual, behaviour. This affects the “mental model” that people exhibit towards community and society, in such a way that fosters the creation of relational capital at micro scale.

The importance of relational capital has hardly been noted by extant literature on technology or policy driven living labs (see e.g. Bergvall-Kareborn and Stahlbrost, 2009; Svensson et al., 2010), while is more familiar to economic geography scholars (Sunley, 2008) as well as marketing practitioners (Prahalad and Ramaswamy, 2004). We see this as part of civic awareness, or the realisation that a shared context (or “Ba”) exists, which is notably the first process where the Design phase starts from according to the discussion done in the previous section.

Additionally, the initial level of civic awareness is reinforced in ULL actors when turning to (real-life) experimental implementation and assessment of prototype solutions. Here, we speculate that from the concrete appreciation (or Discovery) of the viability of future living scenarios as enabled by the innovations being trialled, people become more effectively and permanently influenced than after a generic or abstract discussion of possible solutions to improve community life. This can trigger behavioural change in a similar way to that described by Döös and Wilhelmson (2011), i.e. as the consequence of a shared distribution of experimental tasks.

We depict the dynamics so far described as per the following Figure:

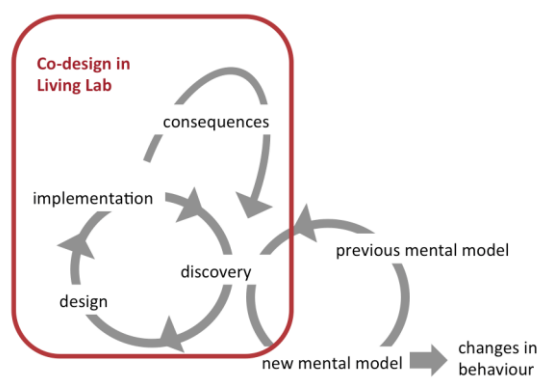


Figure 3 – Living Lab co-design and triple loop learning

It should be quite clear that the scope of the mental model's and behavioural changes expected is far broader than what is implied by a reflection on the effects of individual or collective action. It is a “brand new world” which is being figured out, thus shifting the focus from the micro scale changes brought about by ULL Co-design to the meso and macro scale transformation of neighbourhoods, cities or larger ecosystems.

That is why we propose to evolve from single or double-loop learning to “triple-loop learning” as an interpretative framework. The latter is a most elusive concept (Tosey et al., 2012), regarded as a level of awareness and knowledge that is beyond, and probably superior, to Argyris and Schon's theories. However, this level is rarely attained (Yuthas et al., 2004) as it involves the fundamental questioning of the meanings and assumptions so far attached to the external “world”, ultimately leading individuals and organisations to question the basis of all knowledge. For instance, triple-loop learning is said to occur when “one starts to reconsider underlying values and beliefs, world views, if assumptions within a world view do not hold any more” (Pahl-Wostl, 2009). Accordingly, triple-loop learning is related to transformational shifts in what individuals, groups and societies see as desirable ways of living and may be characterised as shifts in regime.

Now if a Co-design approach can be maintained throughout the shift from the micro scale to the larger environments, where user driven, open innovations are experimented, we posit that a triple-loop learning can be achieved, so eventually making behavioural changes become systemic. This because of collaboration among Living Lab actors, which intensifies the collective learning experience through the creation of “ad hoc” feedback mechanisms during (real-life) Implementation.

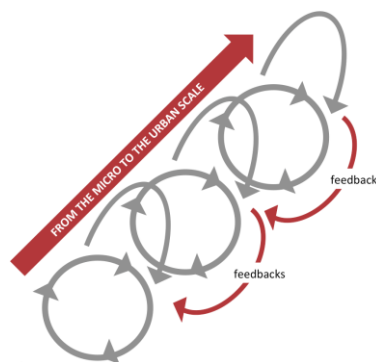


Figure 4 – Concatenation of learning cycles at different community scales

In particular, the above picture shows how the generation of feedbacks from different, scaling up stages of Co-design can consolidate the transformational changes induced by the learning effects of Implementation and Discovery.

This concatenation of learning cycles, as it is well known, does not happen frequently. However, the evidence collected in Periphèria, which is described in the next section, leaves the possibility open that in ULLs the (almost) compulsory need to scale innovation results up to the broader community level can more easily ignite long chains of feedback having higher probability to activate triple loop learning and therefore behavioural change in the communities involved.

4 Some evidence from the Periphèria project

The co-design work carried out within Periphèria project dealt with the six pilots of Athens (EL), Bremen (DE), Genoa and Milan (IT), Malmoe (SE), and Palmela (PT). In the remainder of this section, we take the case of the city of Milan as illustrative and exemplary of the results achieved.

Work has been carried out along three phases, each bridging Design to Implementation: 1) Observing the current situation; 2) Modelling the current situation; 3) Envisioning a better situation; 4) Instantiating the vision. Each phase can be mapped on the four processes of the SECI model, in coherence with Figure 2, as stated below.

STEP 1: Observing the current situation is a form of Socialization. Insight-gathering methods or problem-finding methods, such as ethnography, often rely on acquiring tacit knowledge through inhabiting a specific context and interacting with others in that context. As Nonaka writes¹, “The key to acquiring tacit knowledge is experience. Without some form of shared experience, it is extremely difficult for one person to project her- or himself into another individual’s thinking process”.

STEP 2: Modelling the current situation is a form of Externalization, better if this is carried out by individuals producing artefacts (documents, presentations, graphics, ...). Sharing someone’s experience and insights with others, for example, by writing a piece of ethnographic research, requires abstraction and generalization. As Nonaka writes, “Externalization... is the quintessential knowledge-creation process in that tacit knowledge becomes explicit, taking the shapes of metaphors, analogies, concepts,

¹ *Quotations are from Nonaka (1991)*

hypotheses, or models”. And he adds: “To make a hidden concept or mechanism explicit out of accumulated tacit knowledge, abduction, or retroduction is effective rather than induction or deduction”.

STEP 3: Modelling a better situation is a form of Combination. A designer looks at aspects of what is and imagines combining them with other things that he or she has experienced or imagined. Nonaka writes that Combination “synthesizes knowledge from many different sources in one context. The combination mode of knowledge conversion can also include the ‘breakdown’ of concepts. Breaking down a concept...also creates systemic, explicit knowledge”.

STEP 4: Instantiating a vision is a form of Internalization. Prototyping requires working out many details and determining many relationships, creating a new level of knowledge of the model on which the prototype was based. As Nonaka writes, “Explicit knowledge, such as product concepts or manufacturing procedures, has to be actualized through action, practice, and reflection so that it can become knowledge of one’s own”.

In the following table, the outputs and outcomes of the Milan pilot are mapped onto the four processes along three consecutive phases (cycles) of experimentation.

Table 1 - Mapping Milan Co-design cycles onto the SECI model

	Milan 1st cycle	Milan 2nd cycle	Milan 3rd cycle
Socialization	Exploring the way one of the most important square (Leonardo da Vinci) in the Campus is used and transformed has been the goal of this phase. Many participants have collected data, information, stories and even video, images as well as capturing some situations of the square (during holiday time for example when it is not lecture time and very few students are using this space). Many participants have invented ways for snapshotting specific conditions of the square and for reporting their idea of the square. In this phase some interviews have been carried out in order to widen the points of view of the square users and also to prepare some citizens groups to interact with the academics involved in the initiative. Some participants also started creating analytical syntheses out of their data and information so developing some interpretations out of their observations.	Many citizens and organizations have started thinking to and imagining what to do of/in the square. Some of them have started looking other experiences, inside or outside Milan, in order to get idea of what experiment to implement in order to test transformation of this area. Collecting ideas to be shared with others have been the main activities of this phase that also clustered new actors: new members joined the small academic team that was responsible of the activation of the whole process. Some started interviewing special urban groups like skaters or city writers to imagine new possibilities for using and transforming the space (therefore also enlarging the number of people becoming familiar with the process. Many experiences have been collected and somehow reframed, in order to be proposed and tested in the square.	The problems experienced while implementing the initiatives in Leonardo da Vinci square have been shared among the many involved actors. They have discussed on communication, people engagement, and the needs for the space to be part of the communicative strategy. *** A reflection on the results of the prototyping phase in in Leonardo da Vinci square started in the environments of both the Neighbourhood Council and the Milan Municipality. Some key actors started to reflect on the civic relevance of the experiments and on the great results achieved (citizens as active promoters of the space use and transformation) and to envision how and where else in the city to replicate the same process.

Externalization	<p>Many meetings (called coordination meetings) have been carried out to produce one synthetic view of the square conditions. All the participants have reported their impressions and collected evidences and supported their arguments using, in some cases, some of their reporting products. Personal reports but also reporting others' opinions have been the ways to create a "transfer" environment and to start aligning the vision on the square. In this phase the main discussion focuses have been on general problems, individual narratives, and interpretational mapping of the square situation within the campus context but also considering the square in the wider urban framework. This phase produced a rich document, detailing the square conditions in terms of opportunities and resources that have been also presented to the neighbourhood council and to some officers of the Milan municipality and also discussed with the same group of citizens who collaborated in the previous phase.</p>	<p>The ideas have been all presented, discussed and even adjusted to be all consistent and complementary, in terms of time and financial resources availability. Many meetings have been carried out which have also included the new involved actors. For this phase it has been very useful the presence of newcomers because it required the whole story to be repeated every time so making the externalization deeper and deeper. All the proposals have been also discussed with the Neighbourhood Council so assigning to the experimentation of the square transformation a bigger institutional value. The differences among the collected ideas and also the number of proponents suggested the idea that many actors were engaged in a re-appropriation initiative: the idea of "we can make that public space become the space of ours" started to be discussed also due to the fact that many suggested initiatives had a clear self-made nature.</p>	<p>How to make the link between public space and people deeper? This question brought to the idea to develop an ICT device that could better integrate the space dynamics with the people. Some of the people started to use existing apps in order to better strengthen the link between people and the activities carried out in the square. Foursquare, Layar have been tested as sort of space-based social networks; also others started to look for ideas of ICT solutions to be implemented and shared those ideas with the others.</p> <p style="text-align: center;">***</p> <p>Starting from the results of the Leonardo da Vinci square, some actors started to verify the opportunities for such a replication, which was also discussed during some meetings with the academic team being active in the Leonardo da Vinci square.</p>
Combination	<p>Some scenario design workshops have been carried out to rethink the role of the square in the campus and in the whole city of Milan. The attendees of the workshops have not been the same along all the workshops so requiring many reporting activities to guarantee a shared scenario as main output of this phase. Each participant, coming with different ideas of the future condition of the square (from the ways it can be used to deep physical transformations), argued strongly his/her vision and the construction of the scenario for the square has worked out as a bricolaging/alignment process more than a choice of one solution among many. The square have been thought as an experimental urban lab where new practices for urban transformation can be envisioned, tested and eventually transformed into praxis. This scenario found the enthusiastic favour of the neighbourhood council that arrived at making a formal decision to transform the square from a parking area into a pedestrian one.</p>	<p>Slowly the idea to create a coherent whole out of all the proposed initiatives started to be discussed and enriched. The RiconquistaMi framework has been developed to include all possible initiatives that could be practically and easily implemented and/or activated (sport, music, theatre, paintings, games and parties, ...). A very simple webpage (http://smartplanpolimi.wordpress.com/page/2/) has been created that could support the communication of such initiatives and also represent the virtual narrative of the square experimentation story. The Combination phase of this cycle is also made clear by one formal decision made by the Milan Municipality that formally assigned to a no-profit organization the responsibility to develop and implement a 2 months program of sport activities in the square. RiconquistaMi is framed as an experiment itself: a sort of experimentation of how the city can activate and cluster the many forces that are active in the city and transform them into a driver for public space transformation.</p>	<p>Many ideas of possible ICT tools have been shared and discussed till the idea for a new App came to people mind who involved an ICT private actor to start a long design activity: the app Stick Around has been designed that allows people to create and announce events that appear in the space as augmented reality objects.</p> <p style="text-align: center;">***</p> <p>Recently three additional areas of Milan have been identified by the municipality as available to urban experimentation. The authors have no clear knowledge of the way this decision have been made but in some declarations made by the local government it is clear that the initiative of Leonardo da Vinci square is being replicated and scaled up [see http://milano.repubblica.it/cronaca/2014/04/27/news/meno_auto_pi_pedoni_e_metropolitana_a_cielo_aperto_piazzale_loreto_cambia_vita-84587837/]</p>

Internalization	<p>The use of the square is transformed. The no car zone changed the physical asset of the space and made it be perceived differently by the citizens who started using it differently: from using it only during the week to consider it a public space available 24 hours everyday; from simply walking where earlier the cars were parked to playing there; from playing there to participate there in events organized by others; from being just participants to become organizers of events. A number of opportunities are envisaged at this stage and this gave birth to the second SECI cycle.</p>	<p>Initiatives started to be implemented in the square. Many initiatives have been implemented: some had a top-down nature, some others have been more insurgent and bottom-up. This explains why in this phase prototyping has two different levels of significance. The first one is referred to the level of each single experiment: each represents a prototyping of what the square can be and become but also of the way the square can be transformed and re-appropriated by people. The second one is referred to the prototyping of the way the municipality can manage processes in an experimental perspective. These two levels of prototyping activated two new different branches of the process: one devoted to support operational space transformation (the conception and development of Stick Around) and the other one devoted to replicate the same initiatives in other areas of the city (the reacquisition to public life of many other open spaces of Milan with the same experimental driven transformation).</p>	<p>Still to happen.</p>
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The Milan pilot of Periphèria was related to the development of smart services inside the urban environments of the University campus(es); the Table particularly reports about the Co-design activities that took place in relation to the desired renovation of a public square (Piazza Leonardo da Vinci) where the Politecnico di Milano buildings are located.

The three experimental phases also represent consecutive learning loops that have produced feedbacks towards involved actors. In practice, the experiment included many overlapping initiatives that took place in the square and involved a significant number of people (about 400 overall, though not constantly throughout the whole process). These initiatives also had very different nature (university lectures, sport activities, theatre and music events, collective or individual parties, street art initiatives, ...) and involved four different kinds of actor, specifically citizens, academics, municipal administrators, and local voluntary associations, each involved with specific and precise “tasks” interacting with the square renovation and being announced and performed with a diffused awareness of their experimental and exemplary nature. Each experiment produced its own feedback (or set thereof) towards each of the actor categories. Some examples can help the understanding of such feedbacks.

A first example is related to the sport activities. One experiment (“MiMuovo”) within the RiconquistaMi initiative, planned to move some gym activities from the indoor spaces of sport associations to the square; although being the beneficiaries of such an attempt, the sport associations themselves imagined that very few people would have joined the event due to the need of privacy during physical exercise. Instead, the high participation of citizens and the growing number of subscribers showed that people in fact do like open spaces for their gym activities. This result pushed the sport associations to propose more new activities and events under the MiMuovo umbrella. This example shows a feedback created during the second cycle mainly towards the sport associations.

A second example is related to the students’ usage of the square. The Piazza Leonardo da Vinci is widely used by students who consider this urban space a sort of extension of the university space, initially being their private parking place. During the experiments carried out within the “RiconquistaMi” initiative, students have been involved in many different activities, either as protagonists of a temporary transformation of the square (architecture school) or as engaged spectators of theatre or music events. Many of these activities have created conflicts with the Municipal decision to close the square to private cars; nevertheless they could help a completely different use of the square be experienced, that has made participants the real protagonists of experimented urban transformation, bringing them somehow to re-consider their initial position.

Many other feedbacks can be identified throughout these pilot initiatives, which have affected the beliefs and values of many of the actors involved in the ULL. Behavioural changes can also be identified in relation to them, which are all characterized by the fact of being related to a common urban practice, i.e. the use and management of public spaces in the area of the Leonardo Da Vinci campus.

In short, the experimental nature of the whole process transformed specific practices into action fields whereby behaviour changes are revealed. In a general sense it is possible to identify some “trends” in those changes, like a shift in citizen’s view from respecting to transforming the use of public spaces, or one in the public administrator’s vision from an initial scepticism to a later confidence and approval, as testified by the decision of the Municipality to replicate the same “participative approach” to square renovation in other neighbourhoods of the city of Milan. See in the following Table 2 the main identifiable changes that can be associated with the typologies of actors involved.

Table 2. Main behaviour changes and related practices

Actors	Specific practices	Behaviours	
		<i>before</i>	<i>After</i>
Citizens	Use of public spaces	Respectful	Transformative
Academics	Public space design	Bottom-up	Collaborative
Local associations	Use of public spaces	Responsive	Suggestive
Public administrators	Public space management	Delegating	Participative

These behavioural changes are clearly results of a Co-design approach, which has been largely evolutionary in terms of the underlying relational structure (being open to new actors and stakeholders) and also characterized by its constantly being experimental and not repetitive in its manifestations. The idea that the transformation of the area would be the result of a long, participatory and differentiated experimentation on the “urban” dimension (Experimenting the Urban was the early slogan of the whole initiative) has never been abandoned by the Municipal decision makers and academics involved in the pilot. Making this experiment open to anybody, by directly engaging planners and urban designers together with neighbourhood representatives, citizens and local associations, has turned the Leonardo Da Vinci square into a collective learning environment, where practice generates tools for new behavioural tests.

5 Conclusions and Future Work

The idea to relate learning to behaviour is not new (Argyris and Schön, 1978; Ajzen and Fishbein, 1980; Ajzen, 1991; Kim and Hunter, 1993; Witte and Davis, 1996; and many others). The literature on knowledge management and organisational learning has provided various definitions and conceptualisations of social learning. Now there seems to be consensus that learning in complex collective environments requires communication and interaction of different actors in a participatory setting. This is believed to result into a set of collective outcomes, such as the generation of new knowledge as well as the development of relational links (Muro and Jeffrey, 2008) which in turn gives rise to the conditions for the definition of a collective action to which future individual behaviours will be more aligned (Björgvinsson et al. 2010).

The analyses carried out in this paper, and the evidence collected from the Periphèria pilot in Milan, confirm the potential of ULLs for sustainable value creation in civic

communities. This value creation builds on the Co-design activities, carried out for the development of new prototype solutions, in response to previously identified and agreed public service or policy problems. Such activities can be regarded as knowledge creation processes, fostering the generation of relational capital at the micro scale of urban environments, which in turn shapes innovation processes with a character of situatedness, although relating to different environments, somehow less structured and formalized than a city or urban ecosystem. The very generation of valuable relational capital, outside of standardized schemas and protocols, is a situated innovation product by itself.

In this respect, our paper confirms what was analytically demonstrated by Capello and Faggian in 2005, i.e. that ULLs contribute significantly to the production of local knowledge in relation to the development of relational capital. The character of this capital is threefold: it is experimental driven (Periphèria 2013), it gives rise to an evolving and dynamic governance (Concilio et al., 2013), and is situated, or exists in a specific (urban) environment and there it frames a user driven, open innovation process.

Additionally, double-, and triple- loop learning theories imply that the ULL induced processes of reflection and questioning, rather than simple use or provision of information as part of those processes, strengthened by the real-life experimentation of the innovations being co-created with the users, may induce changes in individual and collective mental models, transforming the feedbacks and results of the trials into sources of behavioural change and community scale learning.

Such learning does not occur, however, within the boundaries of a well-identified group or organization; it is rather the consequence of a distribution of experimental tasks among involved actors that shapes the collective, shared, action space (called “shared action arena” by Döös and Wilhelmson, 2011).

The chaining of learning cycles at upper scales than the “micro” in urban contexts can possibly reinforce the above patterns and be responsible of further behavioural (systemic) changes. This seemingly confirms the hypothesis made by Misiko (2009) that longer-term collective experiments develop a strong underlying relational dimension, which is critical for the sharing and scaling up of produced innovation, thus affecting and aligning people’s behaviours towards a collective whole.

Further research and action is required, however, both to document the behavioural impact of ULL knowledge creation dynamics and the conditions under which the value of

innovation can scale up from the micro trials to the meso and macro of neighbourhoods and cities as complex ecosystems.

Referring to these two aspects, empirical studies should possibly take advantage of the “triple loop learning” concept as a suitable theoretical guidance.

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Corporate universities, local systems, knowledge management

Giuseppe Cappiello

Department of Management
Università di Bologna
Via Capo di Lucca, 34 - 40126 Bologna - Italy

Giulio Pedrini*

CRISP - Interuniversity Research Centre on Public Services
University of Bologna
Strada Maggiore 45 - Bologna

** Corresponding author*

Structured Abstract

Purpose – The aim of this paper is to analyse corporate universities as advanced models of knowledge management in a local development perspective. To achieve this purpose the paper investigates the expansion of this phenomenon in Western Europe and emphasizes the role of corporate social responsibility in influencing the diffusion of corporate universities in this region.

Design/methodology/approach – The paper analyses the relationship between the firm and the external environment through corporate universities in the perspective of a sustainable and knowledge-based local development. Notably, we refer to the so-called “stakeholder” corporate university, which is a model that entails an active role of the corporate university in the fulfilment of fiduciary duties imposed by corporate social responsibility. Then, we summarize the main features of European corporate universities based on a review of the existing literature. Finally, we present the main results of a survey on Italian corporate universities.

Originality/value –Our paper puts in evidence the existence of a model of corporate universities in Western Europe that is partly different from the one practiced in the United States. European companies do not only consider the corporate university as a tool for developing and integrating a number of internal organisational processes, but also for keeping a close relationship with all relevant stakeholders and connecting their activity to corporate social responsibility practices. Accordingly, in the European perspective, corporate universities can also be viewed as original educational agencies within local systems of production. Data on Italian corporate universities confirm this suggestion.

Practical implications – Practical implications are twofold. First, corporate universities are required to interact with external educational agencies, notably traditional universities. This perspective would be particularly suitable in local systems of production where the

direct relationship between educational agencies and corporate universities may feed university-industry cooperation. Second, a corporate university oriented to corporate social responsibility would favour the relationship with the relevant local community and support the role of institutions in shaping regional economic change. This evolution may address the increased density of economic and business interactions through the extension of learning processes outside firm's boundaries.

Keywords – knowledge, local development, corporate universities, corporate social responsibility.

Paper type – Academic Research Paper

1 Introduction

The knowledge economy does not homogenise communities and disregard local distinctiveness. On the contrary, it rewards the production and the diffusion of knowledge based on idiosyncratic interactions among economic agents allowing them to take advantage from the opportunities offered by global markets. In this framework, local systems of production are an essential reservoir of tacit knowledge and a source of positive spillovers. Local systems may thus become a "knowledge multiplier" that preserves the collective and contextual know-how generated by the exchange of different types of knowledge, and defines an institutional framework that addresses and regulates the dissemination of knowledge inside and outside the system.

Some typical properties of knowledge are accentuated in this environment. Knowledge is often embedded in employees, it has features of public good, and it can be hardly brought in the market (Cantner et al., 2011). Accordingly, local systems encourage the removal of institutional and economic barriers to the spread of knowledge flows through cooperative arrangements, smart communities, and industrial clusters. In addition, they support the creation of social and territorial capital through the cooperation between public and private entities.

In this model, the firm needs to build up a knowledge management system that pays attention to the different dimensions of knowledge-creation processes in the relevant local context in order to stay sustainably competitive. The exploration and the exploitation of different types of knowledge need to look for places, not necessarily physical, for triggering a virtuous cycle of production, accumulation and exchange of intangible assets in the relevant local system. Therefore, the interaction between firms and the educational agencies stimulates change and innovation in the system as a whole.

As a partially autonomous entity aimed at managing learning processes in a strategic perspective, corporate universities¹ (COUs) can be seen as structures potentially suitable for catalysing knowledge and entering into relationships with local knowledge systems, and eventually supporting the parent company in the pursuit of sustainable competitive advantages. The role played by the COU would thus become significant not only for the parent company itself, but also for the relevant local system. On the one hand, universities and other educational agencies have a stake in the competitiveness of firms located in the territory. On the other hand, businesses have an interest in promoting knowledge creation in the local labour market. The COU may well represent a tool to promote and develop learning in order to preserve the competitiveness of the local systems in the global markets.

Our purpose is to associate this interpretation of the role of the COU with the specific characteristics of this phenomenon in the European context. In Western Europe a strand of theoretical and empirical literature has viewed the COU as an "open" entity that facilitates knowledge diffusion outside the parent company and supports corporate social responsibility (CSR) practices. European companies do not only consider the corporate university as a tool for developing and integrating organisational processes, but also for keeping a close relationship with all relevant stakeholders and connecting their activity to CSR practices. Notably, the COU could take the form of a "stakeholder university" following a partial external path with respect to the parent company. From this position its role in the local systems of knowledge could become highly relevant.

The paper is structured as follows. Section two reviews the literature on local knowledge systems in a regional perspective. Section three defines the COU in a CSR perspective. Section four introduces a model of local knowledge systems that includes the COU. Section five presents the result of a review of the literature on corporate universities in Western Europe. Section six presents the results of a survey on Italian corporate universities. Section seven discusses and concludes.

¹ *Corporate universities are associated with a broad range of organizational forms and knowledge management systems, "ranging from renamed training departments to institutionalized carriers/drivers of strategic knowledge innovation within and between organizations" (Rademakers, 2005, p. 133). In section three we specifically define these entities by reviewing the relevant literature.*

2 Local knowledge systems

Local development increasingly depends on long term intangible interactions between firms and the relevant territorial context. Among the entities that catalyze these interactions we find "human capital factories", mainly represented by traditional universities and other educational agencies. All together they constitute the external organization of knowledge. These agencies are not only conceived as mere educational entities, but they are also regarded as one of the "engines" of an innovation-based development process (Gibbons, 2000; Kenney and Patton, 2006). They are deemed to reduce skill mismatches in local labour markets, to create new knowledge in the form of patents, licenses and spin-offs, to activate partnerships for both research and recruitment, and to provide vocational training programs (Zucker and Darby, 1996). Such a role underlies the hypothesis of a direct relationship between human capital development activity and economic growth, which origins from those models that introduced human capital in the aggregate production function, assuming knowledge as endogenously determined (Lucas, 1988; Barro, 1991, Mankiw, Romer and Weil, 1992). Moreover, in the knowledge economy we do not refer only to knowledge embodied in workforce's skills, but we also include workers' participation to communities of knowledge. This entails an increasing importance of relational competences. Therefore, local knowledge systems enhance economic development even by promoting entrepreneurship, values, and new paradigms of social interaction.

In this framework, educational agencies, especially universities, can be regarded as knowledge producers that foster creation and transmission of new ideas. At local level, however, they may play different roles and activate different paths. Some universities tend to orient themselves to the market, following the model of the "entrepreneurial university" (Etzkowitz, 2003). Other ones can be defined as either "knowledge providers", their activity being focused on general and managerial skills, or innovation incubators. A similar pattern can be referred to the model of the "engaged university", which is able to adapt itself to educational requirements and knowledge characteristics of the region, thereby acquiring a role in the construction of intangible networks and in the promotion of social and territorial capital (Benneworth and Hospers, 2007).

Local governments, in turn, are usually responsible for the provision of vocational training programs tailored on the demand of skills expressed by local firms, and for the provision of subsidies and incentives for firms that directly train newly hired workers

(Batt and Osterman, 1993). Local labour markets and local systems of production can thus become "cognitive multiplier": by reproducing knowledge, they preserve those contextual skills generated by collective learning and promote the exchange of different types of knowledge, defining an institutional framework that facilitates and regulates knowledge dissemination in the system (Bramanti and Salone, 2009).

Such a "local knowledge system" allows the removal of economic and institutional barriers to the diffusion of knowledge between different actors. Assuming that territorial specificities are an essential factor for the development of this system, the adoption of consistent policies by local governments is crucial. Both legal and social norms, together with organizational forms and routines, contribute to determine economic and social interactions and to build those intangible infrastructure assets that channels intra-systemic knowledge flows (Cappellin, 2010).

In this scheme, firms interact with the local system in their processes of acquisition, identification, development, usage, and repository of knowledge. The evolution of the demand of skills and qualifications expressed by local labour markets is an essential element for an effective knowledge-creation process. A dynamic demand activates the interaction between firms and the external organization of knowledge, triggering the recombination of heterogeneous learning processes and stimulating change and innovation (Cappellin, 2010). Three are the main objectives of knowledge management in this respect:

- (i) to acquire knowledge from the outside, through the selection of properly trained workers;
- (ii) to preserve and retrieve knowledge that is already available. This objective is usually achieved through the participation of employees to vocational training courses offered by external agencies, possibly carried out in cooperation with the firm;
- (iii) to generate new knowledge in cooperation with universities and research centres, either targeting existing research activities, or by promoting new research projects.

All types of knowledge are involved in this process. However, it is their combination to serve as a basis for an effective interaction between the different actors. In order to create the conditions for this combination, each local system should find "ad-hoc" places, not necessarily physical, where such a virtuous cycle of production, accumulation and exchange of knowledge can occur. In these places firms acquire knowledge from the system to cope with potential mismatch in the relevant labour markets. The institutional

actors, on their side, are interested in promoting inter-organizational knowledge transfer through the creation and strengthening of complex networks. In this perspective work-based learning is one of the pillars of the so-called "learning triangle" (Ducatel, 1998), whose other corners are represented by the educational system and by the individual and organizational experience. All these pillars must integrate with each other in order to exert their effects in terms of competitiveness of both firm and local system as a whole.

3 Defining the COU in a CSR perspective

In this framework the COU is a thought-provoking phenomenon. It entails both exploration and exploitation of knowledge-creating processes in accordance with the aim of generating and protecting sustainable competitive advantages for parent companies. Knowledge must be transformed and adapted to both endogenous and exogenous change through an "ad hoc" organizational learning process. In turn, knowledge must be oriented towards the development and the implementation of firm's strategy, eventually looking for new opportunities to gain sustainable competitive advantage outside the standing business model. Looking at strategic development as a continuous learning process, the COU can be seen as a strategic tool able to address the requirements to fulfil individual and organizational learning needs, to ensure employees engagement, and to enter into long-term relationship with external educational agencies.

A widely accepted definition of COU is still missing in the literature. The early definition describes the COU as an "educational institution providing training courses created by an organization whose mission has nothing to do with education" (Eurich, 1985 p. 23). According to this view, as it has been later refined, the COU is an "educational entity existing outside the academia..[enabling] businesses, both for profit and not-for-profit, to maintain and expand the expertise of their workforces and, as a result, to secure their position in the marketplace" (Gould, 2005, 510), which is "designed to assist its parent organization in achieving its mission by conducting activities designed to cultivate individual and organizational learning, knowledge, and wisdom" (Allen, 2002, p. 14). Meanwhile, more business-oriented approaches come out, focusing on the relationship of the COU with business strategies. According to them, COU "grows when a company tries to relate their strategies for training and human resource development with the overall business strategy, through the coordination, integration and development of human capital within organization" (Henley Management College, 2005, p. 8), and is

configured as a “strategically useful tool to ensure that an organization achieves its mission” (Moore, 2002, p. 32) and “strategic umbrella of business for educating not only employees, but also secondary customers and suppliers” (Meister, 1998, p. 29). However, despite this variety, the COU is almost unanimously conceived as an entity that favours the renewal, the implementation and/or the optimization of business strategy (Rademakers, 2014), mainly handling the impact of innovation and change on human capital, in particular on systemic and relational skills (Campbell and Dealtry, 2003). Strategic role and reaction to change are therefore the cornerstones of the COU, which represents an advanced solution placed at the upper end of an ideal monotonic growing function of the level of complexity and strategic coherence of work-based learning (Figure 1). In addition, a typical role of modern COUs is to promote a shared corporate culture and provide new learning opportunities, thus eventually sustaining employees’ intrinsic motivation (Blass, 2005) and reducing turnover.

Not surprisingly, the scope of a COU is usually broad. It concerns "all activities that cultivate learning, knowledge and communication of those who, whether or not inside the company, can contribute directly to business success" (Moore 2002). In addition to training programs, the COU can be involved, in whole or in part, in talent recruitment, change management, career paths, geographical mobility, job rotation, mentoring, coaching, partnerships with traditional universities and other educational agencies. In particular, in a knowledge-based firm, recruitment is a channel for acquire competences and trigger the development new capabilities (Song et al., 2003). The COU may thus act as a "knowledge engine" whose strategic role in the era of cognitive capitalism avoids any decision of outsourcing learning practices. Other possible activities are represented by on-the-job training (such as mentoring and coaching), research and development (R&D), vendors selection process, knowledge diffusion outside the corporate (library, working papers, etc.). The common feature is the link between these activities and the factors strategically driving the knowledge within the organization. No COU however is actually involved in all these possible activities (Allen 2010).

The COU can also be differentiated according to the audience of potential “students”. COU activities are not necessarily devoted only to employees, but they may also include external stakeholders, such as independent agents, young graduates, suppliers, and local community members. In this respect, the COU has been seen as “the natural alternative to employee education at work and after college” (El-Tannir, 2002, p. 77), being a

supporting entity in recruiting talents with long run retention perspective. Eventually the COU can exceed corporate boundaries to provide educational services, receive external accreditation for its activities, and eventually act as a proper university issuing legally recognized diplomas. However, its rationale is usually different from the one of traditional universities (Walton, 2005). More frequently, the relationship with traditional universities acts in terms of complementarity, with the COU viewed as a connecting entity between tertiary education curricula and the business domain (Wang et al., 2010). Such complementarity is consistent with a “knowledge-based” firm aiming at expanding its internal learning towards different activities and different types of human capital, awarding a strategic role to education through a greater coordination between contents, investments and performance (Ryan, 2009). In accordance with this framework, the COU would act as a learning facilitator, orientating the individuals and the organization towards an attitude of continuous training, shared values and a climate of openness.

However, the existing models of COUs may substantially differ one to each other according to the relevant theoretical framework and the actual operating context (industry, region, internal structure). Moreover, the heterogeneity of the phenomenon has been exacerbated by the wide spectrum of organizations that have created their own COU: multinationals, SME, non-profit organizations, state-owned organizations. For the same reason we observe some misuse of the COU label. The existence of different labels (Corporate University, Corporate College, Academy, Institute, School, Foundation) is not helpful in this respect, as they often do not correspond to different models.

In this heterogeneous context our focus is on CSR-oriented COU. The relationship with business strategy and the focus on education and training has generated a peculiar approach that views the COU as an actor implementing CSR practices of the parent company. This approach relies on the suggestion that both COU and CSR are related to learning processes and knowledge management. Indeed, CSR has been specifically seen as a set of rules aimed at "increasing the quality of life of the workforce and their families as well as the local community and society as a whole" (The World Business Council for Social Development, 2000). CSR typically leverages on factors such as trust, values and corporate culture for committing both the firm and its stakeholders to engage in learning processes. Not surprisingly CSR has been considered as a suitable institutional tool for closing the gap between private and social value of training investments (Pedrini, 2013).

In the theoretical literature on COUs, CSR-oriented COUs can be referred to the

models of “network COU” (Allen, 2007) and “stakeholder COU” (Allen, 2009; Margherita and Secundo, 2009). In particular, the “stakeholder” COU is defined as a “learning archetype which promotes and develops innovative learning and capability-building processes among globally distributed and integrated networks of employees, customers, suppliers, partners, as well as of academics, professionals, independent learners, and other institutions” (Margherita and Secundo, 2009, p. 199). Accordingly, it can play an active role in the fulfilment of fiduciary duties imposed by CSR, eventually supporting the enforcement of this self-regulatory tool (Renaud-Coulon, 2008). In this way, the COU can be committed to responsibility towards local communities and contribute to build increasingly specialized networks, and, more generally, to share knowledge in the economic system in accordance with the institutional framework. These COUs thus help to ensure not only that parent companies are considered as a good place to work from their knowledge workers, but also that the COU seeks to become an effective learning places for the outside community. The external “students”, in turn, could consider the COU as a place where they can acquire a comprehensive set of skills and eventually to become “better citizens”.

4 The COU in the local knowledge system.

In local systems of production, the changing role of educational agencies affects the relationship between firms and the relevant local knowledge system. On the one hand, universities and training institutions have a stake in the competitiveness of local firms. On the other hand, firms are interested in human capital development in the local labour market.

In this framework, the COU can participate to the process of knowledge transmission in both directions. First, the COU can adapt the incoming knowledge to the production processes while supporting knowledge standardization and codification. In this view, the ability to play that role depends on the capability of the COU to absorb knowledge from outside and make it available for the parent company. Second, the COU can support business schools, vocational training centres, and traditional universities in the creation of intangible networks that channel the knowledge flow between the actors of the system. Accordingly, the COU would attract knowledge inflows from outside the organization, and recombine them before channelling into the parent company. Knowledge outflows, instead, would result from the cooperation between the COU, external educational

agencies and local governments. This cooperation would be implemented through training activities, applied research, local initiatives, conferences and workshops.

Hence, the COU can act as a collector of cultures, skills, technology, and innovation stemming from the local community to the company. In some cases, they may also feed the system in the opposite direction, supporting educational agencies (business schools, vocational training centres, traditional universities) and participating to a network of intangible infrastructures focused on learning and knowledge creation. In this perspective, the COU could contribute to a "triple helix" scheme (Etzkowitz and Leydesdorff, 2000), supporting an evolutionary path of higher education institutions oriented to economic and social development of the local system. The COU would thus represent an "ad hoc" interface for the interactions between educational agencies (and, more generally, the external organization of knowledge) and the parent company (Figure 1).

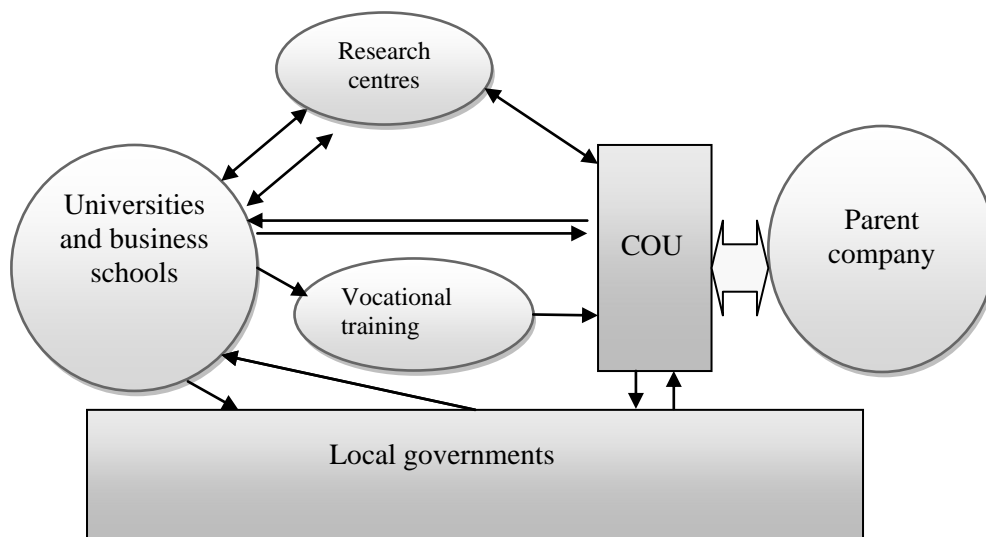


Figure 1 – The COU in the local knowledge system

In this way, educational agencies would be supported by the COU in transferring research outcomes from university to the firms, and in activating local development processes based on tacit knowledge and geographical proximity. In a broader vision, the COU could also be seen as the result of a "reverse spin-off" process. We generally use the term "spin off" when a new business originates from other existing organizations. In particular, university spin-off has been valued as an important tool for the dissemination

and exploitation of knowledge coming from the scientific community. The same process, however, can run in the opposite direction. Assuming an organization that is engaged in a heterogeneous bundle of learning processes, we can imagine the creation of new educational agencies. In this perspective, the COU is an autonomous unit committed to knowledge management which is also oriented to get value from the interactions with the external agencies, and from the provision of training programs outside the parent company.

This role would be emphasized if the COU is involved in the implementation of CSR practices. Several reasons may underlie the choice of adopting socially responsible behaviour. In any case, a CSR-oriented COU could generate value either via positive externalities generated by the knowledge-creation process or through the extension of the recipients of work-based learning activities (Renaud-Coulon, 2008; Allen, 2009). In both ways, the COU would create shared knowledge in the relevant economic system in accordance with local institutions and grounding on the principle of reciprocity. In this respect, communities of practice may represent a suitable method for favouring reciprocal behaviour. These social networks, in fact, can be regarded as points of contact between workers and local context inspired by the principles of cooperation among peers.

The actual role of the CSR-oriented COU in the local system, however, will also depend on exogenous factors: the industry of the parent company, the size of the company itself, its ownership structure, the degree of formal and substantial autonomy guaranteed to the COU, the magnitude of the actual skill mismatch in the local labour markets, the bundle of required skills by both the firm and the local labour market.

5 The COU phenomenon in Western Europe

COUs actually born in the United States where the phenomenon has been experiencing a systematic development as a specific tool for knowledge accumulation and dissemination within the firm since the early 80's. At that time, after the seminal experiences of General Motors (1927), Northrop Aviation (during the second world war), General Electric (1956) and McDonald (1961), other major industrial groups with a vocation of leadership in their industry (Boeing, Walt Disney Corporation, Motorola) set up their own COU. In the following two decades a worldwide spread of COUs occurred. In 1988 400 structures similar to a COU were counted; in early 2000s this number increased to approximately 1,600 only in North America (Bober and Bartlett, 2004). Then

they become nearly 4,000 in 2010 (Abel and Li, 2012), 900 of which refer to the largest companies worldwide, meaning that the phenomenon currently embraces also midsized firms (Maglione e Passiante, 2009; Rademakers, 2014). In parallel, the traditional view of COUs as a sort of re-labelling of traditional training departments was overcome by a new model centred on strategic orientation of organizational human capital (Holland and Pyman, 2006).

In the US, COUs originated as proprietary vocational schools in areas characterized by the presence of major companies. In a classic “make or buy” decision, a limited number of major firms decided to “make” a qualified workforce for their production process. In a second period, COUs introduced managerial competences, becoming more similar to internal business schools. Finally in the last decade a minority of the COUs has shown the attitude to become for-profit degree-granting higher educational entities (Thomson, 2000; Morey, 2004). In this way COUs deals with the need of parent companies to recruit talents and provide them with the required skills, while at the same time capturing the growing demand for career oriented post-secondary and post-tertiary education by external students (Morey, 2004). More generally, the relationship between COUs and traditional universities takes the form of an alliance or a partnership aimed at complementing in-house training with university education and at adding credibility to COU activities (Ryan, 2009).

This evolutionary path has been partially different in Europe. Besides the delayed development that the phenomenon had in our continent, European COUs have been characterized by a high fragmented institutional framework. Therefore, firms in each country have cultivated the concept according to the relevant institutional context. (Dealtry, 2006). To support this intuition we have reviewed most recent surveys referred to Western European countries, while performing a survey in the internet sites of major European companies (Table 1).

Table 1 Number of COUs in the main European countries

Country	Number of COUs	Main industries
UK	24	Banking and insurance
France	39	Banking and insurance
Germany	51	automotive, utilities
Netherlands	17	Banking and insurance, energy
Spain	18	Banking and insurance
Italy	39	Banking and insurance
Scandinavian countries	14	TLC
Switzerland	8	Banking and insurance

Portugal, Ireland, Belgium	3	Energy
Total	213	Banking and insurance

Source: our elaboration from literature survey and internet sites

Existing studies suggest that COUs in Europe represent a peculiar application of the relationship between firms and knowledge, aimed not only at tightening the link between learning processes and business strategies in order to reconfigure existing knowledge assets, but also at facilitating the effective integration with the relevant local knowledge system in order to absorb new knowledge from outside. This feeling is confirmed by the fact that COU are rarely seen as autonomous agents of endogenous change, nor they are directly involved in proper research activities.

In particular, the possible role of the COU in promoting CSR seems to have been positively welcomed in Europe. Case studies show that major European firms willing to provide meaning and relevance to CSR can orientate organizational learning towards an outside-in approach. These COUs, however, support CSR practices in different ways. In terms of methodology a CSR-oriented COU may implement learning open platforms and shape CSR strategy of the parent company (Rademakers, 2014). With regard to contents this type of COU may represent an instrument for embodying CSR-related strategies into leadership development programs (Meyer and Van der Pool, 2014). Moreover, specific sectors are specifically involved in CSR-related activities. This is the case, for instance, of utilities industry. In this sector European COUs look at external stakeholders and enhance cultural integration within the parent company (Antonelli et al., 2013). Moreover, some of them are given an explicit role in the promotion of environmental sustainability applying wider corporate projects promoted by the parent company.

Overall, European COUs are characterized by a substantial degree of openness and show a peculiar propensity to support their parent company in accomplishing fiduciary duties imposed by the CSR. This objective can be actually achieved through either the partial internalization of positive externalities generated by the production of knowledge or by the widening of the recipients of work-based learning activities (Renaud-Coulon, 2008; Allen, 2009). As a consequence, a substantial part of European COUs provide incentive to workers' intrinsic motivation and promote the transferability of human capital outside the company by delivering a wide range of content and offering personalized training paths.

6 Italian COUs and CSR. Results of a dedicated survey.

In analysing Italian COUs we refer to our recent survey on Italian COUs (Cappiello and Pedrini, 2013) that contain specific questions on the relationships between the COUs and external stakeholders and on the existence of CSR-oriented activities.

According to this survey, the framework of Italian COUs is highly dynamic. Although in Italy COUs are not a novelty in itself, most of these entities have been established in recent years and their configuration is still in progress. Their most popular mission is to create shared values in order to support employees' integration and stimulate their participation in learning activities. In this way Italian COUs also provide incentives for employees' retention. Moreover, the majority of Italian COUs recognizes change as a factor of complexity that requires a systematic collection of knowledge and experience in order to develop proper learning paths in different contexts. Only in a limited number of cases, however, COUs focus on the creation of new knowledge, thus acting as "engines of innovation". Nevertheless, most of the COUs claim that they foster creativeness, innovation and change. Similarly, the majority of COUs consider themselves as a tool for addressing the acceleration and the transformation of skills needs resulting from both exogenous and endogenous change.

Concerning the interaction with educational agencies, it is perceived as part of the mission by a minority of COUs. Once established, however, most of them look for complementarities between general and specific training through their relationship with external agencies, mainly represented by traditional universities. In addition, they seek to update the existing skills and foster multi-disciplinary learning processes by offering opportunities for the exchange of knowledge and experience with the external environment (Table 2). However, like most of their European homologues, Italian COUs do not perceive themselves as competitors of traditional universities. On the contrary, most of them enter into a cooperative relationship with the relevant local context and they can be seen as potential incubators of ideas within the organization.

Table 2– Relationship of the COU with external stakeholders

Subject of the relationships with traditional universities	Percentage
Common lectures	60%
Partnership	80%
Stage agreements	70%

Participation to students' and graduates' events (e.g. Career Day)	70%
Joint degree programs	10%

Finally, although CSR-oriented activities are not as much popular as activities related to corporate culture and organizational change, the majority of Italian COUs also play a role in supporting CSR practices (Table 3). For this family of COUs the channel to promote CSR practices is represented by all those activities that are likely to enhance the competitiveness of the parent company while simultaneously advancing the economic and social conditions of the communities in which it operates. In this way the COU creates shared values, which in turn are tightly related to CSR practices. In particular, like in the European framework, CSR-oriented role is acknowledged by COUs belonging to the utilities industry.

Table 3 - Role of the COU in the firm

Role of the COU	Percentage
Knowledge preservation and diffusion	80%
Corporate culture diffusion and talent integration	90%
Support in addressing technological and organizational change	85%
Knowledge creation and innovation	80%
Support in CSR practices	55%

7 Conclusions

In the knowledge economy firms are requested to upgrade talents and leverage human capital towards innovation and structural change, while promoting an effective mutual integration with educational agencies and research centres in order to enduringly support business strategies. In many situations, however, neither the Triple Helix model nor university spin-offs are adequately encompassed by the practice of educational agencies or by the support of local governments to partnership initiatives. Accordingly, local development increasingly depends from other forms of long-term interactions among the relevant actors (firms, workers, government levels, educational agencies, third sector), whose role is a discriminating driver of sustainable competitive advantages .

Within this framework, the COU can be seen as a catalyst for work-based learning, potentially addressing innovation, learning and knowledge transfer in a strategic

perspective, thus playing a peculiar role in the knowledge local system where the parent company operates. On the one side, it can bridge the gap between required and attained skills of workers entering the firm. This gap is higher in presence of a cyclical component of human capital demand which the education system is unable to cope with. On the other side, it can address the need to provide different skills so as to balance the needs to share knowledge, experience and identity with the needs to specialize competences and capabilities. Interconnected and interdependent markets require the activation of complex knowledge management processes able to anticipate change and stimulate the creation of a shared organizational culture.

The review of the scarce empirical literature on European COUs shows that a part of them can be seen as "open" structures, thus complying with the CSR-oriented model. This type of COUs can potentially act as a critical junction in the processes of knowledge transmission and intersection of cultures, technology and innovation. Notably, European COUs differ from US homologues for the existence of a substantial number of CSR-oriented COUs. In particular, the integration between COUs and CSR in our continent is usually aimed at mutually supporting the creation of a shared corporate identity and the promotion of differentiated skill portfolios. For their nature, these peculiar types of COUs can contribute to the promotion of the so-called "local competitive goods". This propensity is partially confirmed by an original survey on Italian COUs. A substantial part of Italian COUs has an explicit role in promoting CSR practices, and in creating interconnected and interdependent situations with the relevant external knowledge system.

In Europe, therefore, the relationships between CSR-oriented COUs and the other components of local knowledge systems can represent an efficient mechanism for the transmission of knowledge and the sharing of a sustainable management model in the local system of production. This perspective would be particularly attractive in those local systems of production where the educational agencies and COUs jointly feed university-industry cooperation. In addition, the relationship between the COU and local governments could support the role of institutions in shaping regional economic change by creating collective identities and developing specialized networks, relying on accepted rules and on a reciprocal basis. Through COUs different actors could look for new aggregation processes centred on human capital, eventually achieving competitive advantages that are sustainable for both firms and local communities.

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Achieving a sustainable growth in Higher Education institution through knowledge-based strategies: A rising economy perspective

Grzegorz Majewski*, Paul Giannakopoulos, Sheryl B. Buckley

Department of Computing
University of South Africa
UNISA P.O.Box 392 UNISA 003 RSA

** Corresponding author*

Structured Abstract

Purpose: This article aims at discussing the problems faced by Higher Education institutions (HEI) in rising economies (South Africa is provided as an example here). Such institutions usually have to cope with ever increasing number of prospective graduates. Like most countries around the world South Africa is also confronted with massification of Higher Education (HE). Moreover local conditions affect the potential strategies for development. Nonetheless there are not enough studies devoted to how such strategies can be successfully applied in rising economies such as South Africa. This study fills this gap in knowledge.

Design/methodology/approach: The preferable research approach identified for this research is theoretical approach with comprehensive literature review. This approach is necessary in order to establish what the trends around the world are with respect to massification of education since the late 80s. Additionally in the case of South Africa it is necessary to consider the situation before and after the demise of apartheid in 1994. This will be done in order to model a solution which could lead to a win-win situation. In the end this could lead to a formulation of a model to be applied in practice.

Originality/value: This methodology puts in evidence the uniqueness of the rising economy (based on South African experience) approach to massification of HE. In the case of rising economies a unique solution has to be found to the problems such as accessing HE and low graduation rates. It stands to reason that by allowing students in HE, failure to graduate within the prescribed period it is to the detriment of all stakeholders. The solution proposed here conforms to a pragmatic approach to a knowledge economy rather than financial or social approach which tend to highlight only one perspective of a multi-facet problem.

Practical implications: The practical implications of this study derive from the fact that the knowledge-based strategies for sustainable education in rising economies will be discussed. These strategies are of vital interest to HE practitioners, government planners as well as prospective students. Moreover this study will provide the outcomes of the

application in HEI in South Africa as a case study. The crucial problem is that if such institutions are to become self-sustained, the gap between accessing HE and graduation rates must be closed. If many students access HE and few graduate the institution in the end will not survive.

Keywords – Accessing Higher Education, Rising Economies, educational sustainability, graduation rates, Knowledge-based strategies

1 Introduction

Higher education (HE) in the world, be it in a first world or a third world country, has been under scrutiny for the past three decades or so as the citizens of the various countries have been demanding more sharing of the wealth of a particular country. Globalisation, increasing gap between those that ‘have’ and the ‘have not’, unrealistic expectations of citizens, increasing costs (and primary, secondary and tertiary education are placed high in annual increases) and many other factors, have forced institutions to be more efficient and effective. With respect to Higher Education institutions (HEI) Hayton and Paczuska (2002, 11) once said HE is a *risky* business while many others (Dennis 1998; Archer, Leathwood and Hitchings 2002) emphasised how *expensive* it is.

The two words in italics describe two important aspects of HE, used together and alone. *Expensive*, in simple terms the (financial) input (running of the institution) brings low returns (low (output) graduation rates). *Risky*, because the institution admits a student who stands about a 50% chance dropping out in the first 6 months and a (average) 75% never graduating, but also for the student who might believe (s)he can graduate but might never do so. The effectiveness and efficiency are hampered by the schism between massification, the right of an individual to HE and the pragmatic side that not only economics dictate but also the status could diminish if standards are not kept.

There is no doubt that in the mind of any academic in knowledge management (KM) that, from all types of business, the one that can always be problematic in applying new KM findings is a university. There is at least one reason for it: They are supposed to be the generators of new knowledge, one of their main function, and to be the first to apply such knowledge by testing-retesting before they export it to the market place. How can they suddenly become users of all types of knowledge? However when higher learning institutions begin to be less distinct from each other the competition for attracting high calibre students in the end will determine their prosperity or demise.

This paper aimed at developing a model that could balance the two opposing views about HE whether it is a “right or privilege” if sustainability is to be achieved.

2 Accessing HE: A right or a privilege? A pragmatic approach

The word “access” to education could be viewed in a number of contexts: Gain entrance to a programme that the minimum criteria are not met (Andrews 2003, 54); for

Tight (1989) it means allowing someone to improve an old qualification or get a more relevant qualification. But it could also mean gaining access to formal education at a level appropriate to the individual (Evans 1985, 134). This is very close to South African situation where all individuals that possess a matric certificate can have access to HE.

Whether access is followed by massification or vice versa in the end is a matter of following pragmatism, charged by emotions due to the apartheid past. Research done around the world conforms in a number of findings. a) Student success rates in South African Higher Education institutions (HEI) are unacceptable. b) Higher Education South Africa (HESA) reports that 35% of first-years drop out after their first year (Sapa 2008). c) Breier and Mabizela (2007: 281) found that only 15% of students who enrol, complete their degree in the designated time; d) 30% drop out after the first year and a further 20% drop-out after their second or third year. Around the world the world these figures do not differ significantly (Bohart, Meyet and Visser, 2009; Tait, Van Eeden and Tait, 2002). Highly selective institutions are excluded although a 10% drop in graduation rates can have detrimental effects even if a 90% graduation rate is achieved.

From a pragmatic point of view economics play a central role in any emerging economy and apart from that they are even above other needs which tend to be short term solutions. For example the dilemma that exists between creating jobs and feeding people and deforestation or preservation of forests. All dilemmas associated with economics are directly related to sustainability.

The concept sustainability has in the past most often been broken out into three constituent domains: environmental (ecological), economic and social (cultural and political) sustainability; these are the known circles of sustainability. "The sustainability paradigm rejects the contention that casualties in the environmental and social realms are inevitable and acceptable consequences of economic development. " Sustainability can be considered to be a "paradigm for thinking about a future in which environmental, societal, and economic considerations are balanced in the pursuit of development and improved quality of life" (McKeown, 2002: 7).

In the case of HE the balance is pursued between the right and privilege of the individual. The simplest scenario is the following: Should one have the right, if scientific evidence shows that the probability of graduating, especially in the prescribed time, is almost 0%? Every stakeholder loses. Luck of funds by a capable individual to access HE makes access a privilege for the rich, the elite (as in the past) but also for the institution else it cannot sustain itself if the individual was not capable; and of course the country could be deprived of a new leader.

Sustainability of HE is also depending not only on quantity (higher graduation rates) but also on the quality of the product, the graduate. Research has shown that quantity can have a negative effect on quality of education, especially if the standards are dropped. If the institution accepts low calibre students that leads to low status institution. To move back to high status more often than not, is impossibility (Macrae and Maguire 2002, 24).

One of the main functions of HEI is to provide knowledge-related services (e.g.: transmit knowledge, process and synthesise knowledge as well as create knowledge or manage knowledge). These services are yet another contributing factor to sustainability.

3 KM and HE

Knowledge is considered as the most valuable asset in an organisation and probably will remain the in the years to come (Razi, Karim and Mohamed). The knowledge contains useful and meaningful information which later involves selection, filtering and assimilation processes performed by human cognition (Noordin, Othman and Zakaria, 2011).

The service oriented HEI have now come to realise the importance of KM as a result there are a number of studies in KM in the HE sector (Razi, Karim and Mohamed, 2011). The successful 21st-century organisations – schools, universities, small businesses or corporate giants – will be those that make the best use of their information and knowledge and use them to create sustained additional value for their stakeholders. At the same time, the concept of lifelong learning means that the learner is no longer regarded as the eighteen-year-old fresh from school, but now includes those entering and re-entering the university. The university is no longer confined within its own buildings; courses are delivered in outreach colleges, in the workplace and online. With these profound changes have come new words associated with learning: distributed, flexible and blended. The university is no longer the traditional bastion of knowledge, defined by its disciplinary boundaries or its physical campus, colleges and buildings (Buckley 2009, p. 80).

According to Buckley (2009), for universities to meet the demands of the global community

- the creation and dissemination of knowledge should be seen as instrumental activities rather than as ends in themselves;
- organisations set up solely for the purposes of knowledge creation and dissemination must have at the core of their brief the ambition to demonstrate the utility of the knowledge they produce and assist in the diffusion and application of that knowledge; and
- in order to implement the above effectively, such organisations must see themselves as part of that interactive chain of relations that constitute the global society rather than as the centre of a given national science system.

As knowledge is evolving and exploding throughout the time, a strategic method is required in order to manage the knowledge effectively and efficiently (Noordin, Othman and Zakaria, 2011).

4 KM strategies and systems

KM systems have become an important means of organisational development and survival. The rapid evolution of information technology has led to a revolution in industrial organisation, wherein competitive advantages are generated through the application of ITs to KM systems (Lee, Tsai and Amjadi; 2012, p. 30). Some organisations rely on conventional codification strategies, focusing on the use of IT to codify and store knowledge.

KM strategies can be primarily categorized based on two key dimensions: KM focus and KM source. On the KM focus dimension, strategies can be categorized as explicit and tacit knowledge based strategy. On the KM source dimension, KM strategies can be classified as internal and external knowledge based strategy. KM strategies outline KM practices required for managing knowledge effectively. The success of universities depends critically on the collection, analysis and seamless exchange of information or knowledge within and across the above organisational boundaries (Akhavan, Owlia, Jafari and Zare, 2011:1592).

Since the business of universities is about knowledge, they must be able to use technology in the management of that knowledge. Organisations today require employees who can quickly contribute novel solutions, communicate and cooperate effectively, independently seek out and evaluate information and readily share their knowledge in a manner that is intelligible and readily usable by co-workers. To execute successfully KM, top management and leadership should formalise KM practices in universities and connecting KM with economical benefit and innovation, allocating resources and the other variable factors. University staff performance in KM field can be evaluated, improved, standardised, developed and been efficient by performance management (Akhavan, Owlia, Jafari and Zare, 2011:1592).

The awareness in the last decade that knowledge and intellectual capital account for a significant unaccountable wealth companies spend significant amounts of money to capture them. However the systems they use could be ineffective, inefficient and do not create value. A knowledge based management (KBM) strategies and systems have to be applied.

5 A KM based system for sustainability of HE.

KM based systems can be used to a great extent for sustainability of HE. As it was revealed in the first section of this paper achieving sustainability in HE in a rising economy such as South Africa is not always an easy feat. There are a number of factors

that need to be taken into account. Some of these factors come from the environment of an organizational institution (e.g. government, society, and economics) and some come from the internal mechanisms (e.g. internal policy, funding and organizational structure). If graduation rates are one of the factors for sustainability (quantity) and if the type of graduate (quality) is another together with research outputs then one way to ensure sustainability is to ensure that graduates possess certain key competencies (Wiek, Withycombe and Redman, 2011).

According to Wiek et al (2011:203) key competencies are critical for graduating students to possess. They identified certain general key competencies regarding sustainability in HE. According to the authors' view modern economy, society and world generate a range of complex problems such as desertification, poverty, war. Sustainable development is believed to be one of the possible responses to these problems. Therefore the sustainability field has gained significant institutional attention over the past few years (number of new academic journals, conferences, symposia and educational advancements from general to HE). Authors propose to employ *competencies* as a references scheme for evaluation of student learning and teaching effectiveness. Competency in this view is a "functionally linked complex of knowledge, skills and attitudes that enable successful task performance and problem solving" (2011:204). What is important in this definition is that competencies in their core are intrinsically linked to knowledge and skills. Therefore it is possible to link them with the wider academic domain – that is knowledge management.

Wiek et al (2011) note that the current research converges towards comprehensive key competencies such as sustainability research, problem-solving and sustainable education. According to the authors in order to relate education to sustainability it is necessary to incorporate five key competencies: system-thinking competence, anticipatory competence, strategic competence, normative competence and interpersonal competence (2011:205). Remington-Doucette et al. (2013) investigate the sustainability in HE and try to assess it. The authors try to "translate" the abstract competencies identified by Wiek et al. (2011) into a functional university curriculum. They note that this is critical for the effectiveness, credibility and long-term viability of the curriculum.

KM based system for sustainably in HE should take into account the competencies identified before. In the case of the rising economies such as South Africa it should additionally consider the constraints posed by the Economy, Society and current political

situation. Adhikari (2010) focuses on the KM in academic institutions. Author provides two basic definitions of KM and notes that they have in common a structured approach to knowledge assets. Based on that he states that any structured activity, which “improves an organization’s capacity to acquire, share and use knowledge in the ways that improves its survival and success” (2010:97) should be part of KM systems. In this view it is possible to see common interest between KM strategy and sustainability strategy, which is long-term existence and success. Therefore all KM activities and systems should be closely tied to organizational objectives, of which one of the most important ones should be sustainability. The next section will focus on achieving sustainability in the case of open and distance learning (ODL) in HEI in a rising economy.

6 Sustaining an ODL (open and distance learning) HEI in a rising economy.

ODL is an important feature of HE in rising economies as compared to developed countries. It is due to the fact that in some cases transport infrastructure may be not as well developed. Therefore ODL is a natural choice of meeting the needs of the population, without huge expenditure on the infrastructure. ODL in this view may be perceived as a factor enabling sustainable HE and reaching population, which otherwise would be deprived of even the basic educational opportunities.

But ODL has extra challenges than a face to face HEI. Nowadays technology is a key factor which was identified by Adhikari (2010) and possibly many others. These key factors are vital to the organizational capability to exploit knowledge. Among these key factors are: technology and organizational structures. These two factors have also to be considered for achieving sustainable ODL. . Rowland and Rubbert (2001) note that the information needs and practice of part-time and distance learning as well as mature students in a lifelong learning environment are rapidly transformed by the use of ICT in HE (2001, p. 758). They also realize that the information needs of part-time and distance learners are different from the “standard” students and may be not fully recognized by Universities and programme tutors.

Additionally distance-learning units may often cater for only some of the programmes that are offered in a given HEI. A successful strategy in the case of ODL should take this into account as well. One of the potential solutions to these problems is provision (by the

institution) of highly specialized distance-learning units. . Rowland and Rubbert (2001) also note that “some of the demands students made will be easier to implement than others” (2001, p. 760). Therefore in order to achieve sustainability in ODL it is necessary to prioritize the potential solutions. Moreover it is necessary to perform cost-benefit calculations in order to decide on the usefulness of specific facilities, courses and services. Additionally a given course, service or offering can only be successfully implemented if existing marketing and promotion strategies can be adjusted to guarantee the long-term future of this given new service or offering. In other words it is necessary to “guarantee” the market for it in order to achieve its sustainability and profitability to the HEI.

At this point authors would like to consider whether a framework for an ODL institution, which implements sustainable development, could be developed. Of course it is possible to see great benefits, which could be achieved by proposing such a framework. As it was discussed previously such framework should take into account the prioritization of the students’ needs and matching them with the budgetary constraints as well as organizational policy. Additionally factors from the environment should be considered too. Figure 1 presents a very early approach to such a framework.

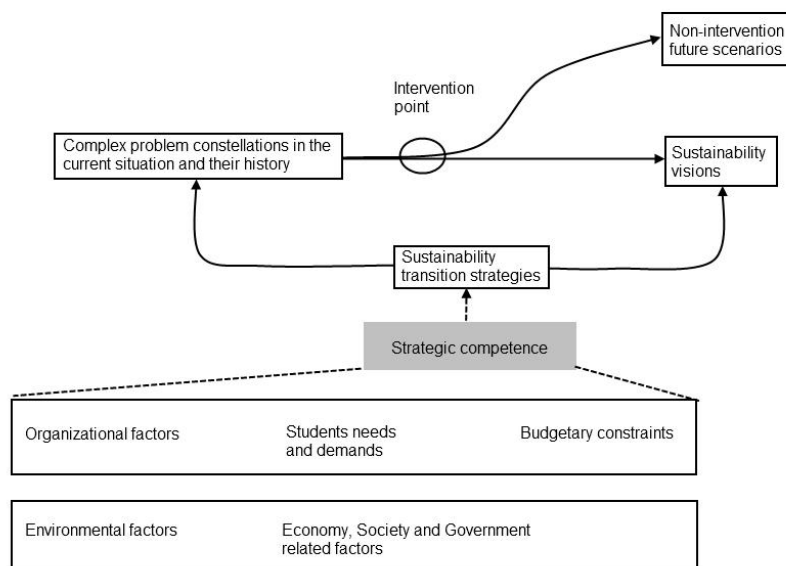


Figure 1. Achieving sustainability in HE (based on: Wiek et al., 2011:206)

As it can be seen on figure 1 the most important key competence in the case of decision makers and solution designers should be strategic competence. This competence should allow formulating sustainability transitions strategies for HE. In other words sustainability in HE can be achieved by a way of shift in paradigms and reformulating given institution's strategies in such a way that they take into account sustainability. Such sustainability transition strategies should encompass ODL as one of the potential solutions to the students' needs and demands on one hand and budgetary constraints on the other hand. Apart from that environmental factors also play a significant role. All this should lead to sustainability visions. These visions in turn help achieve sustainability by providing all stakeholders (not only decision makers) with concrete guidelines. These guidelines may be different for each HEI depending on the factors involved.

7 Conclusion

HEI (also those implementing ODL) are faced nowadays with more challenges than ever before especially massification, competition to attract high calibre students and subsidy cuts by governments. Increase in graduation rates and producing quality graduates are indisputably two factors that will guarantee their existence and of course aiming for being leaders in research and development in the future. However each of these has its own challenges especially for ODL institutions and even more in South Africa, what the authors call 'a hybrid country' that lies between the first and the third world. It is hoped that the suggested model, if properly applied could ensure the sustainability of an ODL institution in the 21st century.

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Using technology for knowledge transfer between academia and enterprises

Ivan Obradović*, Ranka Stanković

Faculty of Mining and Geology
University of Belgrade
Đušina 7, 11000 Belgrade, Serbia

* *Corresponding author*

Structured Abstract

Purpose –Advanced web technology offers possibilities for blending two complementary sources of knowledge, academic and entrepreneurial, within a single web-based framework. The main goal of our project is to establish an open educational resources (OER) platform and network for fostering technology enhanced learning (TEL) within HE institutions and enterprises in the Western Balkans. Another objective is to provide training for members of universities and enterprises for production of OER materials. The third objective is to produce materials in various languages, in video, audio and textual format, supported by electronic terminological resources, services, and functionalities for searching and browsing.

Design/methodology/approach – The TEL platform consists of tools and resources: learning, language and implementation resources. Among the tools some are available open source and commercial tools, some are in-house tools developed by the University of Belgrade Human Language Technology Group. Learning resources are both academic: course planning materials, video lectures, thematic content, and entrepreneurial: case studies, best practice examples, expert presentations and software demonstrations. Language resources supporting the multilinguality of the platform, terminology and its search and browse functions are lexical and textual resources and grammars. Implementation resources consists of best practice design principles and licensing tools to promote OER.

Originality/value – Designing usable, effective and interactive TEL environments is a demanding task, which requires creativity and a significant amount of expertise. Especially when knowledge is elicited from two essentially different environments, the academia and the enterprises. The need for multilinguality of OER is a consequence of the novel holistic approach that takes into account all the languages a learner may use. Hence the language support system within our TEL platform, which provides for OER in different languages and allows learners in a specific domain to get acquainted with domain terminology both in their mother tongue and in other languages.

Practical implications –The proposed TEL platform opens a new dimension in OER by blending two major sources of knowledge: the academia and the enterprise. It thus contributes to the important task of preparing university students for their future jobs, but also enables them to improve their academic knowledge after graduating, by offering them a live-long learning opportunity. Finally, it supports mastering of educational

materials and expert terminology in different languages, in contrast to more traditional approaches that look at one language at a time.

Keywords – Technology enhanced learning, e-Learning, Open courseware, Open educational resources.

Paper type – Academic Research Paper

1 Introduction

The knowledge of professionals with higher education can roughly be divided in two parts: academic knowledge they gain as university students and entrepreneurial knowledge they acquire as practitioners. Although it is safe to say that academic and entrepreneurial knowledge are complementary and intertwine in various ways, the sources of these two types of knowledge and the knowledge acquisition process are in general separated, as higher education offering academic knowledge precedes the solving of practical problems within enterprises that generates expert knowledge. Although higher education institutions (HEI) endeavor towards keeping academic curricula up-to-date with novel entrepreneurial knowledge, this has become a critical issue, especially in engineering disciplines. Technological development generates entrepreneurial knowledge at an ever growing pace, whereas changes in academic curricula require procedures that are time-consuming and considerably slower. But academic knowledge also evolves on its own accord, and the knowledge of a graduate student becomes partly outdated over the time.

Although the acquisition of the two types of knowledge is separated, the need for blending of academic and entrepreneurial knowledge has been recognized (Etzkowitz, 2004). Namely, students are exposed to practical knowledge during their studies, however usually to a modest extent, through student practice and internship in enterprises. On the other hand, once they graduate, and become employees, they are more and more often encouraged to enhance their academic knowledge within the life-long learning paradigm (Longworth, 2013). Nevertheless, blending of knowledge and establishing a continuity of knowledge acquisition still represents a challenge that needs new approaches and tools to be developed.

Technology-enhanced learning (TEL) relies on information technology (IT) to offer support in improving the quality of learning and its outcomes. Designing effective TEL environments in an efficient and affordable way is a demanding task, which requires

creativity and a significant amount of expertise (Goodyear & Retalis, 2010). Within IT, web technology is now widely used in TEL, especially since the Semantic Web or Web 3.0 has been developed (Daconta, Obrst, & Smith, 2003). A variety of web-related educational innovations are now available, enabling further advances in the sharing of educational ideas, materials, and knowledge. Social networking, blogs, wikis, cognitive tutors, virtual learning communities, and especially web-based learning management systems (LMS) are being more and more used in TEL (Rhoads, Berdan & Toven-Lindsey, 2013).

Within TEL, the idea of making university courses publicly available on the web as open courseware (OCW) has emerged, leading to development and implementation of massive open online courses (MOOC), which, in addition to traditional course resources such as videos, readings, and problem sets, also offers interactive user forums aimed at building a community for professors, teaching assistants and students. OCW is embedded within the even wider open educational resources (OER) initiative, where materials are offered openly and freely to educators, students, and self-learners to use and reuse for teaching, learning, and research (Bissell, 2009). The materials are released under an open source license which permits their use, reuse and redistribution with limited or no restrictions.

In this paper we describe an approach to making available both entrepreneurial knowledge to students on a wider basis and novel academic knowledge to graduate employees in enterprises, within a TEL platform founded on OER principles. This web-based platform will enable higher education institutions to publish different academic learning resources in the form of video and lectures, printed course materials and the like, and enterprises to use similar forms to offer expert knowledge, such as case studies or presentations of software implementation in practice.

The platform is being developed within a project funded by the European Executive Agency Education, Audiovisual and Culture (EACEA) in Brussels. Its primary target are universities and enterprises of the Western Balkans (WB), and accordingly educational materials will be published in WB languages, which belong to "small" but closely related languages, but also in "big" languages such as English and Russian. Given the envisaged variety of languages within the platform, a language support system will be embedded to support multilinguality, but also terminology issues and query handling.

The TEL platform will also serve as a model for developing similar platforms as nodes within a TEL network encompassing a larger number of universities and enterprises. The network will feature a common portal for indexing and facilitating access to the various OER within the nodes.

Section 2 of this paper outlines the main goals to be achieved by the proposed approach, whereas the main features of the platform are given in Section 3. Section 4 is dedicated to its language support system, followed by conclusions in Section 5.

2 Objectives to be accomplished

The main goal of our approach is to enable knowledge transfer between academia and enterprises by making OER materials from both sources freely available on the web, and thus foster enhanced learning within higher education institutions and life-long learning within enterprises. Students will be offered an insight into expert knowledge gained through practice within enterprises, whereas employees involved in life-long learning will have access to state of the art high quality academic courses and thus continue with their professional development in a way more suitable to their professional activities than that of the traditional life-long learning programs. By blending these two types of knowledge within one technological framework, the TEL platform developed within this project, our approach additionally contributes to improvement and enhancement of relations between the academia and the enterprises and integration of creative research potential with industry and academic institutions.

The second objective within our project is to develop and implement guidelines and procedures for quality assurance of OER in WB according to best practice offered by the EU, and provide training by qualified OER trainers for both HEI and enterprise staff involved in production of OER materials.

As its third objective the project will produce course materials in several different languages, in various forms such as videos, audio streams and written material. The materials will be supported by electronic terminological resources, as well as services, and search and browse functionalities. Given the composition of the project partners the platform will be initially populated by materials from the domains of ICT, geoinformatics, mining and environmental protection.

Our TEL platform will thus provide educational support for a variety of users at different levels, offering an educational continuum. It will even support the initial phase

of higher education, namely preparation of university admission exams, which precedes enhanced academic education, workplace education and life-long learning. In brief, better quality and accessibility of education through TEL will thus be achieved, enabling OER learners from both universities and enterprises to study the educational materials at their own pace. Our approach also contributes to the development of virtual mobility, as it will enable students to follow a course at another university from their home campus and thus prepare themselves better for continuing their studies elsewhere. It will also increase transparency by offering an insight in the academic content various HEI are offering, which helps students make their choice of the university that best suits their needs. Besides enhancing cooperation between academia and enterprises in general, our TEL platform can be used as a valuable tool for facilitating and enhancing cooperation between different universities, on issues such as development of joint courses, or mutual recognition of diplomas.

Finally, as our TEL platform is conceived as a WB-targeted OCW-based project some of its goals coincide with those of the Open consortium Europe. Namely, as the interest of European universities in OER and OCW rapidly grew, a consortium of HEI led by the Delft University of Technology has been formed. Besides Delft University the main partners within Open consortium Europe are Universidad Politécnica Madrid, Universitat de Barcelona, Katholieke Universiteit Leuven and Université de Lyon, as well as the OpenCourseWare Consortium (OCWC), Creative Commons (CC) and European Association of distance Teaching Universities (EADTU). The universities that initiated the consortium were subsequently joined by more than fifty European partners from Austria, Belgium, Cyprus, Denmark, France, The Netherlands, Poland, United Kingdom and Spain, where the movement is especially popular with almost 40 universities offering free online courses. Partner universities within the consortium are currently offering more than 14,000 courses online.¹

Ultimately, our approach helps OER learners from both universities and industry to fill in the gaps in their knowledge by acquiring new knowledge and become familiar with new technology.

¹ <http://www.opencourseware.eu/>

3 Conceptual design of the TEL platform

An overview of the conceptual design of our TEL platform is depicted in Fig. 1. The platform consists of four groups of components, namely:

- *Tools* - composed of FMG CMS, an in-house Content Management System (CMS) developed by the University of Belgrade, Faculty of Mining and Geology (FMG), the Learning management system encompassing several specific content and learning management software tools, and Development tools, software to support the development, use, reuse and delivery of learning content;
- *Learning resources* - both academic, in the form of course planning materials, video lectures, thematic content and the like, supported by evaluation tools, and entrepreneurial, such as case studies, best practice examples, expert presentations and software demonstrations;
- *Language resources* – lexical and textual resources and grammars to support the multilinguality of the platform, terminology and its search and browse functions;
- *Implementation resources* - best practice design principles and licensing tools to promote open publishing of materials.

The content management system FMG CMS was initially developed within FMG as a custom course management system to support blended learning, which started gaining popularity at FMG in the last decade. Namely, where teachers at FMG expressed their interest in integrating IT with traditional face-to-face class activities in their teaching, an in-house tool was developed to provide online publishing of educational materials, organization of tests and e-communication with students. Later on, blended approach at FMG was further enhanced by introducing Moodle (Modular Object-Oriented Dynamic Learning Environment), a free software e-learning platform, conceived by Martin Dougiamas, who is still the lead developer of the Moodle.Org community. Moodle helps educators to create online courses and fosters interaction within the teacher-student community, especially collaborative content development. As of April 2014 there were around 69,000 registered Moodle sites offering 7.8 million courses by 1.2 million teachers to 73.8 million users in 235 countries.²

² <https://moodle.org/stats/>

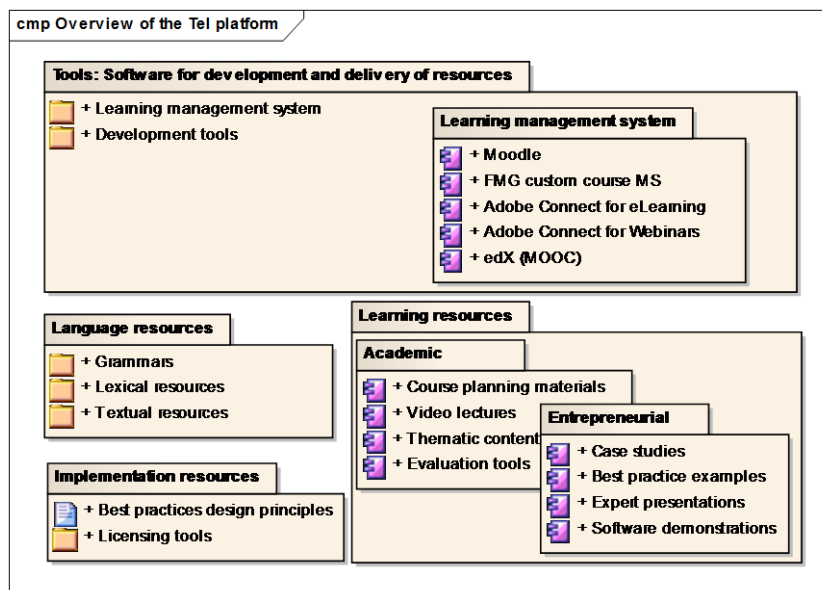


Figure 1: Conceptual map of TEL platform

Besides the FMG custom course management system and Moodle, the Learning management system includes other powerful tools such as Adobe Connect for eLearning, Adobe Connect for webinars, and EdX, a massive open online course (MOOC) platform.

Adobe Connect is a platform that supports e-learning, webinars, and organization of web meetings. Its Adobe Connect for eLearning component is a comprehensive solution enabling mobile learning that is accessible from anywhere, at any time, by means of virtually any PC or mobile device. It features state of the art content authoring tools, as well as tools for measuring real-time engagement in virtual classes and tracking individual student progress. Another component envisaged in our TEL platform, Adobe Connect for Webinars, offers templates for creation of landing pages, speaker information, registration pages, login pages and emails. These templates and content can be customized using several components, such as images, tables, charts, and carousels. It also provides engagement monitoring in real time via an engagement dashboard.³

The EdX platform, recently (2012) conceived by MIT and Harvard University is aimed at supporting massive open online university courses. The platform has been developed as open-source software, akin to Moodle, and is available to other HEI under

³ <http://www.adobe.com/rs/products/adobeconnect.html>

edX Terms of Service.⁴ An important feature of edX is its interactive online learning software offering production of series of short videos, each followed by an exercise where students can immediately check their understanding of the concepts introduced by the videos. The platform also offers creation of online textbooks, as well as discussion forums for student-teacher interaction. Finally, edX provides for online laboratories, as for example in its first MOOC, a course on circuits and electronics, where students were able to built virtual circuits in an online lab (Breslow et al., 2013).

All the aforementioned tools will be integrated within the TEL platform's LMS to provide a synergy of functionalities for efficient realization of the proposed approach. A backend control panel within the platform will enable teachers in the academic environment to track the progress of students while using the learning resources, and thus have an insight into how they are mastering specific concepts, especially those featuring entrepreneurial learning content. This insight could further be used to filter out especially motivated students, and engage them in "peer to peer knowledge sharing", namely in helping students who have problems in understanding some concepts. Motivated students could also be encouraged to become teacher assistants (TA) and publish their own educational materials on the platform.

As for the entrepreneurial environment, the TEL platform's backend control panel provides similar opportunities for tracking the progress of graduate students who started to work in companies and are now involved in life-long learning. The same way university teachers in the academic environment monitor their students, supervisors within the enterprise can monitor how their employees are keeping pace with new knowledge within the learning content offered by academic institutions.

As for development tools, several commercial tools will be used, such as Visual Studio .NET, Adobe Dreamweaver and ArcGIS as well as LeXimir, a multipurpose tool for lexical resources management and query expansion developed at FMG (Stanković et al., 2011).

Besides specific tools, the TEL platform has corresponding resources, which have already been briefly described at the beginning of this section. An important place among the resources is occupied by language resources, which will be described in more detail in the following section.

⁴ <https://www.edx.org/edx-terms-service/>

Besides the TEL platform, our approach envisages the development of an infrastructure for implementation of a TEL network, involving a larger number of universities and enterprises within the WB, and thus giving broader access to OER. The network will consist of nodes at universities and enterprises, featuring their own TEL platforms similar to the platform described in this section, and a common portal for indexing OER and other supporting TEL content throughout the network. Audio, video and written text materials from all partner institution nodes will be indexed and annotated with metadata, thus providing enhanced searching capabilities. Namely, when a critical amount of learning resources is reached, it is very important that they are well described and tagged in a standard way in machine readable form. This approach has many advantages:

- Results returned by search engines are more relevant and better described;
- Those interested in course materials (both educators and learners) can find and compare learning materials that best suit their current needs;
- Developers of educational resources and platforms for development of educational resources can create applications and resources in a well described standard format, thus enhancing the value of the educational materials and their visibility for all potential users (educators, learners, educational and public institutions).

OER metadata management in our TEL platform will follow the guidelines set by international standards and initiatives such as ISO/IEC 19788 Metadata for learning resources depicted in Fig. 2. This standard is intended to provide compatibility with existing ISO Dublin Core (DC) Learning Object Metadata (LOM) standards and to support global requirements for adaptability both from the multilingual and cultural perspective. It has two main goals:

- Provide standard metadata elements and their attributes in order to facilitate the identification and specification of metadata elements when describing a learning resource;
- Offer support for learners, educators as well as specialized software in searching, discovering, retrieving, evaluating, and using learning resources.

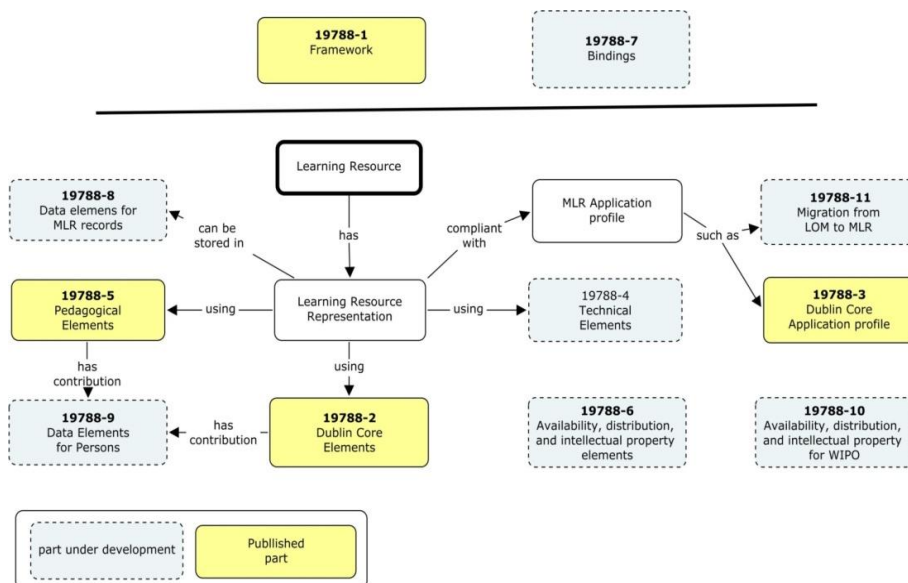


Figure 2: ISO/IEC 19788 Metadata for learning resources

Parts 1, 2, 3 and 5 of the ISO/IEC 19788 standard, marked in yellow are released as international standards, while the seven remaining parts, marked in light blue, are still under development.⁵

4 The language support system

The need for multilinguality of OER is a combined effect of globalization and European integration, favoring a holistic approach that takes into account all the languages a learner may use, as opposed to the more traditional approach looking at one language at a time (Cenoz & Gorter, 2011). Hence, our approach envisages that learning materials within the TEL platform can be in various languages, thus providing an efficient answer to one of the major criticisms of OER being biased towards the so called "big" languages. In order to resolve successfully the issues related to multilinguality, especially terminological issues, but also in order to improve the search and browse functions within the TEL platform, special attention is given to its language support system (LSS). The main goal of LSS is to sustain expert terminology in a multilingual environment and enhance multilingual communication between academic institutions and enterprises.

⁵ http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=50772

The language support system, whose structure is outlined in Figure 3, is based on electronic language resources, namely, lexical resources, textual resources and grammars. Bilingual dictionaries in electronic form are one of the simplest multilingual lexical resources. However, for their full functionality in languages with complex morphology, such as Serbian, they need to be coupled with morphological dictionaries. Morphological dictionaries of Serbian simple words and compounds in the so-called LADL format (Krstev et al., 2010) are thus also part of the lexical resources used by LSS. Besides Serbian, such resources exist for many other languages, including English and Russian, which are also envisaged as OER languages within our TEL platform. Another important lexical resource offering support for multilingual terminology is the Serbian wordnet. In brief, a wordnet consists of sets of synonymous words representing specific concepts, called synsets, with a semantic network formed on basis of semantic relations between them. Akin to standard dictionaries, each synset word, or literal, is composed of a literal string and a sense tag, representing the sense of the literal string specific to that particular concept. The multilinguality potential of wordnets stems from the interlingual index (ILI), which establishes relations between synsets representing the same concept in different languages (Krstev et al., 2004).

Finally, among lexical resources within LSS are terminological resources such as GeolISS term and RudOnto (Stanković et al., 2012). GeolISS is a thesaurus of geological terms with entries in Serbian and English, developed at FMG within the GeolISS project.⁶ Thesauruses are complex terminological resources, usually related to a specific domain, with as semantic structure formed by semantic relations between terms, and thus in some of their features resembling wordnets. RudOnto is another complex terminological resource, also developed at FMG with the goal to gradually develop into the reference Serbian resource in e-format for mining terminology. Currently RudOnto comprises of concepts in Serbian, their English equivalents, and a small number of equivalents in other languages.

⁶ <http://geoliss.mprpp.gov.rs/term/>

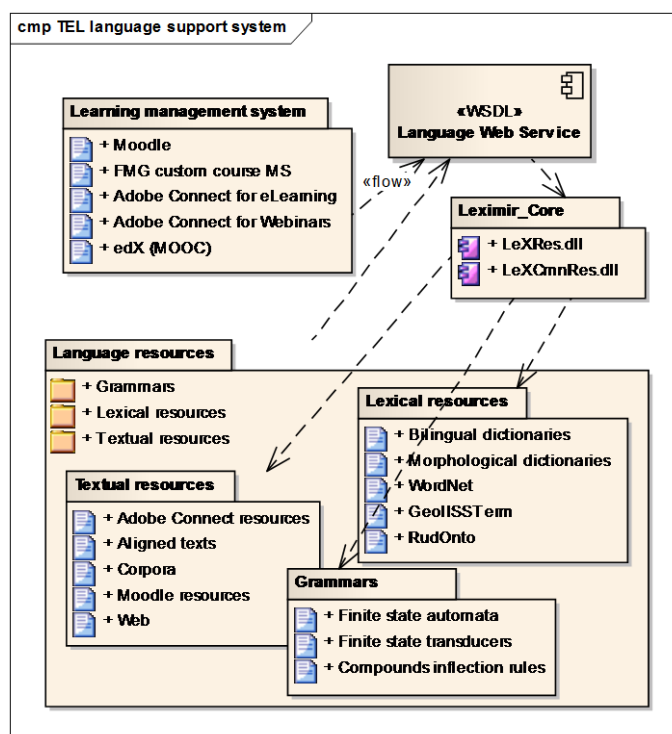


Figure 3: The TEL language support system

The TEL language support system also handles various textual resources. Some of them are directly related to LMS tools, such as Adobe connect and Moodle resources. In addition to that, textual resources feature aligned texts and corpora. Aligned texts are pairs of texts in different languages, mainly an original and its translation, aligned on some structural level, most often the sentence. Aligned texts in LSS are in the standard, Translation Memory eXchange (TMX) format, which is XML-compliant. Corpora are large and structured sets of texts, both monolingual and multilingual, the latter often composed of aligned texts. Finally the web itself represents a textual resource that LSS makes use of.

Specific features of Serbian grammar need corresponding language resources in the form of grammars. Grammars within LSS are implemented by the so called finite state automata, finite state transducers and compound inflection rules (Krstev, 2008).

The language support system handles various types of requests issued by the tools from the learning management system, usually in the form of a query. The requests are handled by a WSDL (Web Services Description Language) described Language Web

Service, basically composed of a web application and a web service. When handling a query, the Language Web Service uses a component of the multipurpose tool LeXimir, namely the function library LeXimir_Core. A query originating from the LMS is accepted by the web application, which forwards it to the web service. The web service then invokes LeXimir_Core, which processes the query using the available resources. During this processing the system can perform a morphological expansion of the query to improve recall, which is especially important for morphologically rich languages such as Serbian. In order to support the multilinguality of the TEL platform, LSS can also expand the query in one language to another language, e.g. a query in Serbian to English or Russian, and vice-versa.

With all the aforementioned features LSS takes a prominent place within the concept implemented by the TEL platform, offering invaluable support for better understanding and handling of the multilingual OER content.

5 Conclusions

The TEL platform described represents a step forward in OER by blending two major sources of knowledge: academic and the entrepreneurial. Its aim is to provide a leaning continuum, from enrichment of university students' knowledge with entrepreneurial knowledge that might prove useful in their future jobs, to keeping their academic knowledge up-to-date once they have graduated, by offering them a live-long learning opportunity as employees.

There are, however, several critical issues, which might impede the implementation of the envisaged concept. The first one is how to motivate qualified academic and/or entrepreneurial staff to produce high quality OER content in continuity. A similar problem might arise on the learners' side, as students might lack interest or willingness to invest some additional effort in learning and knowledge sharing. Finally, authorship issues might be also an impediment due to lack of adequate legislation regulating the practices and principles of publishing and using OER content, especially in the WB region.

As for the technical issues, successful development of the TEL platform requires coordination of activities among partners with possibly different levels of IT skills. Implementation of the OER network, on the other hand, needs successful organization of public procurement and acquisition of appropriate equipment. As for smooth operation of

both the platform and the network, the hardware and software infrastructure and communication links must function flawlessly.

In brief, there is a lot of work to be done before the TEL platform enters full exploitation to the benefit of university students in their preparation for the labor market, and those who have graduated, in their lifelong learning endeavor.

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The “Region of Knowledge” initiative as planning model for economic growth in the South-Southeast region of Mexico

Gina Laura Baena Paz *, Salvador Neme Calacich,
Lenin Martínez Pérez, Aída Beatriz Armenta
Ramírez

Department of Ciencias Económico-Administrativas...
Universidad Juárez Autónoma de Tabasco
University Address: Villahermosa, Tabasco, México

** Corresponding author*

Structured Abstract

Purpose – Being Mexico a Latin-American country located in North America, strengthens the fact of not being considered as part of the group of countries limited to the core Latin-American characteristics, but also without the characteristics of our developed neighbor countries of the North, Canada and USA. This vagueness also characterizes the inequality gap in the 32 states of Mexico, where the northern states present a high index of development and quality life, and the south region is highly marginalized, though with abundant natural resources (i.e., water and land for agriculture) (CCYTET, 2005). In 2004, the Inclusive Commission for Development was established, which main goal is setting the grounds for development in the South-Southeast Region of Mexico. It has been ten years now, where the actions of this Commission are retaken, and the new governor of the state of Tabasco invites the rest of the states to develop a comprehensive development plan for Mexico (CONAGO, 2013).

Design/methodology/approach – Given the characteristics of this research, we will use a qualitative approach. Our data collection methods will be interviews and focus groups. Because, this is an exploratory research, the design of the model will be based on the experiences and insights of the main actors involved. We will first identify the states that conform the South-Southeast Region. Secondly, we will establish communication channels with the main higher education institutions of this particular region. Every institution will name a key actor, preferably a local expert in management and planning in higher education, and an action plan will be designed to transform the region into a Knowledge Region (Carrillo F. , 2005). In these meetings, a task-force group will be pointed out to elaborate a local analysis of each state and the capacity-building of the institutions. This analysis will consider the cultural, social, economic, environmental factors, and the key actors that are involved in the design and development of policies that effectively integrate sustainability issues in strategy, processes and growth trajectories for the South-Southeast region of Mexico in order to become a Knowledge Region (ITESM, 2003). The key aspects that the Development Commission established were development

and economic growth, regional competitiveness, inclusion and social cohesion, development and environmental sustainability, urban and rural development, and social infrastructure

Originality/value – It has been proved that developing countries have changed their economic status when they orient their actions into knowledge, creating true Knowledge Region, and cities devoted to develop any services or products of the region, and actually becoming world innovation nodes of local expertise of the specific region. In Mexico there is only ten experiences of Knowledge Cities and only one is fully developed; because of the individual characteristics of the places, establishing a region instead of a city will be more beneficial for the states that are embedded in that region, achieving a comprehensive development and better quality life (World Bank, 2012).

Practical implications – Every state of the Region has Public Universities that have progressed in their academic development and parallel have worked together by entailment or academic exchanges. Through a committee composed by these higher academic institutions, these universities coordinate the actions to elaborate the comprehensive development plan for the South-Southeast Region of Mexico.

Keywords –South-Southeast Region of Mexico, Region of Knowledge, Higher educational institutions, Planning and Entailment.

Paper type – Academic Research Paper

1 Introduction

Being Mexico a Latin-American country located in North America, strengthens the fact of not being considered as part of the group of countries limited to the core Latin-American characteristics, but also without the characteristics of our developed neighbor countries of the North, Canada and USA. This vagueness also characterizes the inequality gap in the 32 states of Mexico, where the northern states present a high index of development and quality life, and the south region is highly marginalized, though with abundant natural resources (i.e., water and land for agriculture) (CCYTET, 2005). In 2004, the Inclusive Commission for Development was established, which main goal is setting the grounds for development in the South-Southeast Region of Mexico. It has been ten years now, where the actions of this Commission are retaken, and the new governor of the state of Tabasco invites the rest of the states to develop a comprehensive development plan for Mexico (CONAGO, 2013).

2014 planning processes have changed substantially in the 50 responding to long-term planning in the 60s and 70s used participatory planning in the 80 integrate the planning

processes and quality Corrientes 90 and 2000 strategic planning and prospective is what rules the roost , (Zenon Fuentes , 2000). Knowledge today is highly significant globally as Capital Intellectual, People and Value Added organizations, building models of knowledge regions are models of regional development and planning approach.

2 . Approaches to Planning

Planning is an act that has always existed, but not before it was called so, according to the developments of administrative theories and production creates his nomination; but how to do it has always been different, so that the various planning approaches appear.

The emergence of a new need not imply the cancellation of the above needs primitive forms of planning cohabit with the most advanced in the present (Fuentes Zenon, 2000)

The literature of planning basically consists of various schools of thought or approach is the best option (Bryson & Delbecq, 1979)

Each approach is announced as the final and complete solution that replaces other (Ansoff, Declerck, & Hays, 1990)

The use of wrong planning approach leads the following repercussions (Fuentes Zenon, 2000):

- Planning effort that began with great enthusiasm and then completely misplaced and diluted
- Comprehensive survey volumes of information
- Poor organization of activities
- Serious doubts that did make it what it is what is done
- Numerous unfinished projects
- Targets lacking relevance and realism
- Defective solutions
- Plans that do not pass the paper

An analysis of the different planning approaches reveal that although not homogeneous are not different when comparing it with some other match their purposes but mainly because in general, based on the same source: the Comprehensive Plan directed to effect change through a process to gain consent that includes the following steps:

1. The situation analysis to define problems

2. Formulating plan objectives
3. Identifying options for change
4. The analysis of the advantages and disadvantages of each option to define the most suitable
5. Developing the preferred alternative for implantation

Each author determines the depth of each planning approach some give more relevance to the internal diagnosis, others external to the analysis and some future , adopt a more idealistic stance while others focus their attention on integration of programs and budgets and action meet others consider issues like complexity , risk participation , forms of control and good conflict management (Fuentes Zenon, 2000)

The planning process is conditioned by

1. The nature of the subject
2. Characteristics of the object and
3. The subject-object relationship

In relation to the subject, who or who are involved in planning and behavior:

- ✓ If a single decision maker, then the planning has a highly technical nature
- ✓ Group processes, planning seeks the participation and consensus
- ✓ Groups power planning is seen as a mixture of analysis, negotiation and conflict
- ✓ Social sectors planning is part of a political process

In relation to the subject, about what you want to act? , Stored in what conditions , and what is expected , and what real possibilities for change exist? , What are its consequences?

If the object is relatively simple methods can apply well programmed and build detailed solutions

If the object is highly complex alone, it is possible to obtain a surface fragmented knowledge leading methods apply more generally

Considering the subject-object relationship, is to know the object in its dynamics has to do with the way in which the subject sees the object and change, which to a great extent depends on the thinking subject.

- Fix and enhance system operation
- Strengthen the competitiveness of the organization

- Take advantage of opportunities or future threats sports
- Dealing and give concreteness to the desired direction for the organization

3. Knowledge region

The concept of knowledge society, emerged in the sixties of the twentieth century (Machlup, 1962), is located within an economic perspective initially, and is one in which the sectors that use intensively knowledge are the main contributors the growth of the economy (Rohrbach, 2007) Cities or regions of knowledge, from a more complex perspective of development (Méndez, Michelini, & Romeiro, 2006), they are identified as those able to generate, implement and enforce various forms of knowledge to improve economic competitiveness, welfare population, environmental sustainability, greater citizen participation in public affairs and more effective governance of the territory. In this regard, some international organizations such as the European Commission (2000), World Bank (1999), the United Nations (2001) and OECD (1996) adopt this type of approach in its strategic directions related to global development. (Romeiro & Méndez, 2008)

The growing importance attached to knowledge-based development (Carrillo, 2005) (Komninos, 2002), helps to reinforce the traditional role of the city: that of being the center where there is a higher density of knowledge resources (Knight, 1995). And if, over the last decades, social capital and knowledge infrastructure were being considered key for development parts, the novelty associated with urban development based on knowledge is passed a socio-economic analysis of components and strategies of knowledge management, towards a system analysis of urban values based on the creation, exchange and application of knowledge (Carrillo, 2005). This means moving from an object of study focusing on "islands" where development and innovation processes occur more intensely (as in science and technology parks or digital islands) to a systemic analysis of urban strategies and system associated with knowledge management social values (Romeiro & Méndez, 2008).

The model of the city or region of knowledge, is a model of regional development planning, this model has a number of variables:

1. Human Development
2. Effective and transparent government

3. Development planning based on knowledge
4. Environmental Commitment
5. Intellectual Capital
6. Knowledge Networks
7. Quality Education
8. Business Competitiveness
9. Urban infrastructure and information and communication technologies
10. Innovation and technological development (Baena Paz, 2013)

"An enhancer of design options for cities derives from understanding the urban centers as value systems: human communities configured around an array of value that brings and holds together. The development of cities do not have to be restricted to better accommodate the current population to the legacy infrastructure, it can be oriented to the design of the urban experience: the whole family, social, employment, personal experiences, among others, which make it preferable have residence in a city. The potential for urban development are increasingly confined to the construction of civil works and increasingly open to the design and creation of environments and circumstances that enable meaningful and productive experiences " (Carrillo, 2005)

Thus, in the field of planning and urban development, the association between knowledge and territorial competitiveness currently leads to a proliferation of cities that call themselves as knowledge cities. But these are often associated, to city-regions or large agglomerations,

4. Methodology

"The qualitative method or traditional method, aims to deepen specific cases and not to generalize. Their concern is not primarily measured; but qualify and describe the social phenomenon from determining features, as they are perceived by the very elements that are in the situation studied, it seeks to understand a social situation as a whole, considering its properties and dynamics " (Bernal, 2006).

With this should be considered that scientific activity in the social sciences not only faces the difficulties and complexities which in itself represents , but also when it comes

to choosing appropriate methods and techniques to address , interpret and explain social reality (Tables, 2001).

With the above and according to the research questions posed and the research objective , the States of Mexico that make up the South- east Region and establish communication with the main Institutions of Higher Education in each State of the Region were identified to through meetings with persons designated by each institution , which must be skilled in planning for higher education , ation plan is designed to turn the region into a region of knowledge. This type of experience is considered because it is assumed, which is in the Institutions of Higher Education the right place to make the Model of Regional Development Planning . In these small meetings of States and diagnostic capabilities of the institutions shall be determined and a team dedicated to designing the model , taking the characteristics of the State of Knowledge and considering the cultural, social , economic and environmental factors are formed and strategic actors in the development of policies that effectively integrate sustainability issues in strategy , processes and growth trajectories for the region south-southeast of Mexico Region is one of knowledge. The points mark the Commission for the Integral Development of the Southern Region - South East are : Economic development and regional competitiveness , social inclusion and cohesion development, environmental sustainability of development , Urban Development , Rural Development and Infrastructure. All cualse reflected in a matrix to determine the similarities and thereby develop the model.

Research Questions

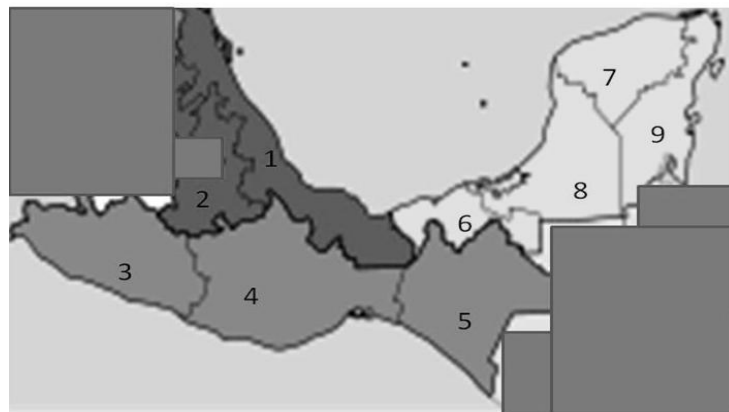
1. Who are the subjects in the process of planning the development model of South-east of Mexico Region?
2. Which would be the object to be modified and their new IDs?
3. How would the subject-object relationship in the development of the Model Development of South- East Region of Mexico?

General Purpose

Prepare the Planning Model for the Development of the South-east of Mexico region based on the construction of a Knowledge Region.

5. Development

After 10 years, in August 2013, the Commission for the Integral Development of the South-East Region of the National Conference of Governors (Conago), headed by the governor of Tabasco and attended by the governors of the 9 States reinstated Region South -Southeast of Mexico



It covers nine states with a combined population of 31 million 752 thousand 532 inhabitants, representing 28.2 percent of the national population, 346 thousand municipalities, which account for over 50 percent of the country's municipalities. In addition, concentrated 68 percent of the indigenous population. There is a direct relationship between indigenous people and poverty, which is part of the challenge to face, as the population dispersion results in a high cost in the provision of basic services. States that comprise:

1. Veracruz
2. Puebla
3. Guerrero
4. Oaxaca
5. Chiapas
6. Tabasco
7. Yucatán
8. Campeche
9. Quintana Roo

At this meeting schedules and concrete actions to promote regional comprehensive development were defined. With a focus on working together, it was agreed to develop a proposal for a project around arisen dialogue and consensus. Highlighting the importance of maximizing the competitive advantages offered by the closeness of the nation with the countries of Central America to integrate a wider market and a stronger multinational region, establishing a commitment to build the shortest path heading welfare peoples and a more prosperous region , promoting public policies that meet the requirements of the region, operating a program of work from 2013 to 2015 , in addition to establishing the schedule of activities and program of concrete actions as the South- east shares historical challenges such as poverty, backwardness and marginalization , but also grandeur and wealth of cultures and biodiversity , develop strategies to strengthen the development and empowerment of Mexico (Libertad en Chiapas, 2013).

We cannot have two México. We cannot have in Mexico is progressing north and Mexico to the south- southeast that is lagging behind.

The axes of development of South- east of Mexico Region are:

- Economic development and regional competitiveness
- Inclusion and social cohesion,
- Environmental sustainability,
- Urban development
- Rural development
- Infrastructure.

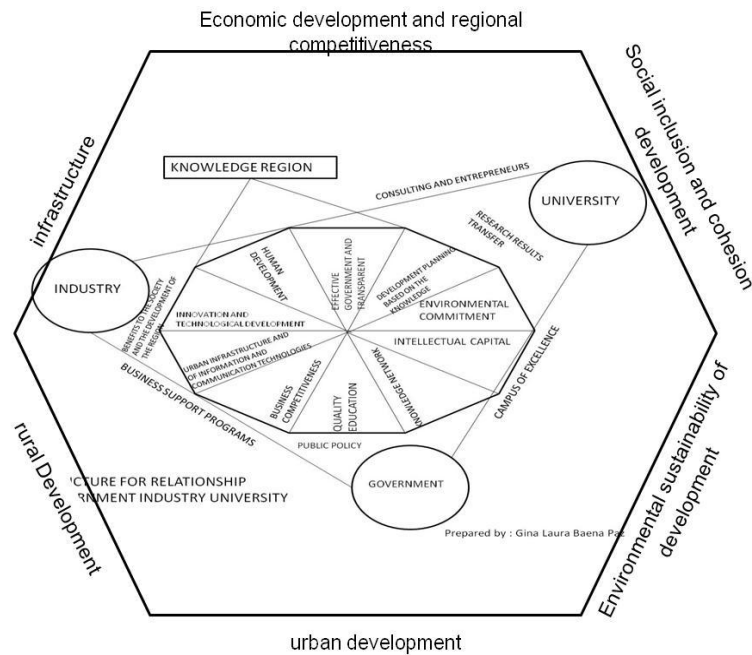
6 Proposal

From the above Matrix Matches are hellebores, to develop the model:

Development priorities of the Region South-southeast of Mexico Knowledge Region	Economic development and regional competitiveness	Social inclusion and cohesion development	Environmental sustainability of development	urban development	rural Development	infrastructure
human development	X					
Effective and transparent government		X				
Development planning based on knowledge			X			
environmental Commitment			X			
intellectual capital	X					
Knowledge Networks	X					

quality education				X	X	
business competitiveness	X					
Urban and information technologies and communication infrastructure						X
innovation and technological development	X					

Then the proposed model is presented Integrator to develop the Model Plan for South-east of Mexico Region under the focus of Planning Cities and Regions of Knowledge



The Triple Helix model in which the University , Enterprise and Government interact through interface relations involving the ten characteristics of the Regions of Knowledge through business support programs , campuses of excellence , consulting entrepreneurs and established public policies , the benefits to society and to the development of the region and the transfer of research results . This in turn is the basis of the guidelines for the development of South- South Region of Mexico.

7 Conclusions

At the present time the disciplinary theories are intertwined and interdisciplinary is present in solving problems, planning takes place in administrative processes and theories

Projects retaking this interdisciplinary trends and taking it to its importance OCCUPY development and by the development of science and technology .

That is why the case presented tends to see the use of knowledge resources in planning approach Regional Development part of Mexico.

This being a purely academic research, will proceed to conduct the interviews and gathering information to determine the operability of the model proposed

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Role of University as a Sustainable Organization in Knowledge Management and Challenges for Stakeholders

Iordache-Platis Magdalena

Department of Economic and Administrative Sciences
University of Bucharest
36-46 Mihail Kogalniceanu, 5 district, Bucharest

Structured Abstract

Purpose – The purpose of this paper is to emphasize the efforts universities have done during the latest years towards convergence in terms of quality, as well as to reveal the new challenges that they have to face in the contemporary context. Universities have developed continuously according to different internal and external factors integrating into their strategic orientation the role of the university stakeholders. This paper will focus on higher education curricula, in terms of the efforts to increase employability of the students and will highlight the cooperation between university management and different stakeholders in the process of the knowledge management.

Design/methodology/approach – We propose an approach that takes into consideration several research methods: descriptive analysis based on both literature review and on case studies including examples of good practices; comparative analysis; research based on a questionnaire. Students will reveal their perceptions towards the latest movements in the university curricula, market and environment. They will express how they see partnerships between universities and industries, how they feel about the university efforts to help them better integrate on the labour market, what do they feel about the modern technologies involved in the teaching and learning process etc.

Originality/value – This methodology puts in evidence the new challenges in front of the university management, in the context of the 21 st century requirements. The originality of this paper consists of a new theoretical approach of the university concept, in terms of a sustainable organization, which means a new definition for sustainable university in the 21 st century, plus the concept of customer relationship management for universities in terms of student relationship management. At the same time, the value of the paper is also a practical one, reflecting a direct connection between organizations and universities.

Practical implications – The outcomes of the application consist of several practical implications for universities, students and companies. University management will be able to better understand their role in the knowledge management and to pay much more attention towards important changes and strategic movements. Students will be able to support university change in a more active way, for their own benefit. Companies will be able to reconsider the relationship with universities in terms of mutual advantage.

Keywords – sustainable organization, knowledge management, stakeholders, employability.

Paper type – Academic Research Paper

1 Introduction: The Higher Education Market Context

Individuals and organizations are living in a global context where competition is an important external factor to be always considered. Higher education institutions or universities face the same challenges. Understanding the context is only the first step in dealing with difficult situations. Therefore, universities develop strategically according to their capacity and behave in many aspects like economic agents. The logical essence of the university management is the following flow: context – action – results. These three issues will be explained in the text.

During the latest decades, university management have evolved towards the integration of several management approaches, such as strategic management and quality management into the management of the specific components that are generated from the institutional mission – education, research and society development. In 2009 ENQA - European Association for Quality Assurance in Higher Education provided the *Standards and Guidelines for Quality Assurance in the European Higher Education Area* which has generated an important movement towards convergence at a European level in terms of quality assurance. Ranhvargers (2013), considers that some of the main trends about the higher education market, in terms of international visibility that is reflected by rankings can be summarized into the following ones: a special interest on elite universities, a lower importance of the arts, humanities and social sciences, less understanding of the methodologies, increasing international interest about rankings, criticisms from the providers themselves.

Usually, an economic market for good and services is characterized by few elements: demand, supply, price and competition. For the higher education market, the four components can be expressed in the following terms.

First component of the higher education market is the *demand* for studies. It is expressed by the number of candidates that apply for the study programmes. Many researches have been done in order to understand the potential candidates' interest and motivation to apply for a programme or another.

Second component of the higher education market – the *supply* takes into consideration the effective offer of the study programmes that is marketed in order to attract students. Universities organise or/and participate to educational national or international fair in order to present their studies to potential future students.

Third component of the higher education market is the *price*. As a marketing mix variable, price is important from the availability point of view. Tuition plus accommodation plus living represent an important subject to be discussed at a family context. In parallel, universities provide different price incentives, such as scholarships or grants in order to less discriminate the young generation.

Fourth component of the higher education market is the *competition*. At present, universities are subject to different networks and consortiums, entities from which they benefit a lot. This means that sometimes, competition changes into partnerships or agreements. Main advantages of participating to networking and consortiums are: people learn from each other experience, good and less good practices are shared, mobility and internationalization are encouraged.

None of these four components can be understood in the absence of a general integrated *strategy*. The institutional preoccupation towards an efficient and integrative strategy is easily to be noticed in the case of prestigious universities, such as:

- Victoria University, Melbourne, Australia. In its *Strategic Plan* for the period 2012-2016 the responsible for the university management mentioned the importance of understanding the competitive environment and that they look for excellence, engagement and accessibility;
- Cambridge University, London, UK. In its *Learning and Teaching Strategy* for 2012-2015, part of the action plan – update on progress in October 2013 it is mentioned related to the student support the need to develop the students' skills and employability;

Therefore, in the contemporary global context, the higher education market can be characterized by the aspects shown in the figure no. 1.

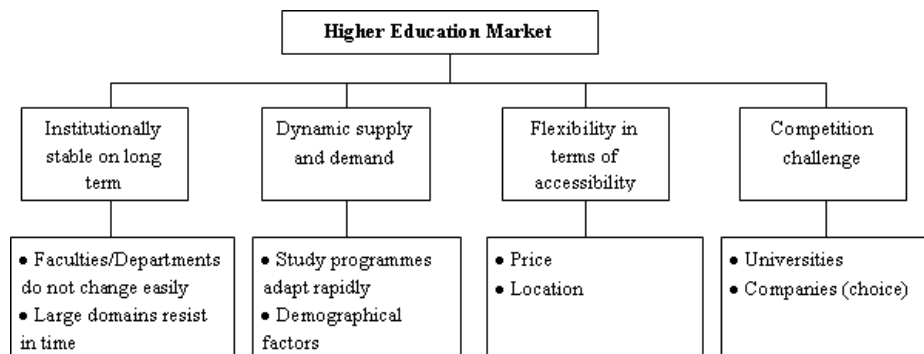


Fig. no. 1. Features of the Higher Education Market.

Source: author

Universities are not small or medium enterprises to be easily established when an initiative comes up. They are public or private institutions with more or less history and on long term they can be seen as stable institutions. What is dynamic is the demand and supply in terms of study programmes; demographical factors affect directly the demand and the institutional strategy determines the supply. In other words, the way the demand and supply adjusts to each other is the university response to the labour market requirements. At the same time, universities are flexible or should be from the accessibility point of view. This means that the price should be so established as to be affordable and the location should be considered flexible when the teaching method is based on blended or e-learning. Competition is a challenge for the universities. Through the exchange of good practices, they become aware of what other institutions did and can become better off.

In addition, in the contemporary context, the higher education market can be characterized by the following aspects:

- higher education is not only provided by local universities. Internationalization has offered a larger opportunity to choose for the students and this is continuously increasing. Local higher education institutions have increased their cooperation agreements and have established joint and double degrees in order to capitalize their strengths and to increase their added value;
- at a large scale, education is also provided by small training companies which generate certificates accepted by the labour market. These are professional

focused programmes of few days, sometimes more flexible in addressing to specific clients of education;

- relationship with the business environment has diversified its concrete actions and has become an important asset in terms of interest from the students and graduates.

Therefore, in order to understand the role of the universities in knowledge management and the challenges for the stakeholders, universities will be described as sustainable organizations and the relationship between universities and stakeholders will be understood from the perspective of a new approach, the student relationship management, as well as the importance of redesigning the curricula in order to increase employability.

2 Universities as Sustainable Organizations

Sustainability is not a new concept. It has revealed the importance to develop in terms of responsibility and environmental protection. Therefore, sustainable organizations have been studied in many perspectives. At the Charter Quality Institute, sustainable organizations are considered a challenge able to be achieved through leadership, understanding and commitment. Pleffer (2010) considers that the main issue to be discussed about sustainable organization is the *human factor*, more precisely - health status at the work force, work hours and work family conflict, work stress and the effects of the job design. Nitu (2011) describes sustainable organizations in terms of strategies and strategic planning and identifies the most important factors for an organization to become sustainable: quality and effectiveness of the strategic decisions.

Taking into consideration the understanding of the sustainable organization, universities are obviously part of these. Features of the universities as sustainable organizations are reflected into the figure no 2.



Fig. no. 2. Sustainable Universities

Source: author

Leadership is what contribute to a better university management, since it involves commitment, professionalism, initiative, professional skills among others. This implies both institutional leadership and individual leadership. The leader university is a reference point for the others, a model to be studied, and an innovator in different actions. In fact, extraordinary leaders are those who are able to continuously generate result as Zenger and Folkman (2007) said.

Strategic management in universities is an important way of institutional development since it contributes to the increasing of the internal capacity to adapt to the educational and labour market. Strategic management means that university has a vision, understands its mission, identifies its main objectives as well as the strategic alternatives, identifies its competitive advantage, correlates the actions to the resources and specifies an adequate timing for these.

Quality management is also part of the university culture. It contributes to the organizational change in terms of the *Plan – Do – Check – Act* cycle. These steps are to be followed systematically when activities are needed to be improved (Have, S. et all, 2008).

It is a direct connection between the sustainability and the organizational success. A sustainable organization achieves success on a long term. Therefore, a sustainable university is an institution that achieves success on a long term. At this stage, two questions arise:

1. Which are the characteristics of a sustainable university?
2. How can the success be measured?

The most relevant features of a sustainable university can be revealed in the table no 1.

Table no. 1. Features of the Sustainable Universities

Crt. No.	Characteristics	Description
1	Creative university	University is able to find solutions.
2	Innovative university	University is generating new activities/programs.
3	Entrepreneurial university	University behaves like an entrepreneur.
4	Learning organization	University has an organizational capacity of learning.
5	Adaptive university	University supports the organizational change.
6	Resource management	University spend rationally the resources.
7	Organizational culture	Strategy oriented towards quality.
8	Efficiency	Partnerships and networks.
9	Research	Strategy oriented towards excellence in research.
10	Social development	Multiple actions.

In order to measure the success, several groups of indicators have been created. Some are institutionally developed, some are nationally ones and some are internationally used, as seen in the figure no. 3.

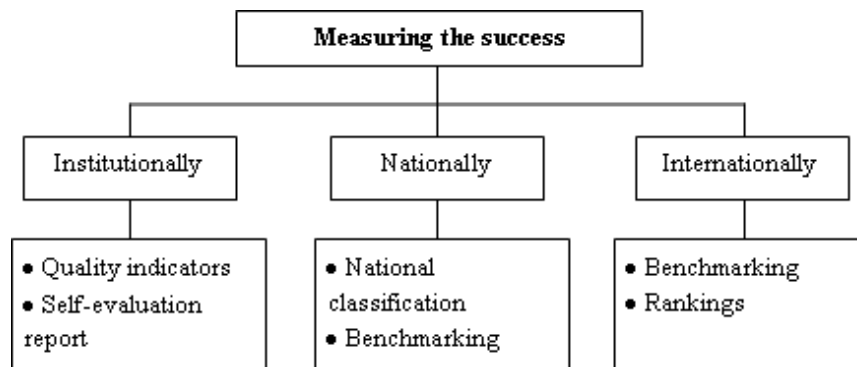


Fig. no. 3. Universities success

Source: author

In order to appreciate the success of a higher education institution, it is important to understand who the beneficiaries of the educational services are. In the quality management context, there are mentioned the *two groups of the university customers* - the students and the companies, as potential employers of the graduates. In addition, one indicator of the university success is the employability. This is going to be explained in terms of the university strategies.

3 University – Stakeholders Relationship

3.1 Student Relationship Management

In the marketing approach, Customer Relationship Marketing is a new type of marketing based on the idea that the relationship with the client has to be developed according to the following flow: contacting the client – convincing the client – informing the client – service to the client – post consuming. (Zollondz, H., D., 2007).

The main features of the *Student Relationship Management* can be expressed according to the following aspects:

- University develops a permanent relationship with the students, they interact continuously; students are integrated into the decisional bodies.
- *Student relationship management* is part of the strategy, where students are considered partners of dialogue.
- the logical flow of the effects are quality in education and research – students' satisfaction – students' involvement – university success.

3.2 Curriculum Design and Employability

In order to better analyse the university role as sustainable organizations in knowledge management, the intergenerational transfer of knowledge has to be accepted. During teaching and learning processes, as well as during the implementation of the projects when students are involved, professors transfer knowledge to students. This is not new. It has always been like this. What has been demonstrated during the latest years in terms of the quality management in universities is the need of evaluation of this transfer. In other words, different assessment have been created and implemented in order to improve the knowledge transfer - self-evaluation of the professors, feed-back from the students, evaluation from the head of the department and so on. At an institutional level, the self-assessment is a requirement for study programmes accreditations.

Many changes have been done during the latest years in order to increase the employability, as a clear indicator for the university success. The most frequent measures adopted by universities in order to help the students to better integrate on the labour market include:

- practical placements integrated in the curriculum and extra curriculum practical stages

- internships offered by companies
- visits organized in companies
- trainers invited from companies to teach practical issues
- debates and dialogues with company representatives in order to explain successful models for students
- different events – such as Career Days, Life Transition Programme, Job Fair
- career counselling.

In most of the cases, the activities involve the career service or centre that exist and function in most of the universities. As institutional bodies, they face difficulties in terms of resources (human or financial).

Two small *researches* were conducted in order get a broader perception on the importance of the university changes related to employability. In this area, no matter how many actions are taken, how many activities are organized, there is always need for more.

First research on what best universities do in terms of employability was conducted at the University of Bucharest in April 2014. Students from a master program were invited as part of the debate dedicated to *University Visibility and Strategies* to study the websites of the first 10 universities included in the Shanghai rank. Here is what they revealed for the first 3 universities:

Harvard University – several articles or results of different short researches on employability, such as if the employable skills are coachable or not; a special link to the employment information, in terms of discovering the possibilities for career. In addition, for their own new employees, the university has created a New Employee Guide in order to accept him or her faster in the community. In other words, university pays a lot of attention towards the awareness and informative role of their actions.

Stanford University – information is differentiated according to the public it is addressed to, such as undergraduate and graduate Alumni, parents, students, international donors. For instance, in case of the parents' information, they are invited to become donors or volunteers. In other words, university look for building a relationship on a long term.

UC Berkley – the Career Center is very developed. Information refers to events or workshops, counselling, career exploration, internships, jobs. What is relevant for this university is the huge activity of the centre, clear structured, for the students. They are the important stakeholders.

The second research was conducted at the same University and was based on a simple questionnaire addressed to students from the Faculty of Business and Administration. The students from an undergraduate study programme and from a graduate programme were asked the same question. Between the two groups of the respondents is a direct connection – many of the students from the undergraduate level continue their studies and become students at the master programme – the undergraduate programme is called *Business Administration* and the graduate one is *Business Administration for Small and Medium Enterprises*. The objective of this research was to reveal the differences between the way of thinking and acting between undergraduate and graduate students to see how they feel about the university efforts related to the students and graduates insertion on the labour market. There were given 120 questionnaires for the undergraduate level and 80 ones for the graduate students. The valid numbers of the answers received from the two groups were 118 and 70.

The questions that are relevant for this study are the following ones:

- How the students define employability?
- If the students have participated during their studies to events dedicated to employability?
- How the students feel about the university effort to organize extra-curriculum events dedicated to university-industry cooperation?

While only 42% of the respondents from the undergraduate level defined correctly employability according to their knowledge, at the master programme, students proved that almost all of them (97%) have a clear idea of what it means.

At the same time, students at undergraduate level are not so interested to participate to events dedicated to employability – only 29% of the respondents participated to programmes. At the graduate level, many of them (85%) have been involved in different training session, which proves not only that they become more mature, but more interested and committed.

In terms of the university efforts, all of the respondents mentioned that they want many more such events, even if they did not participate during their studies at previous ones. At the response moment, they have a better perception of the need of such programmes. To be mentioned that the undergraduate students were selected from the last year of study.

3.3 Strategies and challenges

In different countries, national ranking systems have tried to identify groups of universities either research intensive, or education intensive. Specific national rules made national classifications as compulsory and connect the public financing process to the position in the ranking.

At the same time, international rankings such as Shanghai ranking or Quacquarelly Symonds developed specific methodologies to make universities more visible according to specific indicators.

A brief history of changes which were reflected sooner or later in university policies is shown in the table no.2.

Table no.2. Summary of latest changes in universities.

No Crt.	Document/Action	Time	Purpose
1.	Bologna Process	1999	To create in a decade a European Higher Education Area (EHEA)
2.	Budapest-Vienna Declaration	2010	To recommit to the EHEA objectives
3.	Prague Declaration	2009	To generate a message to political leaders in order to stimulate investments in universities
4.	Promoting quality culture in higher education institutions (PQC)	2012-2013	Project of EUA (www.eua.be)
5.	Empowering universities to fulfill their responsibility for quality assurance (EUREQA)	2012	Project of EUA (www.eua.be)
6.	European Quality Assurance Forum (EQAR)	Annual event, since 2006	To bring together the key stakeholders in the field
7.	World Class Universities Conference, 5 th Edition	2013	Challenges to building www.shanghairanking.com

All these changes included directly or indirectly the concept of quality in university. At present, some of the latest messages in terms of quality in universities can be concentrated in the following ideas:

- Quality has to do with all the processes and activities within a university.
- Quality is easily connected to the position in an academic ranking.

- Quality is not something to be achieved since it is a permanent feature; it has to do with the process of continuously improvement.
- Quality cannot be measured in all its elements.
- The perception of the quality is different for different subjects.
- Quality culture is part of the academic and administrative staff behavior.

At a global context, the issue of quality is more important than ever. The explanation for its importance recognition consists of the following:

- All universities are or want to become preoccupied of internationalization. Student and academic exchange double and joint degrees are a concrete proof of convergence in terms of quality.
- Quality in education, as well as quality in any of other activities generate effects on long term for individuals (either students of professors and researchers), and universities. Therefore, qualitative programs become adaptable and flexible which means sustainability.

Part of the quality management process in universities, many changes have been taken place at institutional level, in terms of university – industry cooperation. The importance of the university – industry cooperation has increased. The general issues revealed from the debates on employability and university involvement described the following aspects:

- ✓ universities must develop programs in order to increase the students' and graduates' insertion on the labour market
- ✓ students are not sufficient tracked when they decide to get a job
- ✓ professional practice is not well integrated in the curriculum
- ✓ internship programs are encouraged

Cooperation between university and industry is seen differently by the stakeholders involved. *Students* - they become better prepared for life; they gain practical skills and develop transversal competences; they can easier find a job. *Companies* - they have new contracts in activities which can be better developed; they have access to less costly recruit young people; they can get ideas for future programs through the involvement of the creative students in projects. *Universities* - they become more applied; they fulfil

much better their mission, mainly having three components: research, education, social development programs; they become more visible and with sustainable programs.

Universities need to understand where the global economy is going to, so that they can adapt and react.

Main steps:

- self-evaluation process – to understand what universities do, how they do and how they know if what they do works
- promote internal actions and external ones connected to real environment
 - Internal
 - Training programs for transversal competences
 - Events like career day
 - External
 - Programs of start-up businesses
 - Competitions organized by multinational companies
- learn from bad practices and good practices at international and national level

7 Conclusions

Students are important actors in the process of change. They pay attention to simple things like attractiveness of teaching and building a relationship with professor. Apparently, students have no idea of what educational process means, but in fact they have a different perception than standards and indicators show. None of the students connect the concept of quality to student/professor ratio or to square meters of the classroom. Young generation pays attention to quality as a result of doing things well and this means that university management should promote equilibrium between the two mechanisms of quality improvement: as external and as internal feature.

Employability issues are part of the quality management process. Universities have done many things in this area. What should they still focus on is to better differentiate the events according to the students motivation and interest. While at the undergraduate level, the efforts should concentrate to event dedicated on how to increase the awareness among the students about the importance of being connected to the labor market, at the graduate level, the events should be based on experiences, internships and jobs offer.

In conclusion, universities are stable organizations as successful ones. Part of the success can be the efforts made in terms of employability. This is an important criteria for self - assessment and evaluation systems, as part of the quality management in universities, as well as part of the ranking indicators. In order to increase the employability, universities develop and implement specific strategies. Part of this strategy is the curriculum design and the extra-curriculum activities.

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Integration of formal and informal knowledge networks: A South African mining education case study

Clinton Birch

School of Mining Engineering,
University of Witwatersrand
1 Jan Smuts Avenue, Braamfontein 2000
Johannesburg, South Africa

Grzegorz Majewski, Marija Jakovljevic

Department of Computing
University of South Africa
UNISA P.O.Box 392 UNISA 003 RSA

** Corresponding author*

Structured Abstract

Purpose: In today's world knowledge workers are immersed in a great number of diverse networks. Very often access and exposure to such networks is an indication of how well a given knowledge worker will perform in his or her organization. So far most of the research focused on the formal organizational mechanisms (formal knowledge networks). This is however not enough as noticed by some researchers. There is also a grave need to examine the role played by informal mechanisms. Additionally it is necessary to investigate how the formal and informal knowledge networks operate and interplay between each other.

Design/Methodology/Approach: The research approach is an empirical study. Qualitative approach was used with convenient sampling. Data gathering method was in a form of a questionnaire, with follow up individual interviews. The empirical study was conducted among 70 final year students, who were split into 13 groups with 5/6 members in each group. Students were given an objective to carry out a mine design exercise to the level of a pre-feasibility (PFS) study based on the mineral deposit block model supplied to them.

Originality/Value: The originality and value of this research is as follows - displaying the impact of establishing a formal knowledge network (CoP) on both formal and informal knowledge sharing as well as knowledge integration. Additionally this research reports on the results of an empirical study conducted in South African mining industry and education sector. This can bring another original value as there is in general lack of studies in this area.

Practical implications: This study investigated how the introduction of a Community of Practice (CoP), which is a formal knowledge network, affected the existing informal knowledge networks among the students of the 4th year BSc mining engineering students at one University in South Africa. Moreover it measured the performance of the students that were members of the CoP and those that decided not to (“formally”) participate in them. Additionally it provides an insight into the opportunities of integrating knowledge from formal and informal knowledge networks. The results provided will be interesting for CoP practitioners as well as knowledge networks researchers.

Keywords - Knowledge management, knowledge network, Communities of Practice, knowledge sharing, human resources management

1. Introduction

Communities of Practice (CoPs) have existed for a long time and can be found in schools, universities, research institutes (Nistor, Baltas, & Schustek, 2012) and business organisations. However, the specific guidance to form CoPs in higher educational institutions (HEIs) does not exist. CoPs are one of the most recognised knowledge sharing tools, making it a very highly valued tool of knowledge management. Knowledge sharing in turn enhances effectiveness (Gupta and Govindarajan, 2000) because, unlike other organisational assets, knowledge tends to increase when used or shared: “ideas breed new ideas and shared knowledge stays with the giver while it enriches the receiver” (Davenport and Prusak, 1998, pp. 16-17). One of the most important characteristics of CoPs, which appeals to knowledge managers, is their ability to traverse geographical, organisational and cultural barriers. Lave and Wenger (1991) described it as an activity system that brings together individuals with common values, interests, and varied experiences to share among them.

Gannon-Leary and Fontainha (2007) highlight that the technological developments which gave rise to improved communication and participant interactivity, academic staff and learners (students) in higher education have been functioning in virtual Communities of Practice (VCoPs). These online environments allow participants to communicate synchronously or asynchronously (Baran, 2006). According to Bolger (cited by Gormley 2012) VCoPs can facilitate employee development and learning while preserving crucial organisational knowledge. Nistor et al. (2012) notes that although VCoPs’ usage improves academic participation and learning success, full participation in VCoPs does not occur that often.

Research on the environments of online CoPs has significantly increased (Baran, 2006). There is a wide range of open research questions, which need to be addressed. One of these questions is how to establish CoPs and keep it alive over a longer period of time. It is a difficult task. Gannon-Leary and Fontainha (2007) support further research on CoPs and virtual learning communities across European Union countries. Similarly Petersen (2007) cited by Gannon-Leary and Fontainha (2007) proposed that the concepts of learning in CoPs need to be further developed.

This research project's goal is to investigate how Communities of Practice (CoP) may be used in higher education amongst students to share knowledge. The empirical part of this research took place at the School of Mining Engineering at University of the Witwatersrand. An initial survey questionnaire was distributed amongst various groups within the School of Mining Engineering in January/February 2013 to gauge how students share knowledge and if they are aware of the concept of Communities of Practice. These survey questionnaires were distributed amongst students from the First Year, Fourth Year, Post Graduate and Certificate classes. Researchers observed that the introduction of a CoP (formal knowledge network) greatly increased knowledge sharing among students. Students shared knowledge using both CoP as well as informal knowledge networks that were already established. One of these networks used a mobile app for the purposes of knowledge sharing. Therefore the main research problems of this piece of research focus on the introduction of CoP in the HE institution and the synergy between formal knowledge networks and informal knowledge networks. Most of the research (e.g. Nonaka & Takeuchi, 1995) focused so far on investigating the formal organizational mechanisms (formal knowledge networks) in order to gain insight into how the knowledge is generated, dissipated and absorbed. Some researchers (e.g. Awazu, 2004) noticed that this is not enough and that there is also a grave need to evaluate the role of informal mechanisms (Desouza, 2003a). Additionally it is necessary to examine how the formal and informal knowledge networks operate and interplay between each other.

2. Description of the Research Project

The School of Mining Engineering, where the study was conducted, is recognised as one of the top mining engineering schools and departments throughout the world. Mining engineers play a key role in the planning, exploitation and excavation of mineral resources. The 4 year BSc mining engineering program is the schools flagship program and includes individual and group project work. The final project is a mine design project completed during the final months of the students' undergraduate year (University of Witwatersrand, 2013). The next section will introduce the mining design project and describe the case study.

For the purposes of the study 70 final year students were split into 13 groups with 5/6 members in each group. According to the brief given to the students at the commencement of the project, they had to carry out a mine design exercise to the level of a pre-feasibility (PFS) study based on the mineral deposit block model supplied to them. They were to utilise the knowledge gained over their previous coursework as well as experience gained during vacation work to complete the project. They had to then make a substantiated recommendation regarding the viability of mining the mineral deposit. The financial aspects of the project was thus critical as well as the technical aspects. For 2013, the final mine design project was Lily Gold Mine, close to Barberton in the eastern part of South Africa.

The 4th year Final Mine Design students who were working on the Financial Valuation Chapter of the Mine Design were invited to participate in a Community of Practice (CoP). A CoP is a group formed voluntarily with its purpose to benefit the members by exchanging thoughts and ideas. Thus the 13 groups into which the students were placed for the mine design could not be considered a CoP as they were forced to work together. The association across these 13 groups for the students working on the Financial Valuation Chapter could be considered a CoP because it was their choice to join the group or not. According to the data there were 13 students invited, 9 chose to join the CoP and the other 4 chose to work outside the CoP.

For 2013, the final mine design project was Lily Gold Mine, close to Barberton in the eastern part of South Africa (see Figures 1 and 2).

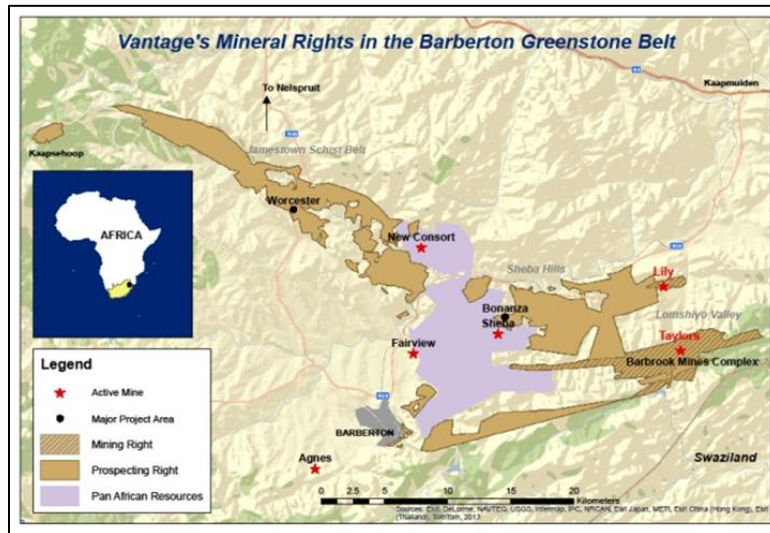


Figure 1. Location of Lily Gold Mine (Vantage Goldfields, 2013)



Figure 2. Entrance to the Lily Gold Mine (Photo by author, 2013).

2.1 Description of the Lily Gold Mine

The Lily Mine began as an open pit operation in 2000. The open pit closed down in 2008 and had produced more than 100,000 ounces of gold. The ore body extends for at least 2,000 m along strike and has been drilled to a depth of approximately 700m (Figure 3). The Mineral Resources are currently estimated to be 2.017 million ounces (22.23 Mt

@ 2.82 g/t) and the Ore Reserves are 0.49 million ounces (4.76 Mt @ 3.18 g/t) (Vantage Goldfields, 2013). The mine has continued as an underground operation and the students were able to visit the current mine and observe the mining method employed (Figures 4 and 5).

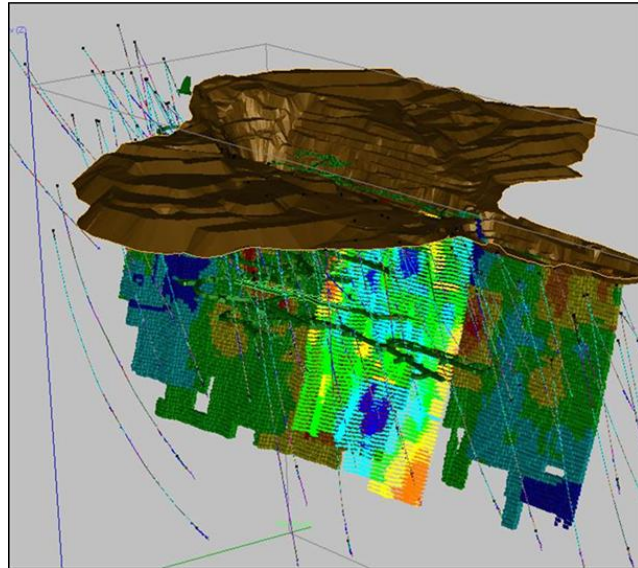


Figure 3. Lily Gold Mine Geological Model (Mawson, 2013)



Figure 4 and 5. Students on underground visit at Lily Gold Mine (Photos by author, 2013).

2.2 Mine Design Report

The students were instructed to start their designs at the stage where the mine started their underground operation and that the plant has a maximum capacity for 37 000 tons per month. The students were given the geological model as generated prior to the mine developing the underground portion based on the sampling in the pit as well as the surface diamond drill prospect holes.

For the purposes of their coursework students had to determine the construction/establishment times and costs as well as operating costs for the life-of-mine. They had to determine appropriate levels and methods of beneficiation and apply the correct royalty and income tax rates. They then had to do a full cost-benefit assessment of the project, including a discounted cash-flow analysis (DCF) and calculate the internal rate of return (IRR). Based on these, they had to make appropriate recommendations.

The total marks for the Mine Design Final Project was 350 marks. 300 marks were allocated for the report and 50 for the presentation of the mine design. All the academic staff within the School of Mining Engineering are part of the marking process and responsible for their own areas of expertise. There were 22 specific areas that were marked.

Part of the marking, which was subject to this piece of research, was allocated 20 marks of the total. This mark allocation was split into the following sub-categories:

- Problem Statement and Background Information (2 Marks)
- Cost of Capital, Capital Cost, Working Cost and Revenue (4 Marks)
- Optimisation (4 Marks)
- Conclusions and Recommendations (10 Marks)

One of the evaluation methods of the students' progress was cross checking the figures presented against those presented in other chapters notable Chapter 6 - Technical evaluation (grade-tonnage curves; resource & reserve statements) and Chapter 10 - Production scheduling to ensure that the figures in the geological block model as well as the mine plan were consistent with the cash flow schedule presented.

The concept of Optimisation received special focus and resulted in a large range of interpretations of the mining plan to obtain the highest financial return. In marking the projects, an order of magnitude difference was noted between the group with the lowest Net Present Value and the highest Net Present Value, primarily due to differences in Capital Costs, Mining Volume and Scheduling.

3. Community of Practice Project

According to Etienne Wenger, Communities of Practice (CoP) are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly (Wagner, 2010). The Final Year Mining engineering students all share similar professional backgrounds and experience and all have completed the courses related to Financial Valuation. The groups which the students were assigned to; were not considered a CoP for this study as the students within the groups were each working on different chapters and thus not exchanging ideas specific to the chapter in question. They had to work together with the intention of completing the entire Mine Design by the due date and to the required standard.

3.1 Project Groups

The 4th year Final Mine Design students who were working on the assignment were invited to participate in a Community of Practice (CoP). A letter was sent to each of the students by the lecturer outlining what a CoP was and what benefit they could derive by participating in a CoP. The students who chose to participate were invited to a meeting on the 4th October 2013 where the group was formed and a discussion was held about the aims of the CoP.

Students from 9 of the 13 groups chose to form a CoP. The other 4 students chose to work independently. The students chose to meet formally on a weekly basis to exchange ideas and information as well as establish an informal group on WhatsApp Messenger (a mobile application) to discuss specific ideas. WhatsApp Messenger is a cross-platform mobile messaging app. It allows groups to be established where a single message is sent to all group members. It is more cost effective than sending sms messages. WhatsApp Messenger is available for iPhone, BlackBerry, Android, Windows Phone and Nokia and being cross-platform, the phones can message each other. WhatsApp has recently been purchased by Facebook. (WhatsApp, 2014). All the members of the CoP had cell phones capable of utilising WhatsApp Messenger. At this point it is possible to consider WhatsApp Messenger as a technology-based enabler of an informal knowledge network. The choice of this platform was not influenced by the researchers. Quite opposite it was suggested by the students and it was their choice. Students also committed to complete a

questionnaire at the end of the project for the author to help determine their experiences from working in the CoP.

The students who joined the CoP met every Friday for the period that they were working on the Mine Design project. These meeting were facilitated by the researcher who led the discussion and guided the exchange of ideas between the members. Although the attendance was not compulsory there was virtually 100% attendance by the members.

A group was established on 5th October 2013 and ran until the project was completed in November 2013. Messages included setting up the times and place for the formal meetings, ideas around what should be discussed at these meetings as well as specific questions that students wished to discuss.

4. Findings

4.1 Results of the marking of the assignment

One of the most obvious ways to investigate the effect of knowledge sharing in both formal and informal networks was in a form of the academic results. The marks for the groups for the assignment were used as a measure of the effectiveness of the CoP process. The marking was done not knowing if the student had participated in the CoP or not. Table 1 presents the results of the marking.

Table 1. Marking of the students' assignment

Group	CoP	Mark /20	In CoP	Out CoP
1	x	13	13	
2	x	15	15	
3	x	14	14	
4		11		11
5		16		16
6	x	16	16	
7	x	10	10	
8	x	11	11	
9		14		14
10	x	18	18	
11	x	12	12	
12		17		17
13	x	17	17	
Average		14.2	14.0	14.5
SD		2.5	2.6	2.3

At the first sight it could be surprising to notice that the results for the students who were part of the CoP differed only slightly from those outside of CoP (Average of 14.0 with standard deviation of 2.6 as compared to average of 14.5 with standard deviation of 2.3). The total average for the marks was 14.2 with a standard deviation of 2.5. Researchers investigated the issue further. Next section will provide information regarding survey questionnaires.

4.2 Findings from the survey questionnaires

Five of the nine students who chose to be part of the CoP completed the survey questionnaire. This questionnaire was handed out to the students after their final project presentations. Some of the respondents were group facilitators. Section A (questions 1-4) of the survey questionnaire was collecting information on the students' age, gender, year of study and race, while section B was collecting questions related to CoP functioning (with question 10 aimed at the facilitators) Full questionnaire is provided in Appendix I. Table 2 provides the summary of the respondents' answers.

Table 2. Respondents' answers.

Q No.	Respondent 1	Respondent 2	Respondent 3	Respondent4	Respondent 5
1	Male	Male	Male	Male	Male
2	22 years	22 years	24 years	22 years	23 years
3	Fourth Year	Fourth Year	Fourth Year	Fourth Year	Fourth Year
4	Black race	Black	Black	Black	Black
5	"Neutral" to all questions	5.2 "Neutral", 5.6 "Strongly Agree", rest "Agree"	5.2 "Neutral", 5.5 "Strongly Agree", rest "Agree"	5.1, 5.3 and 5.6 "Strongly Agree", 5.2 "Disagree", 5.4 and 5.5 "Agree"	5.1 "Agree", 5.2 "Neutral", rest "Strongly Agree"
6	"Neutral" to all questions	"Neutral" to all questions	6.3 "Neutral", rest "Agree"	6.1 and 6.4 "Agree"; 6.2, 6.5 and 6.6 "Strongly Agree"; 6.3 "Strongly Disagree"	6.3 "Disagree", 6.5 and 6.6 "Strongly Agree", rest "Agree"
7	First 4 questions "Agree" and rest "Neutral"	7.4 "Neutral", rest "Agree"	7.6 "Neutral", rest "Agree"	7.1 "Neutral", 7.2 and 7.3 "Agree", rest "Strongly Agree"	7.2 and 7.6 "Agree", rest "Neutral"
8	About 7 hours in total spent on CoP	5 hours	roughly 5 hours	12 hours	Overall 24 hours
9	9.1, 9.3 and 9.4 "Neutral", rest "Agree"	9.1 and 9.6 "Agree", rest "Neutral"	9.3 "Neutral", 9.5 and 9.6 "Strongly Agree", rest "Agree"	9.3 "Agree", rest "Strongly Agree"	9.1, 9.2 and 9.3 "Strongly Agree", rest "Agree"
10	No response	No response	10.1, 10.2 and 10.5 "Agree"; 10.3, 10.4 and 10.6 "Neutral", 10.13-10.16 "Disagree", rest no answer	10.1, 10.4, 10.9 - 10.11 "Agree"; 10.2, 10.3, 10.12-10.14 "Neutral"; 10.5 and 10.6 "Disagree"; 10.7 "Strongly Disagree"; 10.8 "Strongly Agree"; rest no answer	10.2, 10.10, 10.11 and 10.15 "Strongly Agree"; 10.7, 10.8, 10.13, 10.14 and 10.16 "Neutral", rest "Agree"

It is possible to observe that most of the respondents gave similar answers for each section. Regarding section five - one student was neutral on all the points of this section but the other four students generally agreed or strongly agreed with all of these points. One student disagreed with the aspect of following their own activities regardless of the prescribed ones.

In the case of section 6 most students agreed or strongly agreed with all of these aspects, except one student who was neutral for all of these. Two students disagreed (one strongly) about the intention to change their role during the CoP phases. Section 7 was one of the sections where all the students were neutral, agreed or strongly agreed to all of these questions.

Section 8 of the survey questionnaire was asking the students how many hours they spent working within the CoP group. Two students answered 5 hours, one 7 hours, one 12 hours and one 24 hours. There appears to be different interpretations of what time spent was referring to with some students interpreting it as the time they spent within the group scenario (roughly 5 hours) and the total time spent working on the assignment i.e. the report (12-24 hours). Regarding section 9 all the students answered this section with neutral, agree or strongly agree responses. Section 10 of the survey questionnaire was supposed to be completed by the facilitator of the CoP.

Three students chose to fill in this section although researchers are unsure of the three which one was the facilitator, or if they considered the author to be the facilitator. There was no definite facilitator defined for this project and thus the responses to these questions are very varied. This is an indication that this section of the questionnaire and methodology needs to be worked upon.

To sum up most of the responses were in favour of introducing CoP as a tool for knowledge exchange and as a help with the assignment.

4.3 Knowledge sharing between formal (CoP) and informal knowledge networks

At the end researchers investigated how formal (CoP) and informal knowledge networks affected students' performance. Based on the students' respondents it is possible to state that the students outside the CoP were communicating constantly with the students within the CoP. It is based on the fact that many of the ideas discussed within the formal CoP sessions were noted in the assignments delivered by the students that were not participants of CoP.

It could be observed that students were constantly exchanging ideas and forming a formal CoP may provide them with a convenient venue to discuss their ideas and problems. Apart from that very often students may opt to form information knowledge networks (or already are part of such networks) as they may feel more comfortable with them.

5. Conclusions

As it was presented in the previous section it is possible to state that there are numerous benefits of introducing CoPs into academia. They are a catalyst for knowledge sharing, exchange of ideas and problem solving. Those students who were in the CoP group and chose to fill out the questionnaire were generally positive about the CoP process and felt it was beneficial to them successfully completing the assignment. Of course there is a grave need to conduct this (or similar) research with different schools, departments and institutions in order to achieve reliability of the results.

Another conclusion that can be drawn from this research is that students very often use informal knowledge networks for similar purposes to e.g. CoPs. Introduction of CoP should take into account this fact that nowadays students use numerous technological services (e.g. WhatsApp, Skype, Facebook or Twitter) to facilitate knowledge sharing. Formal knowledge networks (supervised by the lecture or member of academia) should not compete with those, but rather utilize synergy. This can be achieved by for example encouraging students to share and discuss what was the debated during CoP meeting with those that did not participate. This could be beneficial for all parties involved.

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Appendix I

- 5.1 The activities were appropriate for my learning tasks
- 5.2 I followed my own activities regardless of prescribed ones
- 5.3 Activities stimulated brainstorming sessions
- 5.4 I understood my CoP activities
- 5.5 Activities helped in discussing developments of the tasks or project
- 5.6 Activities were meaningful across CoP phases
- 6.1 Roles were suitable for allocated time frame
- 6.2 Responsibilities were clear for my chosen role
- 6.3 I intended to change my role during CoP phases
- 6.4 My role contributed to positive group outputs
- 6.5 Roles were appropriate for our learning tasks
- 6.6 My role inspired others in problem solving actions
- 7.1 Volume of work was manageable
- 7.2 Knowledge covered was appropriate
- 7.3 Overall standard of accomplishment was acceptable
- 7.4 Level of difficulty was endurable
- 7.5 Detail requirements were fulfilled
- 7.6 Required outcomes were achieved
- 9.1 I received enough instructions from my team coordinator
- 9.2 Other CoP members appreciated my ideas and participation
- 9.3 I was proficient in technology to participate in this CoP
- 9.4 I contributed constructively in CoP discussions
- 9.5 I enjoyed sharing my knowledge with others
- 9.6 The social media helped us to effectively share knowledge and experiences
- 10.1. I communicated the primary CoP purpose and specific needs to the CoP group members
- 10.2. The short term goals were set in my CoP group
- 10.3. The CoP charter was developed in my CoP group
- 10.4. Norms for behavior were established
- 10.5. I provided orientation to members
- 10.6. I evaluated member and group activities
- 10.7. I determined the member profile
- 10.8. I facilitated a brainstorming session for CoP benefits, name and branding
- 10.9. I discussed tasks and activities within the CoP
- 10.10. I maintained regular contacts with the CoP group members
- 10.11. I provided support for member roles and responsibilities
- 10.12. I established clear and measureable objectives for each activity
- 10.13. I arranged mentoring/coaching
- 10.14. I clarified rewards and recognition
- 10.15. There was evidence of performance management in my CoP group
- 10.16. I submitted CoP reports regularly to the project leader

Montreal as a Creative City: What Attraction Factors for Artistic and Knowledge Workers?

Diane-Gabrielle Tremblay *

Department Administrative Science
University of Québec-Téluq
5800 St-Denis Street
Montréal, Québec, Canada H2S 3L5

Thomas Pilati

University of Québec-Téluq
5800 St-Denis Street
Montréal, Québec, Canada H2S 3L5

** Corresponding author*

Structured Abstract

Purpose – This paper extends from the hypothesis that in many economic sectors competitiveness is based on intangibles. Knowledge and innovation are premises of social development and provide critical resources to local economies. Therefore countries with sizeable resources in human capital are likely to provide higher standards of living (Romer, 1989). Our argument draws on Richard Florida's theory and intends to test the hypothesis according to which the city, in order to maintain its knowledge intensity, must develop a beneficial and attractive urban climate likely to retain creative workers - it must promote creativity and support innovation.

Design/methodology/approach – Our research is exploratory and proposes results from a first test of relevant attraction factors applicable to Montréal. We applied a qualitative approach based on semi-structured interviews. The investigation examines artistic careers and the features offered by Montréal to visual artists. The survey was conducted largely in the Plateau and Mile End districts. The interview guide has four sections that focus on the career path of highly qualified and/or creative workers, on the city's strengths and weaknesses, on creativity-enabling aspects and on the city's features that contribute to retention. Also examined is the influence of self-managed artists centres on the network of stakeholders on the territory

Originality/value – Richard Florida's theory (2005-2002) has attracted the attention of many cities, but has not been tested much. It is interesting to test as Richard Florida's theory considers that the city, in order to maintain its knowledge intensity, must develop an attractive urban climate likely to retain creative workers - it must promote creativity and support innovation - and it must offer not only good quality of life but scores of career opportunities, especially in the arts sector which can be seen as a source of

innovation. The idea is also that the creative workers and amenities would then attract knowledge workers.

Practical implications – The test of this hypothesis can have important implications in terms of city management, city infrastructure development as well as factors of attraction to develop in order to attract knowledge workers and creative workers.

Keywords – Creative class, creative workers, artists, local development, cities

Paper type – Academic Research Paper

1 Introduction

This paper extends from the hypothesis that in many economic sectors competitiveness is based on intangibles. It is generally understood that knowledge and innovation are premises of social development and provide critical resources to local economies. Therefore countries with sizeable resources in human capital are likely to provide higher standards of living (Romer, 1989). Our argument draws on Richard Florida's theory and intends to test the hypothesis according to which the city, in order to maintain its knowledge intensity, must develop a beneficial and attractive urban climate likely to retain creative workers - it must promote creativity and support innovation - and it must offer not only good quality of life but scores of career opportunities, especially in the arts sector which can be seen as a source of innovation. Focus is also set on artistic careers since a number of authors believe that careers in the arts, although boundaryless and unsettled, are forerunners of careers of the future and typical of jobs likely to develop in many other sectors (Menger, 2002).

In addition, the city must promote the development of training institutions to prepare workers, quality cultural infrastructures, dense networking and social coherence discernible in its ethnic and cultural diversity and in the cooperative measures implemented toward social development. Basically, Florida's theory is that creative workers (artists, including professionals and others) tend to be attracted to and remain in so-called 'cool' cities where the population is open to multiculturalism and tolerant of gays and lesbians (Tremblay and Tremblay, 2006). It follows that the success of an urban region in the generation and retention of creative activity depends on the quality of space and on such factors that promote good neighbourhood and social cohesion in the community.

We have dealt elsewhere with our criticism of Florida's theory (Pilati and Tremblay, 2007) and do not wish to revisit the issue in full detail here; our intent here is essentially to test the assumption empirically. While Florida's ideas has often been criticised on their theoretical foundations (Shearmur, 2006), the particulars still remain to be tested and deserve a reality check for two reasons: first, because of their wide dissemination, and second, because they have hardly been submitted to empirical investigation according to a number of authors, namely Shearmur (2006) and Kotkin (2000). Kotkin (2000) and Kotkin and Siegel (1999) claim that talents (the authors reject Florida's creative class concept) are first and foremost concerned with the cost of living in the city, commuting between home and work, and the range of family recreation amenities offered by the city and that Florida's theory does not stand. It thus appeared interesting to determine which are the driving factors of attraction for artists in particular; other groups were analysed in other research (Tremblay and Darchen, 2010). In this paper, we will briefly expose the general context of the research, mainly as concerns globalization, then look at the concepts that underpin our research, that is those of creativity, creative class, etc. We will then go on to look at the situation of artists in Montréal and in the province of Québec, our methodology and finally some results of the research.

2 The context of globalization and arts/culture as a source of economic growth

Globalization has had major impacts over the last decades, although it is not the only force at hand, technology and management strategies also having impacts, as delocalization and relocalization do for example. These international trends to delocalize, relocalize and rationalize have impacts on neighbourhoods, cities and regions and major problems have appeared over the recent years, industrial activity being attacked in many developed nations, as industry moves to low-cost countries. and nations look for new sources of economic development and growth.

Globalization and management strategies have thus put forward a *new model of knowledge-based capitalism* that underlines the role of high tech activities, but also more and more over the last years on creative activities and services (Miles & Green, 2010; Musterd & Murie, 2010). This new model is based largely on *multiple networks* (Castells, 2004), which develop across international borders and actually increase the porosity of borders (Castells, 1997, 1998; Amin & Thrift, 2002).

These reconfigurations place cities and mega-cities at the forefront of the movement and transformations related to globalization (Scott, 2001). In such a context, we can see that some parts of the population are successful in integrating social and economic networks (Scott, 2006b; Sassen, 1996; Soja & Scott, 1986), while another part of the population is excluded from such networks and prevented from benefiting fully from their citizenship (Castel, 2008).

Cities are therefore witnessing the concentration of power in certain spaces at the expense of others (former industrial and manufacturing zones, working class neighbourhoods). Many of these former industrial and manufacturing districts are the object of revitalization activities, and many of these rest upon the so-called creative activities and services. It is the interest in these transformations that lead us to question the major factors of attraction of the creatives and knowledge workers, in cities in general, and in Montreal in particular in this specific research.

3 Knowledge City and Creative City

The Italian economist Pier Luigi Sacco (2005) claims that creativity plays a fundamental role for economic and social enhancement in a given territorial system; creativity may ‘enhance the competitive advantage of businesses, develop new social forms and contribute to a social process of knowledge accumulation’.

The US author Richard Florida puts forward the idea that a creative city is based on talent, technology, and tolerance, but his argument is contested on the grounds that his notion of talent resides rather exclusively within an elite, that is mainly people with high levels of education, or artistic groups. While many researchers as well as city managers accept the importance of creation for revitalizing urban neighbourhoods, the debate on creation and innovation in urban settings has been focused on the strategy of the “creative class”, proposed by Florida (2002), which has been highly criticized and provoked strong opposition from the excluded and deprived to strategies of city development centered on cultural creation (Tremblay and Tremblay, 2010).

In *The Rise of the Creative Class*, Florida classifies all knowledge workers in the ‘creative class’, which adds up to a rather disparate party of all ages found in every population strata. Florida (2002) and the Catalytix team conducted an investigation of the creative economy in 24 of the largest regions of the United States and Canada. The authors contend that ‘creatives’ account for 30% of the workforce in the U.S. The creative

class is structured as follows: one ‘very creative’ core or class, and generic creatives ‘by profession’. According to the Catalytix team of authors, the whole creative sector includes four large occupational clusters designated under T.A.P.E. (the acronym stands for Technology, Arts and culture, Professional and managerial activities, and Educational activities). T.A.P.E. also includes persons who work in the information sector, life sciences, computer hardware and software, mathematics, and in other activities like architecture, design, arts and entertainment. This group embodies society’s cultural capital and a *modus vivendi* endowed with values in individualism and meritocracy. In addition, the authors emphasize above all the virtues of competitive, open, challenging and flexible work in a context that Florida has labelled *cool space* in order to underscore *sensemaking* and interaction among individuals (Pilati and Tremblay, 2007).

Florida’s creative class theory has drawn a lot of attention and much criticism from many social scientist as well as urban scientists. The ‘creative class’ is often seen as an advanced alternative community, an avant-garde of pioneers absorbed in a fascinating creative calling that entails empowerment, and more importantly for urban development issues, that is instrumental in creating amenities and activities to attract knowledge workers and thus foster urban economic development.

Many consider that this creative class concept does not add anything to the traditional concept of human capital (Shearmur, 2006; Tremblay and Tremblay, 2006). With the elite considered as the source of creativity and diversity, Florida calls for huge investments in cultural and artistic amenities to make the city attractive for the so-called creative class, who would in turn stimulate innovation and economic growth.ⁱ

According to Menger (2002) ‘the arts are a testing field for flexibility’. This will be confirmed in our data as we will see that our interviewees, all of them artists, are often employed on a part-time "as required" basis and must therefore live by contractual flexibility standards. Moreover, the unfolding of an artist’s activity is usually a cycle of work periods and more or less extensive job insecurity episodes.

4. Montreal, City of Creatives

Montreal seeks to be recognized as Canada’s creative and cultural metropolis (Bellavance and Latouche, 1999). According to Stolarick, Florida and Musante (2005), Florida *et al.* (2005), a Canadian creative class is established in three large urban city-regions: Montréal, Toronto and Vancouver. In this study, the three Canadian cities rank

first among the 24 North American cities for the concentration of the very creative core. This core class is believed to have undergone an impressive growth in recent years in both the U.S. and Canada. In Canada, creatives would be approximately 4 350 000 according to the definition, that is 28% of the active population. Stolarick *et al.* (2005) have determined that in the Montréal region creative class resources amount to a substantial ratio with 450,000 persons, ahead of the services sector, at least according to their definition. Of course, the exact boundaries of the creative concept remain disputable and largely intuitive, but the figures are nevertheless worthy of note if only because the arts sector, generally regarded as a marginal sector, is suddenly given significance in conjunction, of course, with other creative sectors.

Data conveyed in the Canadian study on the arts by Hill Strategies Research (2006) confirm that there is, in the largest Canadian cities, a rather high concentration of artists, that artists' average income is relatively high and that growth in the arts sector is remarkably significant. Three cities (Montréal, Toronto and Vancouver) account for the largest number of artists, that is 38,400 artists or 29% of the 130,700 artists in Canada. In Québec, artists are concentrated mainly in Montréal (36% of the provincial artistic workforce) and Montréal ranks third in terms of headcount in Canada (1.9% compared with the 0.8% Canadian average); Toronto ranks first. Montréal numbers 10 075 artists and the headcount has grown by 24% or 2,000 persons between 1991 and 2001 (Hill Strategies Research, 2006). This growth, however, is the least of the three large Canadian cities (Vancouver 57% and Toronto 35%) and is lower than the Canadian average, 29%. At 50%, the rate of growth of artists in Montréal is the highest in the three Canadian major cities where Vancouver records 23% and Toronto 36%.

Further, according to a *Hill Strategies Research* study (March 2006) Montréal accounts for the largest number of artists, second only to Toronto: in terms of producers, directors, choreographers and similar professions, then second for musicians and singers, for authors, editors and writers, and finally for actors. Indeed according to Bellavance (2004) the arts sector owes its development first and foremost to the substantial growth in the number of artists in Québec, in Canada, and in the Western world. Bellavance notes that this field has witnessed in the last decade not only 'a diversification in the practices but also an acceptance –if not an institutionalisation of contemporary art and of its aesthetics which now prevails' (Bellavance, 2004:2). Thus a diversification of disciplinary competencies is developing and the movement is toward new technologies

and even toward new artforms (new arts). Bellavance also notes that this combines with ‘increased tolerance if not a definite recognition of creativity and innovation values that coincides with the institutional acknowledgement of the legitimacy of the aesthetic of modern time mainstream. From the fine arts in the traditional sense (and in the disciplinary sense), the movement has taken us to contemporary visual arts (in the multidisciplinary sense)’.

From 1991 to 2001¹, Montréal accounts for the largest number of artists in Québec with an increase of 24% over that period. It is notable that neighbourhoods such as LaSalle (47%), Verdun (33%) and St-Hubert (30%) have also witnessed a considerable increase of their artist population. Nevertheless, it is in Montréal that the largest number of artists is to be found. Montréal artists also have the highest average income among the artists in 21 cities of the province. The gap in income, however (i.e., the percentage difference between the average income of artists and that of the local active population) is the lowest (7%) among the cities in the province (Hill Strategies Research, March 2006, p. 34). Let us now examine the method of our research.

5. Methodology

Our research is exploratory and proposes results from a first test of relevant attraction factors applicable to Montréal. We applied a qualitative approach based on semi-structured interviews. The investigation examines artistic careers and the features offered by Montréal to visual artists. The survey was conducted largely in the Plateau and Mile End districts.² The interview guide has four sections that focus on the career path of highly qualified and/or creative workers, on the city’s strengths and weaknesses, on creativity-enabling aspects and on the city’s features that contribute to retention. Also examined is the influence of self-managed artists centres on the network of stakeholders on the territory as well as the importance of the above as they relate to Florida’s bohemian index, i.e., the weight of openness in values and standards on human capital attraction and retention. In this regard, *The Flight of the Creative Class* (2005) claims that immigration plays a decisive role in the attraction of the best talents who, in turn, provide a definite competitive advantage to a city-region. In order to demonstrate that a flow of

¹ We have not found such an analysis with more recent Census data , for 2011, but the same districts appear to be developing still,

² From here on, the paper is an adaptation and translation of a paper published in French in the *Revue canadienne de science régionale* ,in Canada.

immigrants from all origins is a critical element of a city's capacity to attract international talent, Richard Florida makes reference to North American cities and indicates that the presence of immigrants from many places and in high numbers favours some Canadian cities. The mosaic of ethnic and racial groups is seen as positive, since no particular group dominates (Florida, 2005). Immigrants bring along more than just their specialised skills, and therefore immigration policies should be designed to sustain the entry of newcomers. Immigrants actually bring along their networks of contacts in both the economic and creative areas. In this paper, we deal with issues that pertain to the social fundamentals at work in the attraction and retention of talented persons, including the characteristics of the urban employment market likely to alleviate the risks associated with the lack of a job or revenue and that can deflect or change a career path and artistic career.

6. Artist careers: results from our research

In the wake of enquiries by Menger (2002) as well as Florida (2004a, b, and 2005), we have focused our attention on artistic careers in the hope to somehow corroborate their conclusions with this exploratory field study.

6.1. Employment or career opportunities

From the start we have observed that artists seek stimulating work and employment that brings them professional development. At the outset of a career, the professional opportunities offered to artists are based on a series of contracts, most of them in the arts sector. As the career unfolds and where a voluntary rerouting may occur, artists prefer to remain in the same artistic domain, but often don't have the choice in order to earn a living. Where the change is not deliberate, artists try to develop other activities that have some artistic overtones, for example teaching or management in the artistic field, as is the case in self-managed artists centres¹. This aspect is accounted for in a study by Bellavance (2005) in which we learn that an array of arts-related jobs such as teaching and other unrelated employment opportunities take up a lot of time in the professional life of artists and, of course, in their income.

In 2000, at the time of the Statistics Canada census analysed by Bellavance, (2005), one (1) artist out of three (3) was engaged in activities such as teaching art or commercial arts-related practices or activities (photography, commercial drawing and other related

work). Similarly, Martin (2005) observed that young interviewees who had relinquished their artistic career sought another professional status, mostly teaching. At the onset of a career, establishing oneself in Montréal is the most important step for most artists in search of a context and an ambience that are receptive to creative experimentation which, according to our interviews, is encountered in Montréal.

Several Montréal features are attractive to artists in terms of employment market: a dynamic artistic and cultural context that offers year-round activities, the possibility to experiment a wide variety of art forms, the availability of affordable work space as well as continuously renewed calendar of events launched throughout the city. This bubbling diversity of activities provides artists with countless opportunities for exposure and for the display of their work. For long term career opportunities, however, where artists must move from Montréal, our respondents state that they would nevertheless prefer a life in cities that offer even more opportunities such as Toronto and New York, in North America, or London and Berlin, in Europe. Artists acknowledge that in terms of career opportunities, an artist in one of those cities would be granted better recognition than artists living in Montréal. According to one artist (MB, 2006) ‘artists who pursue their creative work over a long period of time, say in France, become *artiste d’État*, commercial artist in the United Kingdom, and a contact artist in Germany’. Our respondent MB adds that in the latter cities ‘there is a larger population - there are specialised platforms and broadcasters - and of course prestigious institutions the likes of which are not found in Montréal’.

Another artist, (ML), compares Berlin and Montréal. According to this respondent, ‘Berlin is probably quite similar in terms of quality of life, but in terms of career opportunities, the outlook is more vigorous’. One more interviewee, (CD) likewise compares Montréal to a neighbouring American city, New York. In terms of quality of life, she says that ‘Montréal is much better’ but she also states, although she hasn’t lived in New York, ‘that in terms of professional development someone well positioned would perform more and better’. And in a Montréal-Toronto comparison she adds ‘of course there are more opportunities given the size of the population; there is a larger number of specialised agents and distributors of art, and prestigious institutions in Toronto. Obviously there is more work available in Toronto, if only in the museums, but the cost of living is higher there than in Montréal, which limits the access to work space and thus,

creativity to a certain extent. Then, in Toronto, one must live and work in English only and that's a drawback' for many.

Other artists hold that Montréal is clearly deprived of cultural and artistic structures, that Montréal is at times unreceptive to investments intended for that sector. Many consider that Montréal's infrastructures have been largely ignored except for a few recent investment in the Montreal Symphonic Orchestra's new hall. Indeed as Toronto is 'credited with the existence of 19 symphonic orchestras compared to only 4 in Montréal and with 58 theatre companies while Montréal accounts for only 33, this certainly legitimizes the shape of this new urban cultural order' (Latouche and Bellavance, 1999:2).

It appears that Montréal may be attractive mainly due to the lower cost of rent, for home and for working space, and for career entry opportunities. In terms of career advancement, however, many respondents consider that Montréal does not have enough institutions, structures and networks to support a genuine artistic career without individuals having to resort to other contingent jobs just to survive.

6.2. Career promoting networks

Artists deem that one of the features that a city can contribute to minimise job-loss or low-income related risks is the establishment of a stakeholders' network on the territory. An active and dynamic cultural environment certainly helps to create this network which is growth-sustaining for artistic communities and careers¹. One artist (MJL) says that she 'was lucky enough to access well-established networks in the artistic community and in the underground community, and benefit from the strong interconnections among the different people who crowd these social networks'. Another artist (CB) holds the same opinion, 'I think that a network is really vital', she says. She believes that 'the availability of a good professional network provides a safety net of sorts when you become involved somewhere and when you change jobs, activity or even change locations. Your skills are known and never lost for that community and it is helpful for job hunting elsewhere'.

To develop and maintain a network of contacts is an efficient strategy to put into action both the expectations and the objectives of a career. But this network is of rather limited scope in the Montréal metropolitan area and is not set to envision career

¹ We also conducted a research on the links between the Business and Arts sectors, with Elisa Cecilli, student from the Arts Management program at the University of Trento. See the research note on our website (www.telug.ca/chaireecosavoir).

expectations beyond Montréal or the province of Québec. One artist (MB) testifies that ‘it’s all about occupational choice; opportunities do come by and I try to follow up on them through multiple contacts at different levels. I’m an artist, but also a coordinator and a commissioner and this allows me to meet a lot of people who, if they appreciate my personality or my work, are all potential collaborators [...]. Alliances are indeed strategic because if you want to persist in that sector you’ll have to work with these people one day or the other anyway. So there are a few actors in the sector who’ve turned their back to the community, but they’re now completely isolated’. The function of the network is therefore a career-influencing factor. Although the community is relatively small, it seems valuable to remain in contact and above all to be well perceived.

6.3 Artistic career plans, expectations and challenges

Many artists among our interviewees have stated that Montréal possesses valuable assets to which the artistic community will cling. A substantial number of artists definitely prefer Montréal over other cities as their home base to fulfil their future career plans and expectations. Career goals are focused on the potential for a full-time career as a professional artist, which is not always easy or even viable. In self-managed artists’ centres, however, artists are likely to meet and exchange with a score of actors from different backgrounds, whether artists, co-ordinators, facilitators or commissioners. It is this very aspect that encourages and promotes the creation of alliances or the execution of joint projects. For artists, the lack of funding is the most critical issue or challenge, and indeed artists are often under financial pressure. They nevertheless do as best they can to manage this hurdle through the design of new artistic endeavours, project support activities, fund raising policies and including a diversification of their occupational activities into teaching and/or the management and facilitation of networking in the artistic sector.

One artist (ML) contends that ‘there is a lack of capital, I mean there is money but the question is how and where is it invested. Change is frightening, and what I’m saying here may be upsetting [...]. Nevertheless, money is available to artists who want to perform, and the cost of living isn’t that bad. We can have access to production workspace, studios...’. An investigation into the 1999 figures on the financial standing of artists substantiates that the sale or the rental of works of art ‘is not necessarily the main source of revenue yet it is the most often mentioned source among all incomes’ (Bellavance,

2005:iv,xiv). All artists have widely diversified income but as Bellavance puts it, ‘most artists are likely to develop diversified income strategies’ (ibid.). The earnings accrued directly from their practice are usually rather lean.

According to Hill Strategies Research (2006), Montréal displays the lowest income differential between artists and the rest of the working population among the three large Canadian cities. In Montréal, the \$CD 26,200 average income places the city tenth among Canadian urban centres and the differential is the lowest with the overall average income. Montréal is nevertheless credited with a distinct personality and an ever-growing potential that artists do acknowledge. Artists identify Montréal’s uniqueness as an essential qualifying feature: a good place to live on a permanent basis. There are factors and features that make Montréal unrivalled. Montréal is the second largest French-speaking city in the world. The pace is smooth and easy, facilitation is available for establishing knowledge networks and there is an open-minded gay community. Indeed artists, in keeping with Florida’s studies, consider that the city is tolerant, that it acknowledges the expression of multiple cultural profiles and that it welcomes diversity. In the following paragraphs, our interviews and reference documents are analysed to identify those factors deemed most important and which make the city attractive enough to attend to its large number of artist.¹

6.4. Montréal’s attraction and retention factors

Artists assert that the quality of life in Montréal is extraordinary and that the cost of living and other amenities are beyond compare. Montréal offers artists a quality of life better than what is provided in other North American cities for the same price. Economy of scale is repeatedly mentioned, as well as low-cost access to culture which benefits both the public and the artistic community.

According to several interviewees, Montréal’s singularity would be that of talent and creativity. As one City of Montréal cultural development agent puts it, ‘Montréal is unlike other cities to which it is readily compared, for example Toronto, where tremendous efforts are made in terms of cultural facilities with renowned architects and unthinkable buildings worth millions, including a recently added opera house (Centre for the Performing Arts), all things that may be envied, including the Film Festival, yet Montréal

¹ Given the limits in number of pages for this conference paper, we cut out a good number of citations, available in the French version of the paper. See Pilati and Tremblay (2008). See also Tremblay and Pilati (2008) for other elements on the creative city.

has always been recognized by its trait, singular, original, distinctive and French-style *joie de vivre*. [...] Think of a little big city like Montréal, I think it ranks 26th in size among North American cities. It's easier then to pinpoint our distinctiveness as the second largest French-speaking city in the world. And yes there is one singular quality to Montréal, but we're not saying that it is a private or exclusive quality. We differ in that sense, culturally, which makes us unique, but for us the issue is enhancement, not misfortune'.

Compared to other large North American cities, Montréal offers a rather safe environment. One artist (CD) believes that 'the best is yet to come which will provide a little more splash, so to speak. What I like about Montréal is that it's a good place to live. [...] the city is rather safe, and that, for me is another good point'. To this, artist (MB) adds tolerance as an outstanding feature of the city, one that ranks highly creativity and experimentation.

6.5 Less attractive job market

We also surveyed our participating artists on the less attractive characteristics of Montréal. For many of them, Montréal lacks a more authentic and original cultural policy, strategy. Some believe that in order to read Montréal as a genuine, internationally renowned cultural metropolis, Montréal should facilitate creative freedom, within and outside the framework of the cultural industry. One artist speaks of 'the loss of historical information; some things are done not only in Montréal, I'd say the are done in many other cities as well, think only of everything that happens in the entertainment district, one can see so many projects pop up and quickly dissolve'. Montréal appears to be a rather underdeveloped market for contemporary art. The city is therefore less attractive for artists in this sector regardless of the low cost of rent. Whereas low costs are conducive to production, many aspiring contemporary artists state that the distribution of their production is problematic.

6.6. Creativity enhancing aspects of Montréal

Montréal's alternative and underground culture is important for the artistic and cultural landscape and this factor is deemed significant for artists in the development of their creativity. For example, one artist (MJL) underscores the importance of alternative magazines; another artist (CB) goes into more detail concerning Montréal's artistic and cultural context. She says 'it's more like the underground somewhat, these neighbourhood

initiatives that really make the city come alive, for me at least. Diversity also, of course. So for me, in Montréal's culture, this is what counts, what's interesting. Montréal's music scene is very much appreciated internationally. The public is eager and pop music – all of the underground scene, is quite recognised internationally'. We may gather therefore that all artistic segments contribute to the liveliness of Montréal's artistic system.

According to many artists, the urban dimension itself is another significant factor in their creative ability. One of them (CB) says: 'that's the feeling I may have of a network, it imparts meaning in Montréal's artistic community. In many neighbourhoods of the city, there is a community spirit. And somehow to be part of this is a stepping stone to visibility. But to have a window on the street is even better, it is among the very first criteria. [...]' Yet another artist (EG) says that Montréal is a city that is both a village and a metropolis in all its districts, a city that is on the average three-story high [...]. For one's creativity, Montréal is convenient whether a village or a city, and a very large city it is in terms of geographic surface area on this island. Village and large city remain one; public transportation ensures proximity; even when you must take the subway or the bus, it's easy and convenient... taxi rides are inexpensive and the road system is accessible. Proximity is everywhere and that makes for easier creativity.'

Further, artists claim that creativity benefits from a flexible work environment which includes the possibility to access collective spaces with relaxation and socialisation facilities. Montréal offers several such creative spaces in specific city districts, in depressed sectors, or in sectors under reconversion. Without specific input toward territorial planning, creatives would seek for large buildings which can be used for creative projects (Florida, 2004a,b). They invest both in culture and in creativity and they change neighbourhoods into 'creative ecosystems'. These spaces are then adapted to the needs of artists who, in terms of facilities, have a preference for open, well lit, quiet working environments with high ceilings.

One artist (MJL) confirms this and says that for her work she really needs well lit spaces in natural light: 'you see something, when I think of the closet I was given to work at the university, lit with a single neon tube, I never went there, wasn't interested in such an environment either to think or to create; anyhow, it was just a wall and that's it. I quite like wide horizons that give me the impression of being part of the action, in this case an urbanscape seen from the roof where so many things happen [...] ...it's a chance to be able to work in collective workshops, not alone in a cubicle, I was in a huge space, we

were in open workshops and could speak to each other and having had that opportunity I have a different understanding of ‘contacts’... (end of quote).

According to the Hill Strategies Research report on the most creative neighbourhoods in Canada, Montréal supports 5 of the 10 most creative districts in Canada. The Plateau Mont-Royal neighbourhood is considered Canada’s top creative district with 605 artists in a total workforce of 7,560, that is an 8% concentration; quite similarly, the neighbouring district of Mile End has a 6.1% concentration of artists. Such concentration no doubt breeds a setting favourable to creativity and the artists concerned agree that they collect there precisely for that reason. It was also noted that adjoining neighbourhoods such as Mile End have begun to develop in a similar manner because of their proximity to Plateau Mont-Royal and because rents have not yet begun to rise, while they have in the Plateau for some decades.

7 Conclusions

Florida’s creative class theory has drawn a lot of attention and much criticism from both the right and the left. The ‘creative class’ is often seen as an advanced alternative community, an avant-garde of pioneers absorbed in a fascinating creative calling that entails empowerment and self-direction, and that is instrumental in creating amenities and activities to attract knowledge workers. Some of the criticism aimed at Florida’s theory address specifically what some designate under elitism since the less creative population or the economically disadvantaged are not suitably taken into account. In this paper, we did not discuss this issue, and instead we made an attempt at testing the validity of the theory on the attraction factors at play between cities and the talented.

This research initiative has revealed that visual artists display a profile seemingly close to Florida’s and Menger’s contention. Florida does not stress the artistic employment issue enough, and rather highlights to the importance of cultural and artistic amenities to attract other knowledge workers. The employment and market realities require a substantial measure of individual responsibility and activation in order for artists and cultural groups to make a living. Indeed, the talented and the creatives increasingly cope (like many others, dare we add, and not always through choice, cf. Tremblay, 2007) with intermittent employment and the risks inherent to possible career changes.

What is revealed according to Menger (2002) are the ‘paradoxical learnings on artistic work’ whereby some of the main and most significant transformations in work and

employment systems today are: empowerment, intensive involvement in the activity, high self-reliance, work flexibility and choice of context, and for a large number of artists, psychological and social rather than monetary gratification. This of course is the bright side, which we did find in our interviews with the creative artists. However, the same self-reliance and flexibility may however mean insecurity, especially in the less creative sectors.

In the artistic sector, however, the non monetary rewards supply 'an insular basis to the ideological glamour associated with artistic work' (Menger, 2002:53). Artists handle a much more important and powerful capital that relates to the symbolic components acting upon the individual's identity. Artists undertake this activity which is riskier than employment in other sectors, but success may at times yield extraordinary rewards. Artists benefit from their learning potential and from their ability to educate through the multiple exchanges carried out during the activity. Moreover, experimentation happens to result not only from organisational provisions but also and mostly from social relations in self-managed artists centres. As Menger (2002) puts it, pioneer spirit speaks to entrepreneurship, and the creation of a network and work alliances provides its organisational model to other connected fields. However, it remains to be seen to what extent these artistic and cultural groups are indeed the source of attraction for knowledge workers, as Florida has proposed. We have highlighted here the factors of attraction for creative workers, but have in other works looked at the factors of attraction for knowledge workers and there may not be so many relations between the two groups. (Darchen and Tremblay, 2010)

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ⁱ One of the main critiques is precisely that “talent” and the creatives are rather attracted to places where economic growth is actually occurring and not the opposite (Tremblay and Darchen, 2010).

What does it take for an individual to improvise? Exploring the antecedents of ad hoc co-improvisation

Anna-Maija Nisula *, Kirsimarja Blomqvist

Lappeenranta University of Technology/School of Business
P.O. BOX FI 53851 Lappeenranta

** Corresponding author*

Abstract

This paper studies the antecedents of individual improvisation in the ad-hoc co-improvisation context. The paper explores how the intra-personal factors self-efficacy and intrinsic motivation, and the inter-individual or other-focused psychological factor of positive affect are related with individual improvisation in ad hoc co-improvisation event. This is important for two reasons. First, improvisation is an increasingly important ability of individuals, teams and organizations working in various forms of temporary settings. Second, it is important to understand, what the simultaneous effect of both intra-personal (self-efficacy and intrinsic motivation) and the situation related inter-individual (other-focused) factors are for one's improvising. The study explores the relationships of these variables through the SEM-PLS path model with a data sample of 70 respondents collected from four co-improvisation workshops. The results indicate, that self-efficacy relates with individual improvisation. In addition, the positive affect moderates the relationship between intrinsic motivation and individual improvisation, and that this interaction effect is significant, strong and negative. The study contributes on the discussion of the antecedents of temporariness and suggests improvisation as a promising approach for individuals to deal and cope in such emerging conditions.

Keywords – Individual improvisation, self-efficacy, intrinsic motivation, positive affect, PLS

1 Introduction

In rapidly and unexpectedly changing economy (Eksted et al. 1999; Bakker, 2010) temporary forms of organizing have become as increasingly relevant (Bakker, 2010; Mayerson, Weick, Kramer, 1996; Kanter, 1989) as firms need to integrate highly specialized and distributed expertise and knowledge (Tsoukas, 1966; Tsoukas and Chia, 2002) into tasks to respond to the emerging problems and grasp the opportunities. Such

temporary conditions (Mayerson et al. 1996) require different orientation and abilities from the participating members compared to stable organization conditions. This study proposes an individual improvisation as an individual ability and purposeful behavior to deal in dynamic conditions of temporariness and ambidexterity, and, in other words, in the ad hoc social interaction with other experts.

In temporary forms of organizing number of actors work together over a limited (Goodman and Goodman, 1976; Grabher, 2002, Mayerson et al., 1996) and short period of time (Lanzara, 1983; Grabher, 2004; Bakker, 2010). In such conditions the participants neither know each other nor their expertise, and they often have minimal, if any, time for socialization (Lindkvist, 2005). Likewise, such situations lack stable structures, pre-determined roles, shared organizational or team culture (Mayerson et al., 1996; Lindkvist, 2005; Weick and Roberts, 1993), routines (Mayerson et al. 1996), memory (Moorman and Miner, 1997; 1998) as well as conventional sources of trust (Mayerson et al., 1996). Instead, the conditions and the antecedents of such ad hoc teams unfold and are built in real time interaction by the participating members.

Individual improvisation is seen as a near and overlapping construct with individual creativity (Amabile, 1996; Leybourne and Saddler-Smith, 2006; Montuori, 2003) and individual innovative behaviour (Moorman & Miner 1998; Fisher and Amabile, 2009), but represents a more dynamic dimension of these constructs. As an innovative and rule-breaking behaviour improvisation represents real-time responsiveness (Fisher and Amabile, 2009) and ability of an individual to cope in complex and ambiguous settings (Weick, 1993; Montuori, 2003). Therefore, we see individual improvisation as an increasingly important individual behaviour, and possibly even a skill required by modern employers (Friedman 2014a, 2014b).

However, empirical and especially quantitative studies on individual improvisation are scarce (with the exception, see Magni, Proserpio, Hoegl, and Provera, 2009; Hmileseski and Corbett, 2006) and it is not yet clear, what antecedents enable individual improvisation to occur in ad hoc team conditions. For example, Mayerson et al. (1996) argue that without paying attention to, and managing the conditions of unfolding temporary settings, the participants are likely to act more like in permanent conditions, which thereby can limit exploration and suggestion of novel ideas and solutions and risk taking.

To respond to this shortage in the literature, the study at hand examines individual improvisation as the ability of an individual to deal in temporary and ad hoc team conditions. More detailed, the study explores both the intra-individual (psychological) and interpersonal (other-focused) antecedents of an individual improvisation in temporary creative conditions. Hence, intra-individual factors of self-efficacy and intrinsic motivation, as well as the interpersonal factor of positive affect are studied as antecedents of an individual improvisation in an ad hoc co-improvisation context. An interest is thereby paid on whether the individual improvisation is more as a stable attribute of an individual, or is it more an issue influenced by the situation or both. This is, to what extent the situational factors, such as perceived influence and the experienced positive signals of the other person (Bligh, Pearce and Kohles, 2006) affect individual improvisation within temporary team context. What does it take to improvise in an ad hoc team, where two individuals improvise together?

The data was collected from four workshop sessions with working adult students. Data (N=70) was collected via survey in 2013-2014 from experts who had several years of work experience from different industries and fields. We explored the causal relationships between the dependent (individual improvisation) and independent variables (self-efficacy, intrinsic motivation, positive affect) as well as the moderation effect of positive affect between intrinsic motivation and individual improvisation using PLS path model analysis, which is a suitable method for explorative analysis as well as in cases of small data sets.

The paper provides evidence of the antecedents of individual improvisation in ad hoc expert tasks i.e. in conditions that are becoming increasingly common and relevant for firms operating in a global knowledge-intensive context. The results indicate that positive affect, displayed as perceived bodily passion, moderates the relationship between intrinsic motivation and individual improvisation, and that the moderation effect is negative. In addition, self-efficacy affects individual improvisation in ad hoc co-improvisation.

The study provides novel findings by introducing the other-focused elements, such as perceived positive affect, to the discussion of the antecedents of individual improvisation. In addition, the study explores the simultaneous effect of both intra-personal and inter-individual factors on individual improvisation in an ad hoc co-improvisation situation. As a practical contribution, the study suggests that organizations should take more advantage of novelty, diversity and emergence in their knowledge creation and innovation activities.

Against the common understanding, it may actually be easier to collaborate informally with completely novel individuals, rather than with those well-known individuals whom one already knows and may have learned to avoid any controversial issues.

2 Theoretical background and hypotheses

2.1 Individual improvisation in co-improvisation

Individual improvisation is an ability of an individual to deal in complex and unexpected situations (Magni et al. 2009; Magni, Provera and Proserpio, 2010; Vera and Crossan, 2005; Weick, 1998; Montuori 2003) in a creative, contextual and professional manner. It plays an important role in collective creative processes like in team improvisation (Vera and Crossan, 2005), organizational improvisation (Moorman and Miner, 1998) and innovation (Fisher and Amabile, 2009), in fostering processes of new product development (Eisenhardt and Tabrizi, 1995; Moorman and Miner, 1998), product design (Sutton and Hargadon, 1996), implementation of new technology (Orlikowski, 1996; 2002), in start-up firms (Baker, Miner and Eesley, 2003), entrepreneurship (Hmieleski and Corbett, 2006) as well as in institutional entrepreneurship (Fliegstein, 2001). Hence, it is a dynamic behavior and ability of individuals to orient and act in conditions of complexity, temporariness and ambidexterity.

The context of this study is ad hoc co-improvisation, which is understood as a form of team improvisation, where the number of actors improvises together. Such co-improvisation concerns to carry out the open ended task without script and preplanning, in shared and emerging leadership and responsibility under mutual support (Vera and Crossan, 2005; Sawyer and deZutter, 2009; Weick, 1993; Koppett, 2001). Indeed, an ad hoc co-improvisation is demanding and it requires special kind of abilities and orientation from improvising individuals. In co-improvisation the real time responsiveness (ability to cope with lack of time and to respond to emerging situations) and the elements of team improvisation (Vera and Crossan, 2005; Weick, 1993; Johnstone, 1979; Koppett, 2001), such as presence, acceptance and agreement, openness, imagination, bricolage, building on others, shared responsibility and leadership, mutual support for others, scaffolding and mutual trust are fundamental basis for co-improvisation (Vera and Crossan, 2005; Johnstone, 1979; Koppett, 2001; Spolin, 1977). Hence, we argue that in the co-improvisation context the antecedents of successful individual improvisation demand the other-related factors to be considered.

To our knowledge few quantitative studies are available examining the enablers of individual improvisation. Magni et al. (2009) found that team cohesion moderated the influence of team behavioral integration on individual improvisation. Behavioral integration was operationalized constituting of communication and experience, knowledge and perspective sharing among team members. Hmieleski and Corbett (2006) found that propensity for improvisation was a significant predictor of entrepreneurial intentions. Leybourne and Sadler-Smith (2006) found that individual improvisation mediated the relationship between individual intuition and project outcomes. Finally, the study of Vera and Crossan (2005) found interaction effect of team improvisation and contextual factors influencing on innovation.

Hence, the current research of individual improvisation is scarce and it suffers from some gaps. First, although, being highly ad-hoc and complex by its nature, individual improvisation is less studied phenomenon in temporary and ad hoc co-improvisation context. Less is known what factors enable individual improvisation to occur as well as how temporariness effects on its occurrence. This refers to the lack of studies examining how temporariness effect on the behavior of the group members (Bryman, Bresnen, Beardswort, Ford and Keil, 1987), antecedents of team dynamics (Bryman et al 1987, Saunders and Ahuja, 2006; Bakker, 2010) and common creative process (Bryman et al 1987, Saunders and Ahuja, 2006; Sonnenburg, 2004). Second, the team improvisation studies (Vera and Crossan, 2004) measure improvisation and its enablers as team level constructs. Third, the scales of individual improvisation are underdeveloped especially in terms of the antecedents of individual improvisation in situation of co-improvisation. The current scales of individual improvisation measure the individual characteristics, i.e. intra-individual attitudes and propensity of an individual to improvise (Magni et al., 2009; Hmieleski and Corbett, 2006, but pay less attention to the other-related factors and social interaction essential in team and co-improvisation.

Aiming to extend the understanding of the individual improvisation in temporary context we draw from the current research in individual creativity and individual innovative behavior as close constructs to individual improvisation. We take as a starting point the assumption that similar kind of factors may predict all these individual level phenomena. The current literature suggests that both the more stable personality factors or traits and the situation-specific factors affect an individual willingness to contribute to stimuli (Amabile, 1996; Grant and Berry, 2011; Leybourne and Sandler-Smith, 2006;

Magni et al., 2009, Magni et al., 2010). We also adopt the view suggested in recent studies, that self-interested or intrinsic motivations and the other-related or prosocial motivations are positively related (De Dreu and Nauta, 2009; Grant and Berry, 2011). In the following we discuss the antecedents of improvisation related self-efficacy, intrinsic motivation and positive affect more detail and state the hypotheses.

2.2 Self-efficacy

From individual psychological factors the improvisation related self-efficacy is already identified as predictor of individual improvisation (Magni et al., 2009; Magni et al., 2010; Hmieleski and Corbett, 2006) in organizational team context. One's belief in his or her ability to succeed in particular situations (Bandura, 1997) is captured via construct *self-efficacy*, which thereby predicts individual's performance (Bandura, 1986; Shea and Howell, 2000; Tierney and Farmer, 2002). High levels of self-efficacy indicate increased motivation to put efforts, time and energy to particular activities even under stressful situations and obstacles (Bandura, 1997; Denti and Hemlin, 2012). In contrast, in opposite case it indicates the likelihood of an individual to avoid such efforts, which means to stick on the orders (Magni et al. 2010) preventing the rule-breaking behavior and exploration of novel solutions. For individual improvisation to occur, it is obvious that the high level of improvisation related self-efficacy predicts in individual ability to deal with emerging events and in temporary context where fast action is a necessity for performance. Thereby, we state the hypotheses:

H1: Individual improvisation related self-efficacy predicts individual improvisation in ad hoc co-improvisation.

2.3 Intrinsic motivation

The relatively stable personality trait of intrinsic motivation is a key driver of creativity (Tierney et al., 1999; Elsbach and Hargadon, 2005; Grand and Perry, 2001; Amabile, 1983; 1988; Shalley et al., 2004). It describes one's orientation or level of enthusiasm, enjoy and passion for opportunities and activities of generation of novel insights, ideas and solutions (Tierney et al., 1999; Amabile, 1988). The intrinsically motivated individuals feel themselves positively affected (Silvia, 2008; Grant and Berry, 2011), which stimulates creativity (Amabile, 1996) and engagement into complex and

unfamiliar tasks (Gagné and Deci, 2005; Grant and Berry, 2011). Current literature suggests that the orientation of an individual for creativity is partially shaped by the context (Amabile, 1983; Tierney et al., 1999), but the stronger effect is provided by the stable nature of intrinsic motivation (Tierney et al., 1999). An intrinsic motivation has been found to be related with cognitive flexibility (Amabile, Barsade, Mueller & Staw, 2005), psychological engagement and individuals ability to deal with complex and unfamiliar tasks (Gagné & Deci, 2005; Grant and Berry, 2011), which all are essential characteristics also for individual improvisation to occur. In fact, Hmieleski and Corbett (2006) measured one's proclivity for improvising with a large single construct constituting of three dimensions: creativity-bricolage (Tierney et al, 1999; Vera, 2002), pressure-stress, and action-persistence (Unger and Kernan, 1983; Moorman and Miner, 1998). We thereby state the following hypotheses:

H2: Intrinsic motivation for creativity predicts individual improvisation in ad hoc co-improvisation.

Whereas intrinsic motivation is considered as the key source of individual novelty (Amabile, 1996; Grant and Perry, 2011), the other-related factors refer to the importance of the others (Grant and Perry, 2001) for co-improvisation. Therefore, the less studied predictors of individual improvisation are the other-focused psychological factors, which refer to the inter-personal, social and situational affects emerging in interaction between the co-improvising participants. In other-focused factors attention is on the others, i.e. one's perceptions of the other person's behavioural cues, gestures, and signals (De Dreu, Weingart and Kwon, 2000). The perceptions captured from the other person behaviour and responsiveness may represent positive affect (Erez and Isen, 2002), which can increase one's enthusiasm and passion, expression of ideas openly (Erez and Isen, 2003; Staw and Barsade, 1993), acceptance of the ideas of the other person and building on them, and encourage one to throw into improvisation. In fact, we propose that the other person's visible (perceived) positive affect leads to mutual co-creation. This is because positive affect is contagious and the visible positive affect makes another person see the opportunity, and thereafter take action (here increase one's individual improvisation) (Erez and Isen, 2002). In the following we refer to positive affect by discussing the construct of psychological presence introduced by Kahn (1990, 1992), that we measure as entrepreneurial passion by Chen et al., (2009).

2.4 Positive affect

The experienced *positive affect* such as interest and passion has been demonstrated as a critical factor in idea generation, problem solving and innovation (Isen 1999, Amabile et al. 2005). Positive affect may manifest in intensive psychological, cognitive and bodily presence displayed in person's aliveness from concrete and bodily to abstract cognitive and emotional indicators. *Bodily presence*, maintaining the eye contact and fullness of the speech provide physical cues for being present, while cognitive presence is signalled through active participation in a social interaction (Kahn 1990, 330; see also Goffman, 1961). In the entrepreneurship context Chen et al (2009) describe passion as an intense affective state toward a specific target displayed by cognitive and behavioural manifestations. First, it enables intensive focus and full use of energy on the current task, critical for ad hoc expert tasks within specific time limits. Second, it makes the expert's motivation and interest visible in verbal and non-verbal display, energizing the other expert in social exchange. In general, the interactions with one another among team members influence and impact on team members' behaviour, beliefs, attitudes and contributions (Blingh, Pearce and Kohles, 2006; Weick, 1979). We thereby propose the following hypothesis:

H3: *Perceived positive affect predicts individual improvisation in ad hoc co-improvisation.*

The intrinsic motivation is considered as relatively stable intra-individual trait, while the positive affect represents the situation-specific affect. Hence, the interaction effect of these factors to individual improvisation may vary between individuals. In fact, it is likely that relationship between the intrinsic motivation and individual improvisation is stronger for some people than for others, which assumption leads us to explore the possibility of moderation effect in the relationship between the variables in consideration. For example, Grant and Berry (2011) found the other-focused factor of prosocial motivation strengthening the relationship between intrinsic motivation and creativity (independently rated). The moderating variable influences on the strength and direction of the relationship between the predictor (intrinsic motivation) and the outcome (individual improvisation) (Baron and Kenny, 1986; Frazier, Tix and Barron, 2004). Likewise, Erez and Isen (2002) found positive affect interacting with task conditions while effecting on motivations. Hence, it is likely that the effect of positive affect is not equal across the people (Erez and Isen, 2000). We thereby state the following hypotheses:

H4: Perceived positive affect moderates the relationship between intrinsic motivation and individual improvisation in ad hoc co-improvisation.

3 Methodology

3.1 Case description

Our workshops were consciously planned to study both the individual and team antecedents of individual co-creation and action in ad hoc conditions. Hence, we built a situation where the team members (two individuals in each) were strange to each other. This refers to conditions of temporariness (Goodman and Goodman, 1979; Mayerson et al., 1996; Laranza, 1983). As a task they carry out an imaginative and creative task (which is outside their familiar fields and therefore new to them) within short period of time (25-30 min). In fact, they have to improvise together to carry out the task in given time. We were interested about both the intrapersonal and inter-individual antecedents of such ad hoc team work.

3.2 Data collection and analysis

The data was collected via survey from four workshop session in two university centers of continuing education in 2013-2014. The respondents (N=70) were experts with several years of work experience from different industries and fields. In the workshops they worked in pairs with the person with whom they were not familiar with. To analyze the data, we test the causal relationships between the dependent and independent variables using PLS analysis. The PLS is preferred method as it deals non-normally distributed data well (Bontis, Booker and Serenko, 2007), it deals with relatively low sample size (Hair, Ringle and Sarsted, 2011) and it allows multiple predictor variables and multiple outcome variables in the model (Baron and Kenny, 1986; Frazier et al, 2004). The minimum sample size for PLS-SEM should equal with “the ten times the largest number of formative indicators used to measure one construct” (Hair et al., 2011). In addition, it is preferred for exploratory studies aiming to extend the existing theory (Hair et al., 2011), and suggested also for moderation effect studies to overcome possible unreliability in measurements (Baron and Kenny, 1986; Frazier et al., 2004). The data based on the

perceptions and experiences of the respondent's is often non-normally distributed, the PLS was appropriate method for analysis

3.3 Measurements

Dependent variable: Construct *individual improvisation* was measured by five items scale adopted from Magni et al., 2010, who modified it from the team level scale of Vera and Crossan (2005). A sample item is “*I can deal with unanticipated events on the spot*”. The construct was captured by five-point Likert-type scale.

Independent variables: In assessing the improvisation related *self-efficacy* we used a three-item variable (Magni et al., 2009; Zhao et al., 2005) captured by a five-point Likert-type scale. A sample item was, “*I am confident; I can deal with unanticipated events on the spot.*” The construct *intrinsic motivation* was measured with the five item scale (Tierney et al., 1999) captured by a five-point Likert-type scale. The sample item was, “*I enjoy finding solutions to complex problems*”. The construct *positive affect* was measured with the scale of Davis (1980, 1983) captured by a five-point Likert-type scale. The sample item was, “*The person used a lot of gestures*”.

4 Results

4.1 Descriptive statistics

From the respondents (N=70), 58.6% (N=41) were female and 41.4% (N=29) male. The distribution of the education of the respondents was as follows: vocational college 2.9% (N=2), matriculation examination 7.1% (N=5), higher academic degree, 68.6% (N=48), and in the category of the other degree of education were 21.4% (N=15) respondents. The distribution of the age of the respondents was as follows: under 30 years, 22.9% (N=16), 31-50 years 67.1%, (N=47), over 50 years 10%, (N=7). From the respondents 32.9 % (N=23) had a work experience less or equal of 10 years, 40% (N=28) had a work experience between 11 to 20 years, and 27,1% (N=19) had more than 20 year work experience.

The data relied on self-report measures. We therefore assessed the risk of common method bias, and conducted a principal component analysis that incorporated all the items from all of the constructs using the Harman's one-factor test (Podsakoff et al., 2003) for each model. We investigated the solution in order to determine the number of factors

required to account for the variance in all the items. The largest factor accounted for 18.11 %, which suggests that common method bias is not a concern.

4.2 Measurement model

Composite reliability values of the constructs varied between 0.84 – 1.00, which exceeds the suggested value of 0.70 (Nunnally and Bernstein, 1994; Hair et al. 2011) and demonstrates high levels of internal consistency reliability (Appendix I, Table 3).

Table 3: Construct statistics and estimated loadings

	Mean	Sd	AVE	Composite Reliability	Cronbachs Alpha	Communality	Loadings
Intrinsic motivation	2.84	3.940	0.98	1.00	0.99	0.98	0.99-1.00
Improvisation	3.31	1.801	0.86	0.97	0.96	0.86	0.92-0.96
Positive affect	3.28	0.832	0.61	0.88	0.89	0.61	0.71-0.90
Self-efficacy	3.88	0.572	0.64	0.84	0.72	0.64	0.76-0.85

Convergent validity of the constructs based on the average variance extracted (AVE) value showed high levels of validity. AVE values of the constructs varied between values 0.51 – 0.98 (Table, 3 and Appendix I). The lowest AVE value (0.61) was on *positive affect* and the highest on *intrinsic motivation* (0.98).

To assess *discriminant validity* we compared the Fornell-Larcker criterion (Fornell and Larcker 1981) with cross loadings (Table 4). More specifically, we compared the square root of AVE (on the diagonal in table 4) with the correlations between the latent constructs. The all square root values of AVE were higher than the correlations between the latent construct variables. Hence, the discriminant validity was established (Hair et al. 2011).

Table 4: Correlation matrix and discriminant validity assessment

	Intrinsic motivation	Improvisation	Positive affect	Self-efficacy
Intrinsic motivation	0.98			
Improvisation	0.19	0.92		
Positive affect	0.24	0.33	0.78	
Self-efficacy	-0.02	0.17	0.03	0.80

4.3 Model analysis

We examined first (Model I, table 4) the direct paths from the independent variables of self-efficacy, positive affect and intrinsic motivation to individual improvisation. The model I showed that there exists path dependence from the independent variables to dependent variable, albeit all paths were non-significant (H1: $t=0.68$, H2: 0.87 , and H3: 1.06). The $R^2=0.147$ explained 14.7 % of the individual improvisation in ad hoc co-improvisation conditions.

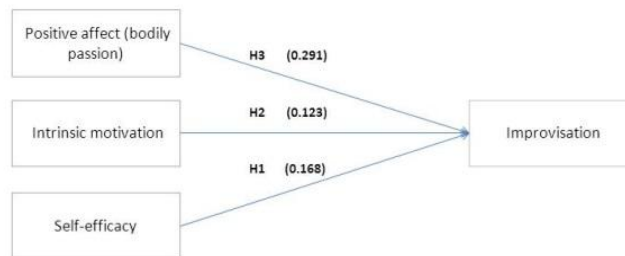


Figure 1: The path dependence between dependent and independent variables.

In the Model II (Figure 2) we explored the moderation effect of the *positive affect* between the variable of *intrinsic motivation* and *individual improvisation*. The results (Figure 2) give a standardized beta of -0.055 from intrinsic motivation to improvisation, and 0.265 from positive affect to improvisation, and an interaction effect of -0.568 with a total R square of 0.424 . The $R^2=0.424$ of the model explained 42.4 % of the individual improvisation in temporal team creativity conditions. The interaction affect had an effect size of $f = 0.48$, which is strong as it exceeds the value of 0.35 (Henseler and Fassot, 2010; Cohen, 1988; 410-414). The results imply that there exists difference between individuals experiencing the positive affect in ad hoc co-improvisation situation. The

interaction effect of positive affect and intrinsic motivation is less important for the individuals with high intrinsic motivation than for the people with low intrinsic motivation. In other words, the individuals with low intrinsic motivation profit from positive affect in co-improvisation.

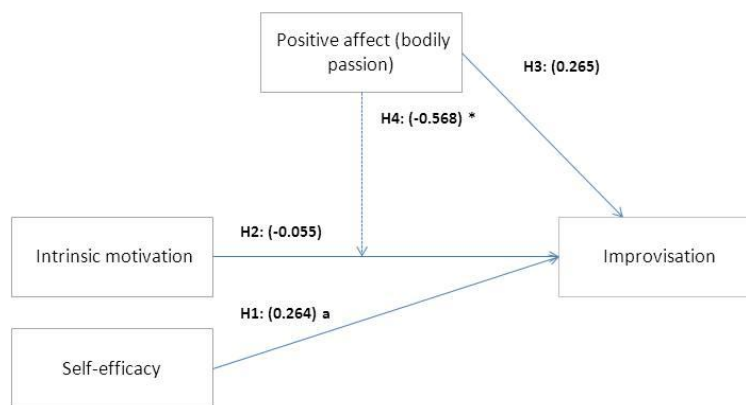


Figure 2: The interaction model.

In general, the R square value of 0.50 is considered as moderate and 0.25 as weak in marketing research (Hair et al., 2011). The judgment of R square, however, depends on the research discipline, and, for example, in consumer behavior the R square of 0.20 is considered as high enough (Hair et al., 2011). This study is explorative one and focuses on human behavior, and there exist few empirical quantitative studies concerning the antecedents of individual improvisation in temporary work settings, hence R square value of 0.42 can be considered at least as moderate.

In the model II the model analysis showed significance on the Hypothesis of H4 (t=1.80) at the significance level of 95%. Also, hypothesis H1 (t=1.29) showed some

significance at the significance level of 90 %. Instead, hypotheses H2 ($t=1.09$), and H3 ($t=0.50$) were non-significant.

Table 4: Testing the Model I and the Model II.

MODEL I	Path Coefficient	S.D.	Standard error	T Value
H1: Self-efficacy -> Improvisation	0.168	0.2455	0.2455	0.68
H2: Intrinsic motivation -> Improvisation	0.123	0.1400	0.1400	0.88
H3: Positive affect -> Improvisation	0.291	0.2455	0.2741	1.06
MODEL II: Moderation model	Path Coefficient	S.D.		T Value
H1: Self-efficacy -> Improvisation	0.295	0.1966	0.2044	1.28 a
H2: Positive affect -> Improvisation	0.228	0.2479	0.2432	0.92
H3: Intrinsic motivation -> Improvisation	-0.533	0.4603	0.1103	1.16
H4: Intrinsic motivation * Positive affect -> Improvisation	-0.996	0.7033	0.3150	1.80 *

Significance on the t-values (one-tailed):

a	*	**	***
90 %	95 %	97.5%	99 %
1.282	1.645	1.960	2.326
			2.576

5 Discussion

The following section discusses the findings of the study, the implications of them, as well as the ways in which the paper contributes to the discussion concerning the antecedents of individual improvisation in ad hoc co-improvisation.

In the direct path model (Model I) we found positive path dependence from the independent variables of self-efficacy (H1), intrinsic motivation (H2) and positive affect (H3) to individual improvisation. However, the path dependences were unexpected weak, which lead us to study the possible interaction relationships (Frazier et al., 2004). For that purpose, we draw from the current literature (Grant and Berry, 2011; Erez and Isen, 2002) to form the interaction effect of the constructs of intrinsic motivation and positive affect to individual improvisation. In fact, the assumption was that the situational and interaction related positive affect (Erez and Isen, 2002) and more stable attribute of an intrinsic motivation (Grant and Berry, 2011; Tierney and Farmer, 2002; Tierney et al., 1999) would vary across individuals (Erez and Isen, 2002).

The results provided support for the role of positive affect in moderating the relationship between intrinsic motivation and individual improvisation. More specifically, the moderation effect was strong ($f=0.48$) and negative. That is, the effect of the perceived positive affect is opposite to the effect of intrinsic motivation, and in other words, the higher the intrinsic motivation of an individual is, the weaker the effect of perceived positive affect is for individual improvisation to occur in ad hoc co-improvisation. Likewise, the lower the intrinsic motivation the stronger the effect of positive affect is.

The finding is novel, and it indicates that in the ad hoc co-improvisation situation both the intrapersonal (intrinsic motivation) and the situational factors, such as perceived positive affect play an important but opposite role for individuals' willingness to engage in such ad hoc and creativity demanding co-improvisation event. Indeed, the antecedents of individual improvisation in ad hoc co-improvisation seem to be to some extent individual-specific factors.

In addition, the results provided some support for the role of improvisation related self-efficacy (H1) for individual improvisation in ad hoc co-improvisation. The finding confirm both the previous studies that found self-efficacy as a predictor of individual improvisation (Magni et al., 2009) and in the more general context the studies presenting one's belief (self-efficacy) toward particular activity (in this case improvisation) predicting that performance (Bandura, 1997; Tierney and Farmer, 2002; Zhao et al., 2005).

5.1 Implication for research and practice

The findings of this study provide the following implications. First, it extends understanding of the factors affecting on individual improvisation in ad hoc co-improvisation situation by introducing the other-focused dimension i.e. the experienced positive affect affecting individual improvisation. Second, the implications of this study also contribute to the limited understanding of the antecedents of individual improvisation and the state of the current empirical measurements of individual improvisation. Indeed, the current scales of individual improvisation (Magni et al., 2009; Hmileseski and Corbett, 2006) lack the dimensions of the other-related factors, which have been proposed as fundamental enablers of co-improvisation (Koppett, 2001; Johnstone, 1997; Sawyer and deZutter, 2009). This is also what the results of our empirical study indicate. Finally,

in more general sense, the study contributes to the topical discussion and the less studied field of the conditions of temporary forms of organizing (Goodman and Goodman, 1976; Grabher, 2002, Lindkvist, 2005; Mayerson et al., 1996; Bakker, 2010). Such unique and unfolding conditions demand different kind of orientation, abilities and skills from participating individuals than the conventional organizational settings does, on which this study shed light by exploring the antecedents of individual improvisation in ad hoc co-improvisation event.

6 Conclusions

This study explored the antecedents of individual improvisation in ad hoc team improvisation settings. With a structural equation modelling (PLS) we explored the simultaneous effect of intra-individual factors of intrinsic motivation (Tierney et al, 1999; Tierney and Farmer, 2002; Amabile, 1998), self-efficacy (Magni et al., 2009; Bandura, 1997) and inter-individual factor of positive affect (Kahn, 1990, 1992; Chen et al., 2009) on individual improvisation in ad hoc team improvisation conditions.

The study contributes to the discussion of the antecedents of individual improvisation in ad hoc co-improvisation context in the following ways. First, although, being highly ad-hocratic and complex by its nature, individual improvisation is a less studied phenomenon in temporary and ad hoc co-improvisation context. This study shed light on the simultaneous effect of both the intra-personal and inter-individual antecedents of individual improvisation in ad hoc event. Hence, it provides evidence of the human behaviour and co-improvisation within conditions of ad hoc interaction and temporariness (e. g. Bryman et al. 1987; Saunders and Ahuja, 2006; Sonnenburg, 2004; Bakker, 2010). Second, the scales of individual improvisation are underdeveloped especially in terms of the antecedents of individual improvisation in situation of co-improvisation. The current scales of individual improvisation measure the individual characteristics, i.e. intra-individual attitudes and propensity of an individual to improvise, but pay less attention to the other-related factors and social interaction essential in team and co-improvisation.

The paper contributes to the discussion on expert tasks and innovation by exploring factors enabling improvisation in ad hoc tasks increasingly common in dynamic knowledge-based network economy. The practical implications of this study suggest first that organizations should take more advantage of novelty and diversity in their knowledge creation activities. Based on the group discussion after each workshop the participants

found that the exercise was useful and productive. Many were also surprised of the innovative outcomes and some of the participants noted that this exercise that was not based on their work-roles, related expertise and known colleagues, and that the exercise was actually more productive than the work-role related innovation activities. Based on our experience as participant observers, the survey data and qualitative “debriefing” discussions our first insights are that against the common understanding, it may actually be easier to collaborate informally with completely novel individuals rather than with those well-known individuals whom one already knows and may be have learned to avoid any controversial issues. Hence, organizations should emphasize more emerging interaction for flexibility and renewal.

7 Limitations and Future Studies

The key limitation of the study is that the sample size is still relatively low (N=70), which may cause some limitation especially in moderation effect analysis. We also believe that there are other potentially interesting factors impacting individual improvisation and co-improvisation, e.g. trust and related trust building mechanisms.

In a seminal article by Mayerson et al. (1996) the trusting behaviours are presented as mechanisms through which unfolding conditions of temporary settings can be managed. We believe that trust can be another facilitator for ad hoc expert tasks, although all of the sources of trust found in conventional context (e.g., familiarity, shared experience, reciprocal disclosure, threats and deterrents, fulfilled promises and demonstrations of non-exploitation of vulnerability) are not likely in temporary settings between strangers (Mayerson et al., 1996). The unfolding elements of temporariness, such as vulnerability, uncertainty, risk, and expectation could certainly be managed by trusting behaviour (Mayerson et al., 1999), and therefore, the future studies should focus on the trust related behaviours and the ways how trust unfolds in temporary interaction between participating members should be studied. Second, the more varied number of the other-related factors (perspective taking) should be studied as antecedents of individuals to cope in ad hoc and temporary conditions. Finally, individual and co-improvisation are promising approaches to understand the unfolding nature of temporariness, which studies should be continued.

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APPENDIX

Item	Mean	Sd	Loading	AVE	Communality	Composite reliability	Cronbachs Alpha
IMPRO1	3,25	1,954	0,92	0,97	0,86	0,97	0,96
IMPRO2	2,92	1,889	0,90				
IMPRO3	3,15	1,938	0,92				
IMPRO4	3,65	1,912	0,96				
IMPRO5	3,67	1,919	0,94				
INTRMT1	3,08	4,060	0,99	0,98	0,98	1,00	0,99
INTRMT2	2,90	4,003	0,99				
INTRMT3	2,63	3,953	0,99				
INTRMT4	2,48	4,264	0,97				
INTRMT5	2,88	3,987	1,00				
POSAFF1	3,17	1,076	0,76	0,61	0,61	0,88	0,89
POSAFF2	3,10	,986	0,66				
POSAFF3	3,40	,942	0,85				
POSAFF4	3,10	,933	0,71				
POSAFF5	3,68	,930	0,90				
SELFE1	4,07	,686	0,85	0,64	0,64	0,84	0,72
SELFE2	3,97	,736	0,76				
SELFE3	3,90	,817	0,79				

Creativity, Culture and Development : The creative segment of the garment industry in Quebec

Amina Yagoubi*

Department of sociology, University of UQAM, Montréal
Case postale 8888, succursale Centre-ville
Montréal (Québec) H3C 3P8 Canada

Diane-Gabrielle Tremblay

TÉLUQ-University of Québec
Canada research chair on socio-organizational challenges of the
knowledge economy (dir. D.-G., Tremblay)

* *Corresponding author*

Structured Abstract

Fashion worlds (Becker, 1988) describes the transition from Fordism towards a new type of economic model and supply chain in which creativity and innovation are favored (Leslie, Rantisi, 2010). The world of fashion design (Bourdieu, 1984) is one that is characterized as being cultural (Throsby, 2008) and creative (DCMS, 2001). It is worth considering that the transition from Fordism to a service oriented economy brings forth major paradigmatic changes (Boltanski, Chiapello, 1999). While observing major actors, a subculture is revealed that is resistant to standardisation and proposes instead development that is culturally, socially, economically, spatially and ecologically sustainable.

Purpose – The goal of our research is to highlight the role of creativity within the given sector as a cultural model for development as well as a contemporary social issue.

Design/methodology/approach – Our analysis of *Fashion worlds* in Montreal is based on participant observations (Peneff, 1996) and a survey (Blanchet et al., 1992; Beaud et al., 1997) which were conducted from 2009 to 2013 by semi-structured and open interviews (approximately sixty, 28 designers and 32 Intermediate Sectorial & Intersectorial Actors). The study was based on interviews and internal data (reports, corporate documents, press articles, etc.). The interviews were conducted in four rounds, all lasting between one hour and half to two hours each, and fully transcribed. The first round is based on a guide to trace the trajectories of Emerging Designer (ED) (semi-structured interviews); the second round takes place in open interviews aimed to collect the story of Renowned Designer (RD) and pioneers (DP) (Bernier, Perrault, 1987). The third round follows a guide developed towards Intermediate Sectorial Actors (ISA), Intermediate Intersectorial Actors (IIAS) and Political Intermediaries (IP) (semi-

structured interviews). Finally, the fourth round follows a guide geared towards Intermediate Promoter Industry (IPI) representatives (semi-structured interviews). Groups encountered are divided into two main categories: the first being fashion designers and the second being the actors from the sphere of influence and cooperation (media, sectorial and intersectorial NPOs, public/private actors...). We chose to adopt as part of our research a reflective and comprehensive position (Max Weber, Hamel, 2007; Bourdieu, 1992). Our methodology is qualitative (Deslauriers and Kérisit, 1997; Van Der Maren, J. - M, 1987). Our study on the trajectories of fashion designers crosses the macro, meso, and micro-levels. The three levels are interdependent (Simon, 2009; Cohendet et al, 2010) to capture careers in a territorial dynamic sector as well as at the individual level. We crossed levels of meso/micro analysis for the interpretation of our data to identify additional information, opposition, tension, etc. (Gurvitch , 1950, 1963) and grasp the dialectical nature of social reality (Gurvitch, 1962). We triangulated data (Jonsen and Jehn, 2009; Royer, 2007) from our various sources (interviews, official documents, information in social networks including Facebook, etc.).

Originality/value – Our study seeks to demonstrate that there is an ongoing effort to value and promote the creativity of local actors. The goals of creative industries evolve in the direction of sustainable industries, and this responds to the needs of territories to distinguish themselves from one another and to eventually exchange amongst themselves.

Practical implications – This study situates itself within an ongoing attempt in Quebec, where for several years the actors and intermediaries, political as well as from civil society, have thought together and sought the establishment of a local metropolitan cluster of fashion in which creativity and innovation are encouraged.

Keywords – Creative industries (CI), Fashion Designer, City, Globalization, Sustainable Development (SD).

Paper type – Academic Research Paper and practical Paper



1

¹ *Janus Paradox* (Latour, 2001 :12)

1 Introduction

Across the fashion industry different actors have had to re-evaluate their business models due to the contemporary state of globalization. With the outsourcing of production to countries with lower salaries and the closing of offices, there are now new rules of operation within capitalism (Boltanski, Chiapello, [1999], 2001). Whereas the fashion industry of Montreal previously enjoyed a significant reputation in North America, occupying the third position after New York and Los Angeles, it now confronts “two shocks in quick succession” (ISA.1). The first one came in 2003 with the opening of borders to “developing countries with North/South agreement [...], the poor countries” (ISA.1); the second came in 2005 with the “abolition of import quotas [...] the industry has completely collapsed!” (ISA.1). The elimination of trade barriers like tariffs and import quotas is achieved by most WTO countries in 2005. “This begins an irreversible process where there are significant losses of employment in the textile sector. In Quebec, several surveys suggest that losses range from about 8,000 to 15,000 jobs” (Ville-Montréal, 2004: 2). The manufacturing sector is the first to outsource their production given the fact that “they are the ultra-intermediaries in the supply chain” and the first affected by the price problematic (ISA.2) whereas the retail sector sees an explosion of “import products” (ED.1).

With this shift, “there is another world now” (ISA.3). The repositioning sector is organized around “comparative advantages such as creativity, expertise, and the proximity to the United States” (City-Montreal 2004: 15). The industrial restructuring context of the industry (Milstein&Cie Conseil Inc.¹, 2011) offers new opportunities. In order to distinguish itself and become more competitive, industry invites forth all the community stakeholders to produce a strategic plan. In this paper we show the specific role of the creative industries (CI) and how they adapt to this economic shift. To do this, we begin by presenting a literature review to introduce the contemporary global context of both industry and fashion, as well as that of CI and sustainable development (SD). In addition, we exploit the results of our survey highlighting adaptations to globalization (or sectorial distinctions) in the form of creative and sustainable solutions. We observe the construction of the creative and entrepreneurial identity in this trade (Dubar, 1991; Dubar

¹ The study shows that the post-industrial era is marked by an increase in the hiring of “white collar” workers.

et al 1998. Hughes, 1996), as well as a commitment within a given territory. We also propose that this highlights the meaning of creativity from an entrepreneurial point of view and not just from a creative one, and how this impacts on designers' and small businesses (SMBs) trajectories.

2 Theoretical/Analytical Framework

2.1 *The creation of a local fashion field (“champ”) and the fashion industry*

The history of fashion in Quebec begins in the 1920's and 30's with the establishment of the *Maison de Haute Couture* as well the presence of renowned local designers such as Ida Desmarais, Lucien Lacouture, Gaby Bernier, Angelina Di Bello, etc. who rely on Parisian fashion as a source of inspiration (Baril, 2004). The first Canadian Designers Association (ACC in French) is established in 1954 in Montreal. By coming together, designers legitimize their profession and contribute to a flourishing environment through events, with the support of the textile industry, the media, etc. Precursor designers such as Raoul-Jean Fouré, Jacques de Montjoye, France Davies, Marie France de Paris, etc. assist the newer generations of designers to succeed them. Two major historical events within Quebec society induce “major changes” (DP.1): The Quiet Revolution in the 1960's and the World's Fair in 1967 (Grenier, 1965). After this, culture and creativity emerge as identity issues and designers and small fashion businesses evolve within a local and international context facing the developments of CI as well as sectorial restructuring.

While the fashion industry struggles to legitimize itself (Bourdieu, 1984), it operates in a problematic industrial context, which creates a fragile configuration. Generating symbolic value goods, it is also addressing the market of commercial property. The fashion industry brands itself as different—an authentic, singular, and creative goo—and seeks to distinguish itself from a “standard production” (Boltanski, Chiapello, [1999], 2001: 597). The notion of the multitalented designer emerges, requiring expertise in different fields (art, artisan, commerce, etc.) which makes his legitimization complex. It can be argued that the fashion designer becomes an “interstitial” figure (Alandete, 2000 : 87) where art, artisan, culture, and commerce cross invoking the *Janus Paradox* (Latour, 2001: 12) which creates a dual identity (entrepreneur/creative). The SMB (small and medium sized businesses) of the sector thus emerge in a very particular context, articulating business and art/artisan. It is in this context that we observe the emergence of

CI. Regarding the dominant international fashion order, the creation of *mode d'ici* (local fashion) finds difficulties in placing itself, either enjoying a reputation or a consecration. Nevertheless, it is the expression of local cultural identity characterized for being branded *Made in Montreal, Made in Quebec*. Within this quest for recognition, we find the industry placing itself on larger issues such as societal development, but facing important challenges in the context of globalization.

To thwart the setbacks of globalization, professional strategies, creativity, innovation and original business models (niche markets and local manufacturing) are put in place. Moreover, the legitimization of the creative sector requires cooperation within a particular milieu, *the fashion world* on the one hand (Becker, 1988), composed of large firms but mainly of many SMBs and designer firms, and the support of intermediary actors (public and private) on the other. In regard to this, a commissioner of fashion is created in 2009: the Office of Montreal fashion (BMM). Also, the Fashion Week (MFW) promotes designers since 2000 and the Council of Quebec fashion designers (CCMQ) is structured in 2010. The sector's restructuring innovates by creating a roundtable of programs (2008-2011) thanks to government aid programs (Pro-Mode Strategy: 2007-2011) followed by a Fashion Work Group (2011-2013), bringing together key industry players (Martini, Lifson, 2013).

Consultation of stakeholders results in a report recommending the creation of a metropolitan cluster of fashion and the need for a cooperative effort of support for the industry, that is designers in particular. During these discussions, the agency Sid Lee proposed a strategy called "ingenious fiber" (Martini, Lifson, 2013: 44) to support the industry in its restructuring. The fact remains that "the designers are the trademark of the entire industry" (CCMM, 2013: 19), and because they make a creative profession, they belong to the CI (grouped statistically with the *architecture and design*, CCMM, 2013).

2.2 Creative Industries: Montreal, Creative City

A parallel second report emerges, and it sets forth a precedent. This report focuses on an extensive study CI of Montreal and relies on the existence of a creative environment (multimedia, architecture and design, the arts, media, and advertising) (DMC, 2001) a "growing sectorial ensemble" marked by the presence of cultural diversity and creative and dynamic capital (CCMM, 2013). The talent of creators and their leadership are the guarantors of a radiating and creative metropolis at a local, national and international

scale. CI generate over 91,000 jobs in Montreal (Région métropolitaine de recensement, RMR¹) constituting 4.6% of all jobs in the RMR. “Direct and indirect economic benefits” (CCMM, 2013: 3) amounted to \$ 8.6 billion. Moreover, these industries “create value in other sectors” and they play a role “in urban regeneration and social cohesion ”(ibid.). Observing a fragmented sector, mainly composed of small businesses (micro-enterprises) and self-employed workers, the report recommends the consolidation of “sustainable creative enterprises” and leaders (ibid.). Moreover, the disparity of local creative goods in international markets is an obstacle to development, which is why it the report recommended to exploit new distribution channels, visibility on the web 2.0, business alliances and the use of an entrepreneurial spirit. This issue of internationalization is important and is one of the main issues to be addressed by the small local businesses in order to remain active and sustain their activity over time. Our paper will show how designers and small firms deal with this issue.

Based on the notion of the “wave of maximizing the potential of creative industries” from Montreal, the report highlights three historical stages of “support measures”: A development wave qualified as “the *institutional* (started in the 1950s-1960s, focusing on culture and creative talent base in Montreal)”; the second wave “the *industrial* (started in the 1980s-1990s, focusing on technology as the base of creative companies),” and the third wave “the *collaborative* (started in the 2000-2010 focusing on creativity and the basis for new creative platforms)” (CCMM, 2013: 3). To complete the development process, six objectives are proposed: “maintain emphasis on talent, stimulate exploration, favor consolidation, value intellectual property, support commercialization, and strengthen the influence and positioning” (CCMM, 2013: 4) of the creative city. The issue of valuing a creative class (Florida, 2002) in the framework of a territorial revitalization (Pecqueur et al, 2009. Pecqueur, 2005) and urban development (Fontan *et al.*, 2003) is a thesis that, although viewed with caution, (Scott 2000, 2006. Tremblay et al, 2010) saw great success among urban policies (Stolarick *et al.*, 2005). Competition between cities is now based on the existence of talents capable of creativity and innovation (Landry, 2000). The report (CCMM, 2013) highlighted the benefits for the different structural actors and the importance of supporting these industries in a context of globalization. This will effectively increase the “territorial attractiveness” (Kahn², 2010 : 642-643) through

¹ The metropolitan area consisting of the cities of Montreal, Laval, Longueuil and 79 other neighboring municipalities is home to 3.6 million people, and accounts of half of Quebec's GDP. (CCMM, 2013).

² Greffe (1999, 2002b, 2005) About his typology of impacts (effects) of the local culture and cultural policies.

economic benefits and the “image effect” (*ibid.*) of the cultural metropolis. Therefore, the city is distinguished by developing its creative talents (Pilati, Tremblay, 2008 ; Pecqueur, 2006), by being simultaneously an Anglophone and a Francophone "young city" (ED.2), by offering a favorable environment: low cost rents and quality of life (ED.1), and it has a “superb fine reputation within the Canadian context” (ED.3). However, the assertion of a creative class within an “uncertain horizon” (Menger, 2009) confronting a global crisis, the deregulation of capitalism (Boltanski, Chiapello, [1999] 2001) is not unproblematic. In this regard, the theme of project work (*travail par projets* ; cf Menger, 2002) to ensure a stable income (Consultancy work, cumulation of 2 jobs, etc.) is a feature of the so-called nomadic creative career which presents many risks (Tremblay, 2003 ; Cadin *et al.*, 1999, 2000).

Amongst the strategies which contribute to build a reputation and image, fashion design is exposed (as for the museum exhibition of designer Denis Gagnon in the Museum of Fine Arts of Montreal, october 2010) publicized and supported by various local actors, and it is more and more assimilated to “heritage works” (De Certeau, 1974: 167), invested by a political and cultural will to organize its influence and visibility. Conventions with various international organizations, in Australia, Europe, UNESCO etc. seek to legitimize all creative sectors and provide a common definition of the creative economy including fashion (Throsby, 2008) even if it is characterized by an utilitarian aspect in its production (Menger, 2010 ; Alandete, 2000). Since the 1980s, cultural policies redefine the field of culture “in its redevelopment by its high content of creativity, culture [...]it] is the area where are sought and implemented qualities that are also a resource for the economy as a whole” (Menger, 2010: 214). In the United Kingdom, CI include *industrial design, advertising, fashion, software and IT services*, which are “included in the scope of public cultural action” (*ibid.*). The city of Montreal, in 2006, joined the Creative Cities Network and became “UNESCO City of Design” (UNESCO, 2006). Distinguishing itself on the world stage, it addresses the challenges of the transition from one social status to another where *nothing seems definitive* (Boltanski, Chiapello, [1999] 2001). “The Montreal metropolitan region therefore ranks among the top 10 North American creative cities” (CCMM, 2013: 31), and ranked 4th in the sub-sector of architecture and design (including fashion) “with 5.4 jobs per 1000 jobs” (*ibid.*: 32) behind Vancouver, Toronto and San Francisco.

The case of Montreal seems to provide a “redefinition of culture” (Menger, 2010) on matters concerning the governance and the organization of culture (*the Festival of design and fashion, the Jazz festival, Quartier des Arts, etc.*). We believe that the local politico-economic dynamics with regards to the creative industry (film, fashion, video games, performance and circus arts), play a significant role regarding contemporary issues of the city, which challenges creativity within a context of crisis, in a society maintaining a complex relationship to globalization (Culture-DD12¹, 2012: 15). Montreal assumes a *creative metropolitan identity*, which values local talents and is active in the development of *urban competitiveness within the new economic era* (Fontan, 2006), while at the same time aspiring to a more global image. “Because the hands are elsewhere and that the head is all that remains in developed countries, we see a boom of studies on innovation management” (Giusti, 2011: 149), but also on the Creative City, its meaning and its possible contribution to local development and globalization (Tremblay and Tremblay, 2010).

The city becomes place of identity affirmation and reputation building for the designers and small fashion firms (Agenda 21, 2012), and it informs us about the changes in relations between culture, environment, society and the economy. The *Creative society* reached a turning point and expresses a new spirit of capitalism linked more towards the idea of service than production, and where the role of creativity calls out the paradox of the “artist critique” (Boltanski, Chiapello, [1999], 2001: 632). In other words, goods produced in response to a demand of authenticity (e.g. eco-products) nevertheless obey the spirit of capitalism (*ibid.* ; Greffe, 2010).

2.3 Culture and Development : Rethinking Social projects

Particular attention placed on CI questions the role played by creativity in development. More broadly, it seeks to assess the relationship between culture and development in the same way that established relations between “environment and development” and between the economy and the environment in the Brundtland Commission (Rapport Brundtland, 1984), which coined the expression *sustainable development* in its report and was “politically adopted by the world in the Earth Summit in Rio de Janeiro in 1992” (Agenda21, 2012: 2). In 1995, “Our Creative Diversity” (UNESCO, 1996) sponsored by UNESCO at the Global Culture Commission, explores

¹ Cit. Edgar Morin

the nature of this relationship. “Culture is [...] the vehicle through which behaviors are transmitted, while at the same time is a source of dynamic change, creativity and freedom and hopeful promises” (UNESCO, 1996: 11). It is up to societies to adopt “new ways of living [...]”. It is also important to promote different development paths, being aware of the influence of cultural factors on the way companies design their future and choose the means to achieve them” (*ibid.*). “Creative diversity” (*ibid.*: 20) intervenes as a response to the de-industrialization of Western societies while creativity, acting as a powerful social engine (*ibid.*), explores engagement models incorporating contemporary cultural and economic concerns. Environmental issues are on the agenda, as is citizen consumption that is responsible and equitable within a given territory; this is what we find, for example, within the context of environmental ethics.

The sustainable development (SD) Law (LDD-Loi sur le développement durable), passed in Quebec (2006), qualifies SD as “development that responds to the demands of the present without compromising the capability of future generation to respond to their own demands (LDD, 2013: 10) and associates this with the objective of “fairness” or equity (Laganier *et al.*, 2002: 5). The LDD introduces “a vision which takes into account as being inseparable the environmental, social, and economic dimensions of development activities.” (Agenda 21, 2012: 2) and associates the notion of *interdependence* (Laganier *et al.*, 2002). Through the decree 763-2012 (4 July 2012), the LDD adds culture as the thirtieth goal. On the occasion of a cultural construction adopted by the Government on the 23 November 2011 (Agenda 21 of Quebec), the objective is formulated as a support for “the creation, production and dissemination in all sectors of the Quebec cultural system to ensure development” (Gov.QC, 2013: 3).

The addition of this fourth pillar to the other three (economy, environment and society) advocates for the values of an “innovative responsible” company making “sustainable development as a fundamental and dynamic engine” (*ibid.*: 62). This adds to “the debate on the role of culture, the local economy and the rich heritage” (Pascual Espuny, 2010: 14-15). In fact, since 1981, “Ignacy Sachs, founder of the notion of eco-development with Maurice Strong, introduced the cultural pillar to the conceptualization of sustainable development (Sachs, 1981: 139)” (*ibid.*). Through its objectives, SD can be integrated in the creative economy.

SD is thus integrated as part of a social project where there is reflection on the relationship of post-industrial and developed societies to globalization and observation of

the manners in which adjustments take place. After years of free trade, we are now in the context of a civic character interdependence, where each territory (city, region, etc.) must think of *new ways of doing things* while adhering to universal values.

The garment industry of Quebec has been transformed by globalization (Pilon, 2005 ; Metzger, 2003) and has not escaped the turmoil of other industrial societies. This is why in the second part of our paper, on the basis of our empirical study, we present the context to highlight how the industry is positioned today in developing such strategies of production relocation. We show how designers and small firm “creators,” as resources of sector and local value (creativity, ways, etc.) are embedded territorially (Simon, 2013) and how creativity and innovation must be considered as new development paradigms. The fashion design segment is to understand in the context of a creative ecosystem (Daidj, 2011) which bases its development between the CI and the garment industry, between the economy and culture. The concept of “*Think global and act local*” (St-Pierre et al., 2010) seems to fit sectorial strategies that put forward local actions in order to support the industry.

3 Creative Commitment : An alternative model between the economy and culture

“*Today, we produce little, but quickly [...] it has to be top design*” and “*it still requires a lot of skill, it is very demanding!*” (IP.2). This is the new fashion trend “*just-in-time,*” *hyper-designed, manufactured quickly,* must ensure locally the presence of “*design modes*” which ensure there is an “*active production.*” (IISA.2). With the industry’s crisis, the closing of many factories and the loss of skilled labor, training specialized labour becomes an important issue (ISA.2). We have discussed the positioning of designers on a local market (production, distribution, niches, etc.) ; we now discuss the specifics of the role of the creative within the fashion industry. While “*the future of Quebec*” seems to rely on its “*creativity*” (ED.5.3), the subculture of the creative industry remains problematic.

3.1 The Garment industry and creative industries

The local market of fashion design proposes products in which creativity, innovation, and sustainable development are highly valued. These may be everyday products, but they result from a process where the creative, the artistic, and/or the craft carry a signature and identity. These designers distinguish themselves from “*international*” fashion, being essentially a “*counter-fashion*” (RD.5), which does not mean they cannot have international success, on the contrary. Following international fashion trends leads “*dangerously towards the homogenization of creativity*” (RD.1) and this may be more characteristic of large firms as well as appropriate for them. On the contrary, for small designers’ studios, it is preferable to have a clear, original, local image, and to export this original creative product. (RD.5) situates herself “*outside what is fashionable,*” and claims “*a need for sustainability, long term use*”, ensuring “*timeless fashion*” and argues that her clothes are “*timeless collection pieces.*” (RD.5) also denounces the political marketing campaigns of “*creative companies*” that focus on catering to the already “*hyper advertised*” high-end luxury brands (e.g. Vuitton, Chanel, Armani, Dolce & Gabbana , etc.) which in turn, prevent small designers who have very little means for advertising. (RD.2) does not like that which is “*ephemeral*”: “*I prefer that it lasts for a long time.*” For her, a designer is someone who has “*guts, their own universe, and one who signs from A to Z*” his/her collection. It is the creative commitment that singles out Lacroix’s work and it for this reason that, “*a Christian Lacroix always looks like a Christian Lacroix, a Jean-Paul Gauthier always looks like a Jean-Paul Gauthier*” (*ibid.*). A truly creative work is a continuous exploration of one’s own creativity to propose unique pieces (RD.1).

While the design community is often perceived as “*a circle of artists*” by the industry (IISA.2), not generating significant business figures (IISA.2, ISA.3), it nevertheless “*showcases*” the creative (ISA.4). The precarious status of independent workers and small businesses, “*studio-designers,*” within the context of economic uncertainty make it difficult for fashion designers to have a career, as very few are “*chosen*” (IISA.2) “*Either you play the game, or you don’t... If you don’t play the game, you scrape the bread!*” The industry encourages designers to develop their own “*business sense,*” an entrepreneurial dimension to the trade. (IISA.2) believes that “*what is missing amongst fashion designers, is real entrepreneurial designers not just creative ones!*” But the paradox lies in the idea of opposing CI and traditional industries. Designers evolve within an industry that continues to favor outdated, traditional manufacturing models (ED.1) whereas the majority

of designers see themselves as part of the creative and/or cultural industries. Our study shows that almost half of the designers surveyed see themselves as being part of cultural industries (41%), and 34% as being part of creative industries, whereas 25% had no opinion on the matter. Clearly, a majority sees itself as operating within the creative domain (75% cultural and CI).

In order to develop local reputation, they can surely use the support of intermediary organizations, and a certain number of them do contribute to this. (Tremblay and Yagoubi, 2014).

3.2 Creative professions at a crossroads of fields

3.2.1 The identity in question

– The Janus Paradox : Creativity and Entrepreneurship

In a “*dream industry*,” such as fashion, we find ourselves in a world of seduction and competition (RD.1) to “*sell the dream*” (ISA.2). The designer is, thus, “*an entrepreneur who dreams*” (RD.1) who must continuously adapt to changes and new paradigms. We derive two ideal-typical figures which define the professional identity, that is the *designer-entrepreneur* and the *designer-creator*, which reflect the complexity of the creative profession, it is a “*difficult*” business (ED.6). “*Much of it is a dream [...]. You start from scratch and you believe in your project!*” In order to succeed, thus, one must master, “*both sides, the business side and the creative side*” (ED.5.4); the passionate side and, “*the rational side which tells me: it must be profitable, it has to sell!*” (ED.1).

Designers have, “*a brain split into two*” (ED.2) on the one hand there is the business (sales, *money making*) and on the other, the creative dimension (creation of the collection). Expressing the idea of a “*dual identity*” (ED.3) says: “*where can I situate myself? Am I an artist or am I a merchant? This is always the dilemma which afflicts us*” (DP.2). The success of the profession is not valued in the same way when considering, “*the artistic versus the financial aspect!*” (DP1), “*one must certainly be an entrepreneur and take into account the profitable side of the company [...], but one must as well have a creative side which is life rewarding although not necessarily always financially rewarding*” (DP.2). This paradox can be undone by the introduction of a dual business. This type of company experiences success by dividing the business into two well defined roles, making collaborators complementary to one another, for example,

while one takes care of the creative side, the other takes care of the entrepreneurial side, this is the case of (ED.12), “ *I have the opportunity of having another person, we are two. Two strong heads... I admire the people who start business by themselves, and are then capable of doing business while remaining creative at the same time*” (ED.5.4).

– *The designer-entrepreneur*

Despite the fact that the world of fashion calls for the creative and artistic dimensions, there is the sometimes hard realization of the entrepreneurial dimension. “*It is not just art, there is also a commercial dimension once there is a target market*” (ED.2). To do this job and to choose to have a collection, makes one an entrepreneur, “*when one is a designer in Montreal and one wants to get out of the more commercial industry, one does not really have a choice, one must be an entrepreneur!*” (ED.9.2). The entrepreneurial commitment requires that one have “*an investigative temperament,*” “*it is a matter of personality more than anything else*” (ED.1). One must, “*always be on the lookout for alliances [...]. One must look for possibilities at a commercial level, as a matter of fact!*” (ED.5.4). How does creativity combine itself with entrepreneurship, and are the two compatible? “*It is clear that it is not for everyone, to be both the boss of the company and the creator as well*” (RD.1).

– *The designer-creator*

Designers who identify themselves as being creative, generally distinguish themselves by participating actively in the cultural sphere. One of the possibilities that is available for them is to associate with the Métiers d’art (artisans) and receive aid from SODEC (Society for support to cultural industries) in the form of grants, funding, prizes, tax credits, etc. . The designer then has a double status: artist/craftsman (culture) and designer-entrepreneur (industry, economy). In order to associate themselves with the Métiers d’art, they must however demonstrate certain skills: treating the material, it being hand-made, having exclusive pieces, etc. However, the artisan aspect of the designers’ trade is controversial and is not viewed positively by all. Some designers fear the pejorative image of the artisan and “*want to stay away from this aspect of the trade for fear of being perceived as a granola-poor artist*” (DP2); “*it makes me think of people who do some crafts at home*” (ED.7). One designer (RD.1) member of the Métiers d’arts defends his position by saying that, “*the art of haute couture*” is “*born from that art of*

that which is hand-made". (ED.2) thinks all designers should master the traditional artistic basis of the business, which is the craftsmanship. *"To be a true master creator, comes from what you do with your hands, you have to love fabrics and love sewing, you have to have technique..."*.

3.2.2 Cultural Dimensions

– *The status of the artist*

The creative process of designers is comparable to other creative crafts: many designers demonstrate the need for self-expression, that which Yves Jean Lacasse called *"the artist in him/herself."* *"The fashion artifact, ultimately, becomes an excuse"* and the fashion design is not an end in itself (ED.3). The well-known designer Marie Saint Pierre explained to us that she could have been also an architect, artist, or sculptor. In choosing fashion design, she finds that this trade is a *"mixture of all three... In other words, there is the sculptural aspect of the garment, that of a certain beauty, of texture, and color [...] and then there is garment as a type of house as well, a sort of shelter that is close to the individual"*.

– *The creative business*

According to our findings, 31% of designers consider that they form part of a creative business, 27% believe their work is innovative and 25% that it is artistic. Despite the risky nature of the business, it is the creative aspect of the trade that keeps many designers attracted to the profession. The risk is high, especially during the first five years, and even if one's career is stable, risks may always come about. The trajectory of designer (ED.4), for example, reflects fifteen years of practice characterized by disruptions and successes etc. Eventually (ED.4) stopped designing despite his *"needs to create"* in order to find employment in another sector. Nevertheless, most designers argue that creativity and passion are the primary motivators within a profession that is difficult and uncertain (ED.9.2, ED.4), even if the *"creative aspect"* constitutes only 5 or 10% of the job. Without creativity, *"I would die!"* Mariouche (Harricana) explains: *"Without the creative element to compensate, I would be very unhappy"* (RD.2). The need for creation, the passion for the business, allows designers to *"believe, go, and even run!"* (ED.5.3). Passion is fed by the idea of avocation, of choice (ED.6); it acts as *"flame"* (DP.2) which feeds creation. *"I live my passion"* says (RD.1).

– *The rise of singularity* (Heinich, 2012)

Creativity is “*the precondition for the originality of the collection*” according to (RD.3). This idea of singularity, of distinctiveness through creation, enables a commercial brand and its creator to become renowned (RD.1). Denis Gagnon explains that his strategy is “*to be [...] as creative as possible*” and to “*go beyond marketing.*” Distinguishing one’s self is promising for success if the designer is accepted for his/her approach: “*I am different from others, and that is what makes me popular*” (ED.6).

The Niche : Designers choose “*a niche product in order to attract a certain clientele*” and gain visibility (ED.10). Local companies develop hyper-specialized niches and are overwhelmed by demand. (ED.3) uses the example of a “*small company*” that manufactures organic cotton and wool, which produces knitwear, coats, accessories, etc., “*quality crafts*” (L’Angéline, 2014). “*They have their own sheep, and the demand has become so large that local wool is no longer enough and thus they now have to import it as well*” (ED.3). (ED.11) seeks a more “*excentric*” niche, “*more high-end,*” “*more creative*”. (ED.8) seeks the “*low price look, the low price of the haute couture*” (ED.8). Some seek the unique piece market, for example the makers of corsets and sweaters (ED.4). (ED.7) speaks of the “*contemporary line!*” a collection that situates itself amidst “*big names like Prada*” and the “*manufacturers*” with garments ranging in price “*from 100 to 1000 dollars*” and which are nevertheless “*Quebecois creations.*” (ED.12) favors local production as well as the “*made in Montreal*” tag. (ED.10) works with natural materials and produces quality products with an eco-design at an average price. Two designers (ED.9.2) privilege the use of fair trade resources, “*organic cottons or fibers*” and develop their own color and silk-screen printing... “*We try working conceptually to avoid the H&M look.*” Ying Gao, researcher-designer has engaged in research and innovation, exploring modular clothing focusing on “*design work [...] conceptual work*” that is cultural and artistic.

The Style: The individualization process goes through the creation of a “*style, a label*” (ED.5.2). “*We recognize the designers through their creation and each year their clientele expects some novelty [...]. We recognize – a Marie Saint Pierre or a Rosie Godbout!*”(ED.5.4). Style is expressed in different manners: “*avant-garde*” (ED.12);

creation of a “*distinctive style*”, “*no trend*”, “*a classic stylized and sophisticated garment.*” (RD.4).

The signature: Once the approach and style are in place, the designer is required to brand his/her creations as an element of recognition: “*as you create your branding by staying on the same garment line and then the power repeat*” the people recognize the creators (ED.2). “*I think it's more in terms of aesthetics than they present that they become recognizable*” (*ibid.*).

7 Conclusions

In order for the creative industry to ensure sustainable social and cultural development, it became clear from our study that local community support is essential, both in terms of intermediation (intermediate sectorial, intersectorial and institutional) as is the support of the media (promoters, media, cultural actors) to encourage creative professions. “*In the Work Group as well as the Consultation Table, both large producers and large retailers recognize that creativity is essential*” to the development of the fashion industry (ISA.4), and particularly to SMBs who want to compete with larger organizations, but on their own field (creative design).

- *Intermediation: it is crucial to support a diversity of entrepreneurial business models in the industry – i.e. support commercial success at different levels from SMBs to large firms – and support products that are made in Quebec, or Canada.*
- *The media: promote the creativity of designers and support their recognition (image and media success) locally, nationally, but also internationally.*
- *Strengthen the image of the Creative City through talented designers: Montreal as a fashion city (BMM, Government, MFW). Promote Made in Montreal garments. All this supports the image of the local designers on an international scale.*

The local fashion industry illustrates a dynamic of resistance to globalization while simultaneously endorsing a particular sub-culture. In our work, we highlighted the similarities between the concerns of the traditional industry and those of creative industries, the latter offering a new model of legitimization and promotion of the creative emerging segments as well as the historical ones. In our view this requires the inclusion and participation of designers in their territory and in a wider view of sustainable development(SD). Fair trade fashion (specific materials: organic cotton, recycled fur, etc.) and local production (local subcontractors, jobs, quality control, etc.) and the “studio-

creators” favor sustainable economic and social development. This also supports the idea of encouraging responsible consumption: “It is important to underline the stubbornness of certain designers and certain brands to keep their production local. We believe that the issue of local consumption is not a temporary fad. The social value added to products is an integral part of the branding of several labels” (Villeneuve, 2007), and this goes at the local as well as the global scale. From a political and social perspective, the worlds of fashion are thus supported by stakeholder involvement and cooperation of the community (business but also clientele, media and intermediary actors).

It is for this reason that we can conclude and summarize that creative industries and sustainable development can be joined to attain the same objectives (Pascual Espuny, 2010). The political pillar cuts across all others and shows the local willingness to adhere to the vision also endorsed by other countries that engage local and fair practices.

Acronyms

ACC : Association des couturier canadiens (Canadian Association of Fashion)
BMM/ MFB : Bureau de la mode de Montréal/Montréal Fashion Bureau
CCMQ : Conseil des créateurs de mode québécois/Council of Fashion Designers of Québec
CI : Creative Industries
CRHIV : Conseil des Ressources humaines de l’industrie et du Vêtement/Apparel Human Resources Council (AHRC)
Gov.Qc. : Government Québec
LDD : Loi sur le développement durable (Law on Sustainable Development)
MDEIE : Ministère du Développement économique, de l’Innovation et de l’Exportation/Ministry of Economic Development, Innovation and Export Trade
MFEQ : Ministère des Finances et Économie du Québec/Ministry of Finance and Economy of Quebec
MFW: Montreal Fashion Week
OMC : Organisation mondiale du commerce/World Trade Organization
RMR : Région métropolitaine de recensement/Census metropolitan area
SMM : Semaine de la mode de Montréal/Fashion Week in Montreal
SODEC : Société de développement des entreprises culturelles/Development Corporation of cultural enterprises
SD : Sustainable development

Interview codes

MICRO: ED : Emerging designer
PD : Pioneer Designer
RD : Renowned designer
MÉSO: IISA : Intermediate Intersectoral Actors

IP : Political Intermediates
IPI : Intermediate Promoter Industry
ISA : Intermediate Sector Actors

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CTT Group : About <http://www.gcttg.com/en/about> consulté le 2 avr. 14

Fur Council of Canada : About us, <http://www.furcouncil.com/aboutus.aspx> consulté le 2 avr. 14

MFEQ : Fashion sector
<http://www.economie.gouv.qc.ca/es/bibliotheques/secteurs/vetement/saviez-vous-que/>, et
<http://www.economie.gouv.qc.ca/objectifs/informer/par-secteur-dactivite/mode/>

Montréal Couture (sewing) : <http://www.montrealcouture.com/> consulté le 2 avr. 14

SODEC : Aide financière aux artisans et Métiers d'art
<http://www.sodec.gouv.qc.ca/fr/programme/route/metier> consulté le 2 avr. 14.

Vestechpro, Collegial Center for the Transfer of Technology (CCTT) :
http://vestechpro.com/?post_type=&lang=en consulté le 2 avr. 14
 - Studies

Campus Notre-Dame-de-Foy : Historique <http://www.cndf.qc.ca/college/historique-du-college>,
 consulté le 2 avr. 14

Cégep Marie-Victorin : Accueil <https://www.collegemv.qc.ca/fr-CA/Accueil/English/index.aspx>,
 consulté le 2 avr. 14

École Supérieure de la mode de Montréal, ESG UQAM :
<http://www.esg.uqam.ca/en/research/expertise/modeethabillement.html> consulté le 2 avr. 14

LaSalle College : History, <http://www.lasallecollege.com/about-us/history.aspx>, consulté le 2 avr. 14
 - Other

Vitre-Art, 2014 : <http://vitre-art.com/a-propos/actualites/nouvelles/> Consulté le 7 janv.-14

Distrectual models and innovation: when creativity drives sustainable growth for the territory

Pamela Palmi

Department of Economic Sciences
University of Salento
Complesso Ecotekne, via per Monteroni, Lecce

Structured Abstract

Purpose - The topic of local development is more and more linked to the role of innovation and creativity as main drivers to implement processes for change, aiming to structural growth and consolidation (Gilbert, 2012). Within such a framework, a crucial role is played by the so-called district economies, which are rapidly taking new shapes, through the transition from the traditional Marshall models to fully developed local systems, which base their competitiveness on innovation and creativity. Such systems, generally referred to as “creativity districts” or “clusters”, are not always able to face the many complex challenges which are coming up on the socio-economical stage and require a strategic planning, both on a political and on an entrepreneurial level, in order to develop those competencies which are nowadays crucial to compete globally.

Design/ Methodology - We propose an approach quantitative. The present paper, starting from the evolutionary tendencies of the post-fordist districts, analyses the identity of the creativity districts (evolved new economical districts, Sacco 2006; Salvemini, 2008) and their relevant policies according to the Italian experience. A creative district or cluster is a geographic concentration of companies, usually small or medium enterprises, with an elevated degree of creativity and innovation, highly specialised, inclined to operate within scientific research centres, such as universities or public laboratories (Cesaroni, Piccaluga, 2003).

Approach/ Originally/ Value - This methodology puts in evidence the tendency of the production district of creativity to balance the activities of *exploration* and *exploitation* of the involved stakeholders, meaning the capacity to research and exploit new technological chances and to implement new technology within products and processes (March, 1991). In order to facilitate the relationships between the stakeholders and therefore the balancing of *exploration* and *exploitation* it is essential to analyse the capacity of the district to stimulate the development of the social capital among the organizations, which is the base of the mutual trust, often driven by the presence and activity as well as socio-cultural animation of associations and public institutions (Granovetter, 1985).

Keywords: Creativity district, Innovation, Exploration & exploitation, Absorptive capacity, Growth

Paper type: Academic Research Paper

1. The Analysis Model

This study aims at proposing an analysis model of creative production districts which may steer politics and strategies of different involved actors, in order to sustain growth and competitiveness at a national and international level.

More specifically, our work seeks to outline a vision in order to support integration of different expertise, so as to render the entire innovation process more effective and efficient. The proposed model essentially aims at balancing *exploration* and *exploitation* activities, identified as the ability to research and explore new creative opportunities, while conveying and incorporating new creativity within product and processes (March, 1991). Such abilities, assumed as being critical to guarantee competitiveness in the short and long term, are nevertheless hardly detectable inside a single economic actor, because they require different expertise and routines, often in conflict with one another (Gupta *et al.*, 2006). Therefore, their coexistence and balance may be efficiently reached inside an inter-organisational relationship space, where different actors of a creative district engage in *exploration* or *exploitation* activities, being mutually connected within an innovation and creativity production chain. Theory studies and empirical evidence (Rothaermel, Deeds, 2004; Lavie, Rosenkopf, 2006), mainly referring to technological districts (based on the aforementioned reasons, such considerations are also valid for creative districts, both because of the proximity and the interrelation between creativity and innovation, of the recurrent inclusion of technology in creative industries, and vice-versa), proved it reasonable to suppose that research centres and universities are mainly seeking to explore new solutions (*exploration*), while enterprises are more interested in industrial development and marketing of products and/or processes (*exploitation*). It is therefore necessary a right balance between these two typologies of institutionally different actors, in order to create conditions apt to favour both development and the deployment of creative and innovative solutions within districts.

However, in order to favour the establishment of cooperational relationships among actors, therefore balancing *exploration* and *exploitation* activities, it is necessary to foresee a series of integration procedures, as for instance co-localisation, relocating the workforce and the alignment of incentives among different actors, with the purpose of encouraging a real cooperation, and move beyond the mere logic of public funding (Albino, Messeni Petruzzelli, Rotolo, 2010). It is actually important to create a mutual trust environment, which has often proved essential to explain the success of partnership

activities. Under this perspective, associations and public institutions may play an important role, since they can serve as a guarantor or sponsor, easing the foundation of cooperation initiatives among actors in the same district (Smith, 2007), as well as the development of the fundamental value known as “social capital”, which has proved to be crucial for successful processes in local economies.

The expression “social capital” has at times been used as a synonym of *civiness* (Helliwell, Putnam, 1993), trust (Granovetter, 1985), or «cultural rules, unwritten in bold type» (Fukuyama, 1995), however in the course of time it reached always broader implications, attaining various cultural, political, infrastructural and environmental connotations. We can conclude that social capital is identified by a system of values, rules and social relations allowing individuals to pursue collective behaviours and represent a sort of facilitator in conveying knowledge, thereby easing its dissemination.

This translates into more chances for organisations to generate innovation, thus outsourcing information and knowledge (Laursen, Salter, 2006). The relation among social capital, cooperation, innovation and creativity has been the subject of treasured works in literature (Sacco, 2006), emphasising how enterprises located in high social capital areas are more inclined to innovation and creativity than others. Furthermore, seen from the perspective of relocating workforce and explore new markets, a recent study (Moretti, 2013) on the American experience, proves the existence of a new labour geography, geared towards *creative class* dynamics and profit-sharing (Florida, 2002; Amadasi – Salvemini, 2006) also applied to creative territories (Montanari, 2011).

In addition, high levels of social capital tend to increase the positive effects generated by investments in research and development, and the inclination towards innovation and creativity inside the same enterprises (Laursen *et al.*, 2012).

The *absorptive capacity* is the third element on which the proposed analysis model is based with reference to the district actors, where “ability” is the possibility to comprehend, acquire and use the knowledge deriving from the interaction with other organisations (Cohen, Levinthal, 1990; Zahra, George, 2002): this mind-set may be absolute or relative, where the latter refers to a specific relation in place, and the opportunity that partners have to successfully interact thanks to a cognitive and organisational proximity (Lane, Lubatkin, 1998).

The concept of *absorptive capacity*, introduced by Cohen and Levinthal (1990), concerns the capacity of organisations to identify, acquire and implement creative

knowledge from external actors. It is therefore a specific organisational skill, which may more precisely be defined in literature as «the ability to recognise the value of a new knowledge, assimilate and apply it to commercial purposes » (Cohen, Levinthal, 1990, p. 128); this skill must not be taken for granted, as it plays a crucial role in the cooperational dynamics among economic actors, and therefore in an effective mix of explorative and exploitative expertise (Zahra, George, 2002).

The organisational literature has highlighted the diverse factors that may contribute to strengthen organisations' *absorptive capacity*, such as: investments in research and development (Cohen, Levinthal, 1990); the presence of qualified human capital (Vinding, 2006); scientific research activities (Rosenberg, 1990; Dyer, Singh, 1998; Fabrizio, 2009), and relationships with universities and research centres (Gambardella, 1992; Cockburn, Henderson, 1998; Zucker *et al.*, 2002). However, the ability of a single organisation to interact with external actors does not solely depend on its “absolute” *absorptive capacity*, but rather on what has been later defined as the “relative” *absorptive capacity* (Lane, Lubatkin, 1998), aimed at analysing the measure of a successful interaction between two specific organisations. In this regard, there are three fundamental factors to explain how two economic actors may interact and exchange knowledge: a certain level of creative similarity (Mowery *et al.*, 1998); similar organisational structures (Burns, Stalker, 1961); shared values and routines (Prahalad, Bettis, 1996). What is defined as «creative, organisational and cognitive proximity » (Boschma, 2005) is therefore the foundation to build steady and long-lasting relationships among organisations, aimed at an effective and efficient integration of expertise and knowledge-sharing. This paper considers *absorptive capacity* as the ability of organisations to identify, acquire and implement creative and innovation knowledge owned by external actors.

In conclusion, another key element of the proposed model regards the actors' ability to connect the district on a global scale, therefore acting as *knowledge gatekeepers* or brokers between a regional and an international system, thereby enabling a gateway to the outside market, and access to new opportunities and technological solutions (Lazaric *et al.*, 2008). In this regard, the presence of multinational enterprises within the district may play a decisive role, guaranteeing an adequate level of international opportunities to the district system, which is therefore positioned inside the current global networks, nowadays the primary exchange place for the information and knowledge market.

Although from a different context and with different dimensions, a clear and well known example of this occurrence is furnished by the birth and growth of the Silicon Valley technological district in California: together with the propulsive thrust coming from Stanford University, it should be surely measured how the activities of multinational enterprises such as IBM, Lockheed and General Electric have significantly contributed to the success of such district in an international scale (Saxenian, 1994; Adams, 2005).

Figure 1 shows the proposed analysis model of creative production districts.

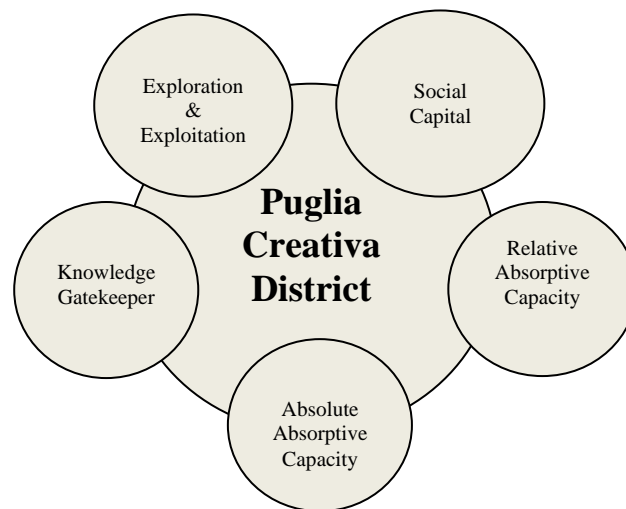


Figure 1 – Analysis Model of Creative Districts

2. Research Method. The Puglia Creativa District

We will examine the Apulian Creative District, adopting the analysis perspective of the theoretical model proposed in the preceding pages. In particular, we will study to which extent the various production chains (1. Cinema and Audiovision; 2. Performing Arts including Theatre, Music and Ballet; 3. Design; 4. New Technologies and ICT; 5. Multimedia and Broadcasting; 6. Training Services: Training, Culture, Creativity; 7. Visual Arts) are able to balance *exploration* and *exploitation* activities; the presence of institutions and/or associations aimed at strengthening the social capital; the *absorptive capacity* of different actors both in absolute and in relative terms; the presence of multinational companies operating as *knowledge gatekeepers*; and the level of creative complementarity among different actors operating inside production chains.

Before proceeding with the analysis of the production chains, or more appropriately of sectors constituting the examined district, it is necessary to define the *proxies* applied to measure different constructs. As regards the balance between exploration and exploitation, we refer to the diverse typology of actors within sectors, differentiating among public research institutions and enterprises. Through this distinction it is possible to consider universities and research centres as mainly concerned with *explorative* activities, while entrepreneurial actors mainly pursue exploitative objectives. This approximation, although rather simple, makes it possible to capture a different institutional direction for involved actors, as well as their *mission*, aimed at exploring new knowledge and creative, innovative and technological opportunities for entrepreneurial actors.

Previous studies have highlighted how the integration of explorative and exploitative approaches allows to effectively combine *upstream* value chain activities with *downstream* value chain activities, hence supporting creative innovation processes throughout the entire production chain (Rothaermel, Deeds, 2004; Lavie, Drori, 2012).

In order to assess the ability of the district to create and strengthen social capital among different actors, the presence of public institutions and/or associations in different sectors of the Puglia Creativa district has been evaluated. Such organisations, thanks to supporting activities and socio-cultural events, may stimulate a mutual trust environment among organisations, which has proved crucial in explaining the success of district economies (Valdaiso *et al.*, 2011). The *absorptive capacity* of actors in different sectors has been evaluated in “creative” terms, with reference to production “prototypes”, relevant to each single production chain¹.

Furthermore, in order to consider only those prototypes (and/or patents) developed by organisations located inside various sectors within the district (with the exclusion of

¹ In this regard, it is worth explaining the operative methodology applied to this work. As for the Movie sector, the prototype is represented by original scripts and film-direction productions; for the Performing Arts sector (Theatre, Ballet and Music), the prototype entails the production of original shows and/or designs, as well as original music productions whose copyrights have been registered at the Italian SIAE Copyright Authority; for Visual Arts, the prototype is a recognisable and patented format, or original formats of exhibitions including the publication of catalogues and/or original works of art created by artists with a recognisable format (which may not necessarily be patented, as it is unusual in this particular field, although it should at least be followed by the publication of a catalogue or otherwise clearly recognisable by its brand, logo or other form of identification); for the Multimedia sector, the production of services with specific copyrights; for the ICT production chain, the creation of new patents; for the Design production chain, the creation of brands and/or patents; for the Services sector, the creation of brands and/or patents.

prototypes developed in different locations and based in other extra-regional contexts), there is a reference to the home address of the first creator, using an approach which is largely employed in literature (Singh, 2008). We then proceeded to include in our analysis sample only those prototypes (and/or patents) whose first creator was an Apulian resident, in order to capture with a good degree of approximation the “creative” capital within the different district sectors. More specifically, as regards the absolute *absorptive capacity* in various district sectors, we mentioned the total amount of prototypes (and/or patents) regularly registered by all concerned actors. The relative *absorptive capacity*, on the other hand, has been measured taking into consideration the cooperation between enterprises coming from the same sector, regardless of the creation of co-production prototypes.

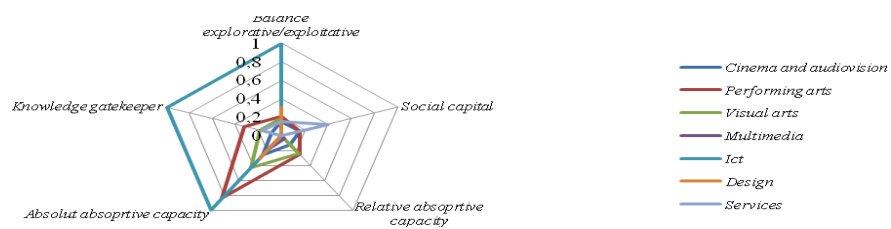
In conclusion, the existence of *knowledge gatekeepers* within production chains and their ability to be open to international markets has been analysed taking into account the cooperation with international enterprises inside various sectors. Such actors may indeed play a “bridging” role, connecting the local system with global networks in terms of exchange of information and knowledge (Lazaric *et al.*, 2008; Adams, 2005).

Practical/Implications

Within the current debate about the measures taken to restructure the district economies, creativity and innovation play a role more and more important (Salvemini, 2008, Sacco 2010). They are driving forces, able to set paths of growth and structural development (Gilbert, 2012). The model specifically investigates four factors, which in the organizational literature are considered as crucial in order to make the process of creative innovation more effective and efficient and thus to explain the success of the production districts of creativity and innovation. Such factors are: a) the capacity to balance *exploration* ed *exploitation*; b) the creating and consolidation of the *social capital*, through the presence and the activities of associations and public institutions; c) the development of *absorptive capacity*, both in absolute and in relative terms; d) the presence of multinational companies, able to connect the district on a global level, thus acting as *gatekeeper* between the regional and the international system.

By means of the model described above, all the sectors constituting the district Puglia Creativa were analysed: 1) Cinema e Audiovision; 2) Live Entertainment, including

Theater, Music and Ballet; 3) Design; 4) New Technologies and ICT; 5) Multimedia and Broadcasting; 6) Training Services: Training, Culture, Creativity; 7) Visual Arts. The relative position of each sector within the district, compared to the parameters identified in the proposed organizational model of analysis, was charted on a scale from zero to ten.



Source: own data elaboration.

Figure 2 – Comparison of Puglia Creativa District Sectors with Reference to Parameters Identified in the Analysis Model

The results provide a useful contribution for an analysis on the state of the district, on its current degree of development and on the future outlook. Such an analysis can contribute to the definition of the regional policies supporting a systemic view of the district, using as a starting point the solidity and the dynamic changes of the sectors which constitute the district itself. An in-depth analysis of each sector, taking into account strengths and weaknesses, can indeed help to define measures to develop the sectors themselves and furthermore to integrate them horizontally and transversally (as well as vertically) within the chain of creativity.

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Academics as Orchestrators of Innovation Ecosystems: The Role of Knowledge Management

Luca Gastaldi*, Mariano Corso

Department of Management, Economics and Industrial Engineering
Politecnico di Milano (Polytechnic University of Milan)
Via Lambruschini 4b, Building 26b, 20156, Milan, Italy

* *Corresponding author*

Structured Abstract

Purpose – In the current hyper-connected world, the success of a firm is increasingly dependent on the activities of other active players within the same environment. It is therefore important to understand how to orchestrate ecosystems made up of multiple organizations, institutions and other intermediaries to produce continuous streams of innovation. The paper suggests a potential orchestrator role for academics within this scenario.

Design/methodology/approach – The paper draws on the experience of an applied research centre in Italy. We begin by describing the research centre, the collaborative research processes through which it accomplishes its activities, how it funds them, and the interorganizational results that it has achieved in seven years of practice. Reflecting on the experience of this research centre, we underline not only the key role that academics can play as knowledge management experts, but also the specific research design allowing them to be effective in orchestrating ecosystem innovation.

Originality/value – The analysis of the research centre outlines two main rationales supporting the key role of academics within an innovation ecosystem. The first rationale is associated with the fact that academics are in an independent position, which is neutral and represents a middle ground between the different organizations that share knowledge to ignite and sustain innovation at an ecosystem level. The second rationale is associated with the levels of compliance and complementarity that academics have with the main purposes for which knowledge within an innovation ecosystem is created and leveraged.

Practical implications – Two ‘design’ choices seem necessary to materialize the potential key orchestrator role of academics: (i) the extensive use of multiple approaches of collaborative research; (ii) the creation and maintenance of a knowledge platform allowing academics to manage and to progressively diffuse and leverage the ecosystem-based learning mechanisms underlying each innovation effort.

Keywords – Innovation ecosystems, Orchestration, Knowledge management

Paper type – Academic Research Paper

1 Introduction

One of the reasons why most innovation initiatives fail is that organizations often lack a coherent ecosystem around them that is able to support and complement their innovation efforts (Adner, 2011). In fact, in the current hyper-connected world, firms are increasingly embedded in networks of interdependent activities carried out by external agents within the same ecosystems (Adner and Kapoor, 2010). On the one hand, these interdependencies underlie firms' ability to appropriate returns from investments in innovation (Adner and Kapoor, 2010). On the other hand, firms can exploit these interdependencies to sustain efforts of interorganizational innovation (Stadler et al., 2013).

Thus, innovation ecosystems require processes characterised by simultaneous cooperation and competition (Afuah, 2009), and an orchestration of the actors involved in the interorganisational efforts of innovation (Dhanaraj and Parkhe, 2006). It is therefore important to understand how to orchestrate innovation ecosystems—communities made up of multiple organizations, institutions and other intermediaries that collectively interact as unique systems to produce interorganisational streams of innovation (Kapoor and Lee (2013).

This paper draws on the experience of an applied research centre in Italy to suggest a potential orchestrator role for academics within these settings. We begin by describing the research centre, the collaborative research processes through which it accomplishes its activities, how it funds them, and the interorganizational results that it has achieved in seven years of practice. Reflecting on the experience of this research centre, we underline not only the key role that academics can play as knowledge management experts, but also the specific research design allowing them to be effective in orchestrating ecosystem innovation.

2 The ICT in Healthcare Observatory

Healthcare is a paradigmatic example of an industry in which most of the innovation efforts have to be extended at an interorganizational level to be effective (Angst et al., 2010). Moreover, in healthcare there is no single organisational actor able to create and extract value from the ecosystem around it (Dougherty and Dunne, 2011). In fact, healthcare organizations lack the incentives necessary to play this hub role, healthcare associations do not have enough legitimacy, and consultancy firms lack the necessary independence. Only supra-organizational entities (e.g. the Ministry of Health) would be able to orchestrate innovation initiatives at an interorganizational level. However, most of them have no resources and/or are ineffective in engaging healthcare stakeholders because they adopt only top-down, pro-

grams, which are unable to affect organizational behaviour in a significant way (Scalzo et al., 2009).

Within these settings, the ICT in Healthcare Observatory (IHO) is one the largest success stories in the relationship between Politecnico di Milano and the Italian healthcare stakeholders. Started in 2008, the IHO has created a virtuous loop among research, training, consultancy and communication, that in few years has allowed it to: (i) align the different perspectives on ICT's role within the Italian healthcare domain; (ii) transfer the urgency of collaboratively working on ICT-driven innovation in healthcare; (iii) legitimate IHO as the leading partner to be involved in national/regional projects of ICT-based innovation in healthcare; (iv) enhance the collaboration between the supply and the demand side of the Italian healthcare industry; and (v) become a reference point for all the healthcare decision makers regarding ICT issues. Table A.1, in the Appendix, outlines the main innovation initiatives instituted and led by the IHO. As depicted in the table, most of these initiatives (22 out of 32) have an interorganizational nature. Table A.2 outlines the main deliverables that the IHO produced as a result of its orchestrator initiatives since its inception.

The IHO conducts its activities according to the process depicted in Figure 1. A longitudinal approach is framed into a set of annual research projects, with public presentations of achieved results each year (Pettigrew, 1990). To increase the possibilities of effectively changing the way healthcare organizations view ICT in coping with innovation issues, public presentations are based both on academic- and practitioner-oriented deliverables—such as workshops organizations, papers in peer reviewed journals, articles in general press, etc. (Mirvis, 2008). The idea behind this approach is to increase not only the number of people interested in ICT-driven innovation in healthcare, but also the urgency of adopting ICT as a driver to solve the main issues faced by Italian healthcare practitioners.

Every year, the IHO weaves two main streams of collaborative research (Pasmore et al., 2008). The first is a Semi-Qualitative Research (SQR) led by IHO's researchers, and enriched with the involvement of the practitioners in the gathering and analysis of the data pertaining to the research problem. In the second, the Italian healthcare stakeholders themselves are the change agent (Schein, 2008), and—in the process of seeking help—they engage in a reflective Clinical Inquiry Research (CIR) with the help of the IHO.

Both streams of research are considered in a collaborative way. As depicted in Figure 1, research-driven SQR is more focused on formally inserting the tackled issues into the global discourse—with the aim of gradually switching from an exploratory (*theory generation*) to an explanatory (*theory confirmation*) perspective. The practitioner-driven stream is more fo-

cused on effectiveness during the practical implementation of the developing models, and aims to progressively expand its focus from *problem solving* to *change management*.

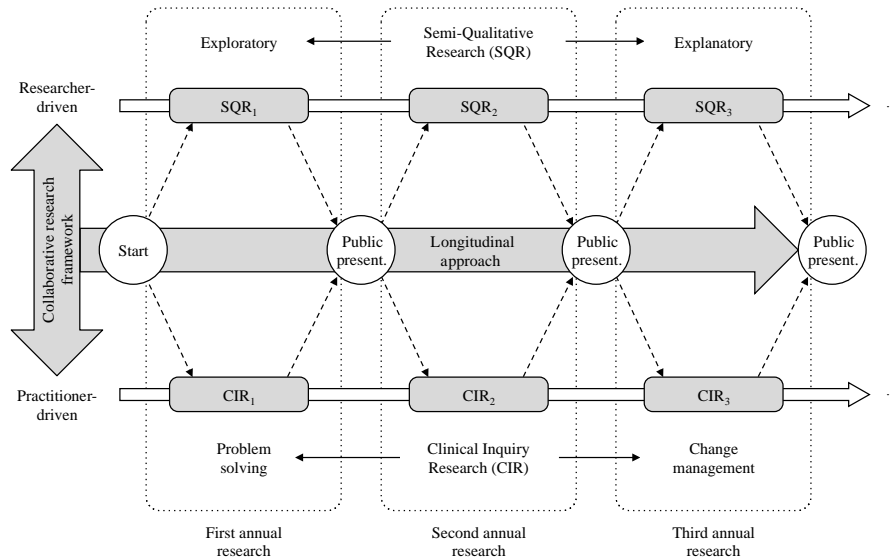


Figure 1 – IHO process to orchestrate the innovation ecosystems in Italian healthcare industry

2.1 Clinical Inquiry Research Stream

CIR is a well-defined collaborative form of research developed by Schein (2008). Clinical refers to the role that academics must play in helping a healthcare stakeholder to (Coghlan and Brannick, 2005): (i) emphasize in-depth observations of change processes, (ii) emphasize the effects of change interventions, (iii) benchmark the findings, and (iv) build theory and empirical knowledge through developing concepts that capture the real dynamics of the system. Gummesson (2000) recognizes that research conducted in this manner potentially enables the total solution to be studied rather than particular parts. Moreover, CIR can be used to initiate change and generate insights from theory development (Stebbins and Shani, 2009).

A distinguishing characteristic of CIR is in the setting of the activity. Unlike most other collaborative research approaches, with CIR the learning opportunity arises in a situation led by the client who needs help and, because of this, is more likely to reveal important data (Schein, 2008). Acting as a process facilitator, the researchers of the IHO help “clients” release resources through self-diagnosis and self-intervention (Stebbins and Shani, 2009). In order to attain a more suitable and sustainable research, the CIR stream of the IHO is framed into annual projects (CIR₁, CIR₂, etc.; see Table A.1 in the Appendix) that end with the presentation of the achieved results not only to the actor who

needed help, but also in broader research contexts such as during specific SQR meetings between academics and healthcare stakeholders, called advisory boards (see §2.2.3).

Business process analysis and mapping (Womack and Jones, 2003), face-to-face interviews and multi-participant interactive dialogues (Mikaelsson and Shani, 2004) are the main collaborative mechanisms utilized in each CIR of the IHO. Moreover, many data are obtained through the involvement of the organization assisted in the SQR process. Periodical meetings are performed in order to progressively share the achieved knowledge with the healthcare organization, orient the SQR process toward more interesting goals, and discuss the empirical as well as theoretical implications of the achieved findings.

2.2 Semi-Qualitative Research Stream

Every year, the IHO uses a combination of a quantitative panel of dynamic electronic surveys, several qualitative case studies, a series of focus groups called advisory boards, and an online community. The overall process of their utilization is depicted in Figure 2.

2.2.1 Electronic Survey

Every year, the IHO creates and delivers an electronic survey to a sample of more than 500 Italian healthcare CIOs from representative organizations of varying types, sizes and geographical areas. A response rate higher than 15% is always achieved (e.g. in the research process of 2012, 127 healthcare CIOs answered the survey—see Figure 2).

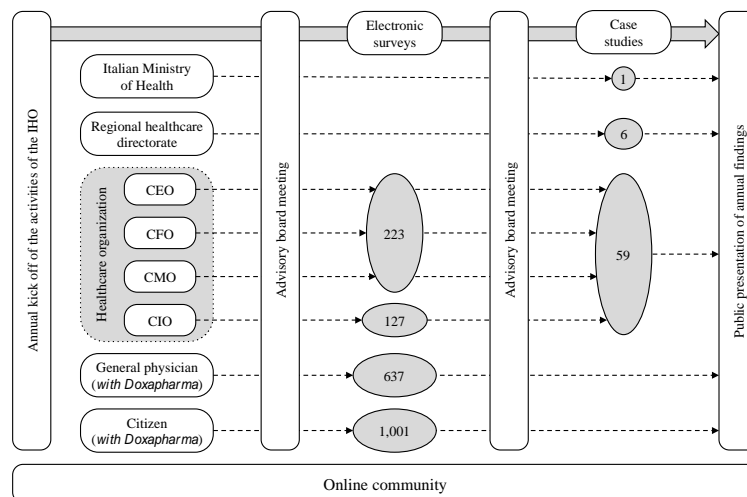


Figure 2 – Semi-Qualitative Research process adopted by IHO in the annual research of 2012

The survey is always designed with semi-closed questions, in order to balance usability and speed—with the possibility of expounding on each question. After positive results from pilot respondents and further refinement with the advisory board, the survey is made available via web in a form allows CIOs to nominate a collaborator able to answer a specific question (and to then review the answer given), and see specific sections of the survey only if specific threshold answers are provided. These dynamic features are responsible for higher response rates—even when using an extensive survey (e.g. 30 questions in 2012).

From a researcher viewpoint, the delivery through an electronic platform gives the possibility to analytically work on closed questions throughout data collection. The IHO is thus able to identify anchors to guide future data gathering, and detect connections between data for further theory generation (Forza, 2002). These preliminary concepts can be brought to the advisory board's attention, together with all the answers given to open questions.

Every year, the IHO delivers a second set of surveys to the Strategic Board—CEO, CFO and CMO—of the same healthcare organizations of responding CIOs, in order to cross-validate given responses. National and international healthcare associations, as well as technology suppliers in healthcare support IHO's research, and actively participate in its activities (Mohrman and Mohrman, 2011). Their contributions aim to not only economically sustain the research, but also push for a timely response on the part of the strategic board of the sample. The brevity of the survey given to CEOs, CFOs and CMOs allows a greater number of organizations to be used as a basis for conducting longitudinal research.

Starting from the annual research of 2012, the IHO has developed a partnership with Doxa-pharma, the branch focused on the healthcare sector of Doxa, the leading Italian institution in opinion pools, market research and statistical analysis. This partnership allows the IHO to run two yearly surveys on statistically-significant samples of general physicians (637 respondents in 2012) and citizens (1,001 respondents in 2012). The idea is that of progressively considering a comprehensive perspective on the topics tackled by the IHO.

2.2.2 Case Studies

The IHO performs a comparative analysis of more than 40 case studies every year (e.g. 66 in 2012). The selection of the healthcare organizations to be studied is based on: (i) the size of their ICT department (measured through the surveys, using the rate of Full Time Equiva-

lents (FTEs) in the ICT direction over the total number of organization employees), (ii) ICT strategic importance (measured through the surveys in budget terms), (iii) ICT projects—both those developed and those in progress—, (iv) advisory board suggestions.

Data is gathered through a series of semi-structured interviews given to the CIO of healthcare organizations of particular interest. A team of an experienced and a junior researcher of the IHO leads every interview, which is based on a consistent protocol, constructed according to survey responses, as well as an a priori analysis of the healthcare organization. All the interviews are digitally recorded, transcribed verbatim, summarized and interpreted through periodic meetings of the IHO in order to test concept reliability, share visions, as well as to formally group and compare key issues. If any information remains unclear and/or more data is needed, interviewees are re-contacted for additional clarifications. Finally, all interviewees are involved in reviewing the summarized interpretation.

A second panel of interviews is delivered to the strategic board—CEO, CFO and CMO—of the same healthcare organizations of responding CIOs, in order to cross-validate the given responses and achieve construct validity (Yin, 2003). Moreover, the IHO analyses multiple sources of evidence: healthcare organizations' internal documents, ICT schemes, websites, white papers, etc. Due to the specific nature of the Italian healthcare industry—in which many decisions are taken at a supra-organizational level (Scalzo et al., 2009)—the IHO performs case studies on the directorate of important and representative regional healthcare systems (6 cases in 2012) and on the Italian Ministry of Health (see Figure 2). When the combination of these sources does not add particular insights to data interpretation, the IHO stops their collection. The huge amount of available data allows better data triangulation (Jick, 1979), which further increases construct validity and enhances the confirmability as well as the credibility of the achieved results (Yin, 2003).

2.2.3 Advisory Board and Online Community

Coghlan and Brannick (2005) note that there are three distinct activities that merit special attention by the parties involved in a longitudinal and collaborative research like that of the IHO: defining the task, defining the process, and attending to the relationship. According to their vision, the IHO benefits from an advisory Board: a multidisciplinary focus group that advises and helps in directing the focus of SQR, in interpreting data, in anticipating future research issues and confirming results via social feedback (Mirvis, 2008). The group counts more than 50 representatives including: (i) C-levels of the main Italian

healthcare organizations, (ii) national and international healthcare technology suppliers, (iii) professionals from national and international healthcare associations, and (iv) healthcare experts. The advantages of working with this heterogeneous group are not only the ability to gain a clear perspective of real sector problems, but also the creation of a community of interest formed around the study—with unique opportunities to bring together the industry supply and demand, and stimulate innovation initiatives.

From a research viewpoint, the advisory board helps in improving both construct validity and dependability of the findings (Yin, 2003). The annual contribution brought to the research by the advisory board is organized around three face-to-face meetings (Figure 2). The first one deals with informal discussion about annual research objectives and priorities in the data gathering process. In the second meeting, initial results are discussed, and the advisory board suggests potential best practices on which to perform the annual case studies. In the last meeting, overall results and explanations are discussed to test, review and confirm them. In all meetings a couple of cases of effective ICT management are presented to share best practices and discuss how to concretize the potential of specific ICT-based solutions.

With the aim of offering further opportunities to discuss ICT's role in the Italian healthcare industry, the IHO has started an online community, which is used not only to discuss preliminary research findings, but also to share experiences, links and news on the topics of ICT and innovation in healthcare. The community helps the IHO in exploring new languages and new channels to be used in order to connect it to practitioners.

3 Academics as Orchestrators of Innovation Ecosystems

The experience of the IHO emphasizes that innovation is no longer solitary exercise, but a collective achievement involving permanent negotiations and new forms of collaboration/com-petition among different stakeholders (Afuah, 2009). The IHO recognizes that the interorganizational initiatives of innovation entail complex phenomena, which exceed the capacity of individuals and organizations to accomplish them (Porter and Powell, 2006). Only through a continuous interaction among many diverse actors—over long periods of time and with a considerable amount of uncertainty—is it possible to benefit from the use of ecosystems as a means to foster innovation (Dhanaraj and Parkhe, 2006; Dougherty and Dunne, 2011).

In this scenario, the IHO shows that academics can play an important role as 'orchestrators of innovation ecosystems', where—paraphrasing Dhanaraj and Parkhe (2006)—

orchestration is defined as the set of deliberate actions to create and extract value from an innovation ecosystem. There are two rationales supporting this consideration:

- The independence of academics within the innovation ecosystem;
- The compliance and complementarity that academics have with the main purposes for which knowledge within an innovation ecosystem is created and leveraged.

3.1 First Rationale: Independent Position

The first rationale explaining why academics hold a valuable position to orchestrate innovation ecosystems is associated with the fact that academics are in an independent position, which is neutral and represents a middle ground between the different organizations that have to cooperate in order to ignite and sustain interorganizational efforts of innovation. In fact, the IHO is composed of academics, and—as opposed to the other stakeholders present in the healthcare industry—academics tend not only to have no hidden agendas related to the promotion of a specific ecosystem configuration, but also to hold significant expertise in building trust and in serving as secure intermediaries between the different actors. Literature has repeatedly shown that, instead of writing lengthy contracts and exercising litigation options, it is better to rely on social interactions to coordinate the activities of an ecosystem and activate streams of joint problem solving within it (Dhanaraj and Parkhe, 2006).

Conscious of these peculiarities, the IHO has invested in being progressively perceived as an impartial and autonomous entity to be consulted in case of fact-checking and evidence-based decision-making. Almost all the interorganizational initiatives listed in Table A.1 have been activated and led by the IHO thanks to its reputation as an independent accumulator of data able to manage privacy issues and help practitioners in accomplishing their innovation decisions. For instance, a big region in Northern Italy asked the IHO for help in developing the guidelines with which to orient and govern the implementation of the electronic medical records of all the 33 public healthcare organizations operating within it (refer to CIR₅ in Table A.1), while the Italian Ministry of Health asked the IHO for data on the diffusion of electronic medical records within the Italian healthcare industry because—having strong relationships with all the providers of this ICT-based solution—as well as the majority of healthcare organizations utilizing it, the IHO ensured a detailed and unbiased picture of the real diffusion of electronic medical records that no other practitioner-oriented entity in the industry has been able to provide. This is coherent with the strategy that the IHO has historically pursued, which is based on two pillars:

- *Favouring interorganizational over organizational clinical inquiry research*: in this way the interest of a single actor does not achieve a predominant position within the ecosystem, biasing the perspective adopted by the IHO in supporting innovation;
- *Accepting only fixed, and small fees to sustain the accomplishment of semi-qualitative research*: in this way the dimension of an organization (and its financing capacity) does not influence the definition of the objectives of IHO research;

3.2 Second Rationale: Compliance to Innovation Ecosystems' Knowledge

The second rationale is associated with the levels of compliance and complementarity that academics have with the main purposes for which knowledge within an innovation ecosystem is created and leveraged. Leveraging on the works of Docherty et al. (2003) on interorganizational networks, it is possible to identify four types of innovation ecosystems to which academics can contribute as knowledge management experts: professional, learning, transformational and strategic. In the rest of the paragraph we describe these ecosystems, why the IHO's experience suggests that academics can be valuable orchestrators of interorganizational initiatives of innovation within them, and the key role of knowledge management.

3.2.1 Academic Compliance to Professional Innovation Ecosystems

Professional innovation ecosystems periodically bring together practitioners who gain some benefit from exchanging knowledge with like-minded peers in order to keep abreast of the latest developments in their fields (Docherty et al., 2003). Indirectly, these knowledge exchanges catalyse collective reflections on how accomplishing organisational and interorganizational initiatives of innovation, and provide opportunities to realise them. There are many professional innovation ecosystems in the Italian healthcare industry. Associations, consultants, and developers of ICT-based solutions organize several meetings to encourage debates among healthcare stakeholders around innovation. However, these meetings tend to be over-focused on specific topics, which are connected to the application domain of the meeting organizer. Moreover, the participants in these meetings tend to share the same beliefs, the same values, the same experiences and the same perspective of the future. Thus, it is often necessary to find incentives of thinking 'outside the box', in order to really keep up the pace with the multiple opportunities available to practitioners.

In this respect, the IHO shows that academics can be helpful in: (i) offering opportunities to share knowledge and expertise; (ii) initiating effective collaborative discussions about in-

dividual experiences; (iii) summarizing and formalizing the knowledge generated through peer interactions; (iv) guiding and bringing value to discussions; (v) helping to think outside the box; and (vi) maintaining the focus on mutual organizational interests. As an example of these capabilities consider the advisory boards periodically organized within the annual semi-qualitative research of the IHO (SQR₁–SQR₆ in Table A.1). These meetings are exploited not only to orient the research process of the IHO, but also to provide the Italian healthcare industry with unique opportunities to bring together its supply and demand side, and create moments to stimulate interorganizational initiatives of innovation. The online community has been created to offer further meeting occasions of this kind in a virtual environment, and to consolidate the relationships established face-to-face.

3.2.2 Academic Compliance to Professional Learning Ecosystems

The organizations in a learning innovation ecosystem aim to increase their knowledge by focusing on innovative sources of inspiration within the ecosystem to which they belong. Usually they interact through private/public meetings, purposefully reflecting on theirs and others' knowledge to identify learning opportunities related to organizational and interorganizational innovation issues. Progressively, formal and informal consortia emerge from this continuous reflection. These consortia influence existing knowledge management systems by creating a safe psychological climate that allows the learning anxiety behind the resistance to change to overcome (Schein, 2002). The Italian healthcare industry can be seen as a compound set of learning innovation ecosystems. It is sufficient thinking to the several work groups through which the Italian Ministry of Health coordinates the sharing of best practices among its regional healthcare systems.

The IHO suggests not only that academics are natural enablers of the learning processes underlying these groups, but also that the higher the moderation of academics, the more effective the activation of multiple streams of unbiased reflection around the practitioners' knowledge at both the organizational and the interorganizational level. With reference to the semi-qualitative research streams activated by the IHO, the number of participants in its workshops and public presentations (Table A.2) emphasizes IHO effectiveness in rendering as salient the learning potential related to the cases discussed within these events.

Practitioners can organize and lead learning innovation ecosystems as well—especially consultants and the supra-organizational entities like the Ministry of Health. However the learning atmosphere that they create is less of a safe psychological climate

than the one created by academics, who, in addition, are particularly effective in understanding the idiosyncrasies of the specific reality being addressed, in embracing a broad perspective, and producing more effective interorganizational knowledge. The advisory boards of the IHO are so effective in capitalizing on the past to better shape the orientation of IHO thanks to the safety perceived by the participants of these “closed events”, which are progressively exploited to present organizational and interorganizational cases of innovation in order to freely discuss them without the risk of public judgments

3.2.3 Academic Compliance to Professional Transformational Ecosystems

Transformational innovation ecosystems aim to transform their participants, whose development in terms of innovation is seen as integrally linked to the development of the ecosystems of which they are a part and/or with which they interact. Thus, the ecosystem acts as a tightly-coupled peer system, in which participants collaborate on directing, developing and deploying the knowledge that is necessary to enable the transformation processes. In Italy, all regional healthcare systems establish themselves as ecosystems of players focused on developing joint transformational processes within the innovation domain. These processes are of course oriented towards sharing professional knowledge (§3.2.1) and/or obtaining learning outcomes (§3.2.2), but their main emphasis is put on having the best conditions to ignite and sustain interorganizational initiatives of innovation.

The IHO shows that, in these cases, the healthcare stakeholders form transformational innovation ecosystems, and that academics can play key orchestrating roles within these ecosystems as knowledge management experts. For instance, the surveys that are delivered to all Italian healthcare C-levels each year provide the IHO with updated data regarding the overall priorities in ICT investments. During 2010, these priorities represented a common base for the development of an ICT-driven innovation plan for a regional healthcare system in Northern Italy (see CIR₆ in Table A.1). This plan has been developed with the healthcare directorate of the region, and the IHO provided this last one with critical inter-organizational knowledge regarding how to effectively enable and sustain the progressive digitalization of the whole regional healthcare system through: (i) the definition of the functional ICT areas and governance initiatives to be kept under control; (ii) a prioritization of the main interventions; and (iii) a set of indicators to monitor the impact of each intervention on the objectives of the regional healthcare system.

Academics are particularly effective in leading an interorganizational ecosystems transformation for two reasons. First, a transformation opportunity is seized and pursued if the relative ecosystem is able to maintain a delicate equilibrium among different interests, and a critical prerequisite to this equilibrium is the presence of a safe psychological climate avoiding any perceived risk of free riding during knowledge sharing. From this viewpoint, academics are the actors that have always manifested the highest level of independence. Second, academics have strong competences in systematically identifying potential directions along which to guide the joint transformational paths of the innovation ecosystem. These competences are the results of incessant literature analyses and of the exposure to the practices of other sectors.

3.2.4 Academic Compliance to Strategic Innovation Ecosystems

Strategic innovation ecosystems are formed to add value to business processes through mutual dependence on exchange relationships. As part of the strategic ecosystem, organizations engage in goal-oriented activities around shared problems, with the aim of dynamically achieving innovation objectives through the reduction of transactional problems. Starting from this viewpoint, it is possible thinking of Italian healthcare also in terms of as a set of inter-related strategic ecosystems aiming to find an overall configuration that allows the whole industry to disrupt their services without compromising the quality offered to patients. The complexity of the decisions taken within a strategic innovation ecosystem necessitates supporting the creation of ecosystem knowledge by: (i) decoding the choices made by each actor; (ii) assessing their efficiency and effectiveness; and (iii) integrating it to the interorganizational knowledge system of the ecosystem. The process is oriented to the production of explicit evidence, valuing mutual dependence during interorganisational relationships.

The experience of the IHO shows that academics can play key orchestrator roles within these settings. For instance, and with reference to CIR₁₉ in Table A.1, the IHO leveraged on its unique knowledge of all the 33 public healthcare organizations operating within a big region in the Northwestern Italy to assess the maturity of their information systems according to a model jointly developed with the healthcare directorate of the region (CIR₁₃), and based on a systematic literature review. The assessment has provided both the region and its public healthcare organizations not only with information regarding specific intra- and inter-organizational ICT-based functional areas requiring further development, but also with the joint objectives of: (i) progressively homogenizing the ICT-based solutions present in the healthcare system; (ii) reducing the costs of ICT management; and (iii) improving the quality

of the regional healthcare system through an ICT-based integration of its different care pathways. These ecosystem objectives are the result of a innovation process that academics easily activated and sustained thanks to their capabilities of realizing systematic literature review, maintaining a continuous relationship with different actors, and supporting the whole strategic innovation ecosystem in knowledge creation, extension, conversion and integration.

3.2.5 Potential Orchestrator Roles of Academics

The experience of the IHO demonstrates that academics can play several orchestrator roles in all innovation ecosystem types. More specifically, the main orchestration role of academics within an innovation ecosystem tends to change according to its nature:

- In professional innovation ecosystems academics provide meeting occasions for ecosystems actors, and help them in recognizing the innovation opportunities available within and to the ecosystem by enhancing the diffusion of ecosystem knowledge;
- In learning innovation ecosystems academics reduce the learning anxiety behind the resistance to change that each actor of the ecosystem tends to manifest, and help in arranging knowledge in order to better framing innovation opportunities at a ecosystem level;
- In transformational innovation ecosystems academics support the different innovation processes activated in the ecosystem through the constitution of the best conditions necessary to accomplish them and the systematization of interorganizational knowledge;
- In strategic innovation ecosystems academics orient each innovation process towards common valuable objectives, and contribute in actualizing each synergy present among all ecosystem actors by constituting an independent ‘knowledge hub’.

The IHO shows also an increasing interrelationship among the different types of innovation ecosystems. This interrelationship underscores how innovation arise from the combination of top-down and bottom-up forces, stemming from semi-autonomous entities that have to interact through complex and uncertain processes of collaboration-competition, and consistent with the main dynamic emphasis adopted by the innovation ecosystem to which they belong.

4 Two Prerequisites for an Effective Academics’ Orchestration

Even if academics have a tremendous potential to orchestrate innovation ecosystems, most of their initiatives are neither oriented toward achieving this goal (Knights et al., 2008), nor effective in attaining it (Bartunek and Schein, 2011). In fact, industries and universities

are governed by different belief systems, practices, and institutional logics, which comprehensively tend to ignite several tensions between academics and practitioners who try to jointly realise innovation. The basic step to manage these tensions is the nurturing of a continuous knowledge exchange between the two actors. However, this exchange is difficult to initiate and maintain due to the presence of diverse goals, motivations, and planning horizons.

Academics in the field of innovation management are aware of the necessity of bridging the gap between theory and practice, and understand the value of being part of (or leading) innovation ecosystems. However, their struggle caught in the middle of a conflict between career concerns and societal contribution, because most of the incentives within the academic domain are connected to peer citation pressures, and not in generating innovation. As a result, the attitudes and the interests of academics are progressively shaped, and their research endeavours are increasingly narrowed down to the point where they are no longer able neither to orchestrate complex phenomena nor to elucidate them. According to the experience of the IHO, two ‘design’ choices seem necessary to materialize the potential key orchestrator role of academics:

- The extensive use of multiple approaches of collaborative research, not only to increase the influence of academics in practice, but also (and especially) to support knowledge creation and exchange at both organizational and ecosystem levels;
- The creation and maintenance of a knowledge platform allowing academics to manage and to progressively diffuse and leverage the ecosystem-based learning mechanisms underlying each interorganizational effort of innovation.

The next two paragraphs deepen these choices, and start outlining a framework for clarifying the orchestrator role that academics can play within an innovations ecosystem.

4.1 Extensive Use of Multiple Collaborative Research Approaches

The IHO shows that the orchestration of innovation ecosystems requires academics a relentless exposure to large number of practitioners coming from different domains: the researchers of the IHO meet frequently with healthcare C-levels (CEOs, CFOs, CMOs, and CIOs), physicians, nurses, employees in the administrative offices of healthcare organizations, policy makers, providers of ICT-based solutions for healthcare, consultants, representatives of healthcare associations, delegates of regional healthcare directorates, deputies of the Italian Ministry of health, etc. In these complex, interrelated settings, the generation of knowledge no longer occurs—as historical happen (Christensen et al.,

2009)—only in the academic domain, but rather in a more distributed manner (Mohrman and Lawler, 2011). Thus, IHO researchers are increasingly becoming just one of the many players through which the actors in the Italian healthcare industry seek to find actionable knowledge to govern innovation initiatives at multiple levels of analysis.

In this increasingly competitive scenario, academics have to decide if they want to ‘stay in their ivory towers’, being increasingly marginalized as ineffective players, or seek out their orchestrator role, exploiting their strengths and establishing partnerships with other network players. The experience of the IHO suggests that an extensive use of multiple approaches of collaborative research allows the achievement and maintenance of a dynamic equilibrium providing academics with the capabilities to orchestrate innovation at an ecosystem level. In the next two sections we respectively explain why collaborative research seems necessary, and why multiple approaches of collaborative research are better than single approaches.

4.1.1 Why Collaborative Research?

Collaborative research implies research efforts that include an active involvement of practitioners in the following four phases (Van de Ven, 2007):

- *Problem formulation*: situating, grounding, diagnosing, and inferring the research by determining who, what, where, when, why, and how the problem exists. Answering these questions requires meeting with people familiar with the problem.
- *Theory building*: creating, elaborating, and justifying a theory. Developing this theory—as well as its plausible alternatives—requires conversations with knowledge experts from the relevant disciplines and functions that have addressed the problem.
- *Research design*: developing a model for empirically examining the alternative theories. Doing this well typically requires advice from technical experts in research methodology and from the people with access to data.
- *Problem solving*: communicating, interpreting, and applying the empirical findings regarding which alternative models better answer the research questions.

The engagement of practitioners in all these phases forces academics to extensively deal with them throughout the research process, not only providing opportunities to legitimize academics’ orchestrator role, but also allowing academics to aspire of having an impact on reality. For instance, the IHO started its online community to increase its dialogue with practitioners, gather research interests from a broad group of stakeholders, periodically stress the importance of following the suggestions derived from its findings, and provide tailored an-

swers to the practitioners willing to adopt the models jointly developed in its research processes.

Moreover, pushing academics outside themselves—to obtain and be informed by the perspective of practitioners—collaborative research fosters the generation and the validation of actionable knowledge, which not only provides a solid theoretical background through which supporting the development of a innovation ecosystem, but also simplifies the alignment with practitioners that is necessary to influence their actions towards common goals.

Finally, collaborative research is based on the value that “knowledge production” and “action” are not set apart as two separate processes, but synergistically support each other. In fact, collaborative research aims to understand the influence in complex systems of behaviours, actions, and purposeful design choices that are intended to manage the systems toward intended outcomes (Pasmore et al., 2008). Thus, academics can use collaborative research in multi-stakeholder settings to orchestrate innovation ecosystems—as clearly exemplified by the interorganizational initiatives led by the IHO (see Table A.1).

Collaborative research	Informed research	Insider/outside research*	Design/evaluation research	Action/intervention research
Description	Academics conduct and control research activities with advice of practitioners	Teams composed of insiders and outsiders co-produce knowledge	Academics develop and evaluate policies or programs for/with practitioners	Academics implement change to solve a practitioners’ problem
Purpose	Describing/ explaining	Describing/ explaining	Designing/ controlling	Designing/ controlling
Perspective	Dethatched outsider	Attached insider	Dethatched evaluator	Immersed change agent
IHO’s examples**	All surveys and case studies in SQR ₁ –SQR ₆	All advisory boards in SQR ₁ –SQR ₆	CIR ₅ , CIR ₆ , CIR ₈ , CIR ₁₃ , CIR ₂₁ , CIR ₂₂	CIR ₁₄ , CIR ₁₉

* Van de Ven called this typology of research “collaborative”; we have preferred the terms “Insider/outside research” not only to avoid a potential terminological confusion, but also because it captures the real aims of these research efforts: developing joint teams, in which one or more members are relative insiders to a setting and one or more members are relative outsiders, to conduct a collaborative study (Bartunek, 2008)

** Refer to §2 for a description of the specific Semi-Qualitative Research (SQR) and Clinical Inquiry Research (CRI) streams

Table 1 – Typologies of collaborative research’s approaches utilised by the IHO

4.1.2 Why Multiple Approaches of Collaborative Research?

Collaborative research contemplates a wide variety of approaches characterized by different degrees of collaboration. At one extreme, collaboration may be limited to access to an organization for data collection. At the other extreme is research that seeks not only to produce

knowledge but also to transform a system. In between these extremes there are several forms of collaboration that can be exploited by academics to orchestrate innovation ecosystems.

From this viewpoint, the IHO shows that multiple levels of collaboration are necessary, and that the more these different approaches of collaborative research are combined and simultaneously pursued, the greater the orchestration of interorganizational efforts of innovation. In order to explain why, it is necessary to generalize Van de Ven (2007), and classify the collaborative research approaches depicted in Table A.1 according to their purposes and perspectives. Purposes focus on whether the collaborative research is being undertaken to describe/explain or design/control the innovation ecosystem. Perspective refers to the degree to which academics relate to the research domain as external observers or internal participants. The intersection of these two dimensions generates four different macro-approaches of collaborative research, which the IHO concurrently uses to orchestrate innovation ecosystems. These macro-approaches are depicted in Table 1.

According to the experience of the IHO, the greater the concurrent presence and the balance among these collaborative research approaches, the greater the possibilities of exploiting the synergies among the relative orchestration modes. In fact, the interplay among the different collaborative research approaches provides multiple ways and levels to engage with practitioners in a comprehensive manner, which triangulates the relative knowledge according to the specific emphasis of the innovation ecosystem. For instance, most of the orchestration efforts of the IHO are placed not in enabling but rather in supporting interorganizational initiatives of innovation. To successfully support these initiatives, each year the IHO weaves semi-qualitative and clinical inquiry research streams. The combination of these different forms of collaborative research allows the progressive assembling of a transformational innovation ecosystem of practitioners and academics able to jointly assess, investigate and realize the strategic role of ICT within healthcare. More specifically:

- *Quantitative-oriented research activities*, like the surveys, provide the IHO with the detachment that is necessary to both deal with different healthcare stakeholders and objectively seize the innovation opportunities within and among them;
- *Qualitative-oriented research activities*, like the case studies, call for first hand involvement of IHO's academics, which however maintain the neutrality allowing them to construct meaningful perspectives for the innovation ecosystem to orchestrate;

- *Action-oriented research activities*, like the CIR or the advisory board, exploit the emergence of insights from the interaction with the social system to sustain the progressive transformation of the innovation ecosystem over time.

Adopting multiple collaborative research approaches, the IHO gradually understands the right emphasis to place on these different research activities, in order to combine their strengths and avoid their weaknesses based on the specific domain under consideration. The end result is a combination of real-time observations and retrospective analysis, which not only maximizes the probabilities of discovering short-lived factors that have a significant influence on the orchestration performance, but also provides the advantages of: (i) getting the “big picture” of the innovation ecosystem, and (ii) avoiding overcomplication and oversimplification during knowledge orchestration (Van de Ven, 2007).

4.2 A Platform to Manage the Network-based Learning Mechanisms

The experience of the IHO shows that to develop an innovation ecosystem it is necessary to change: (i) the viewpoint from which academics look at practice; (ii) the way through which the collaborations between academics and practitioners are established and maintained. Regarding the former, instead of simply viewing organizations as data collection sites and/or funding sources, academics have to view them as a learning workplace (idea factory)—where practitioners and scholars co-produce knowledge on important questions and issues by testing alternative ideas and different views of a common problem. Regarding the latter, Bartunek et al. (2011) suggest that for a successful collaboration among academics and practitioners it is necessary to: (i) widen the circle of involvement, so that everyone’s voice counts, creativity is easily sparked, and accountability is distributed across the whole network; (ii) develop and exploit joint academic-practitioner forums; (iii) connect individual practitioners and academics with each other; (iv) create academic–practitioner communities for action; (v) make sure that academic–practitioner interactions are fair.

While the experience of the IHO indicates that these actions produce dynamics of real engagement between scholars and practitioners, taken alone they are insufficient to maintain the intimacy with practice that academics need for an effective orchestration of an innovation ecosystem. In order to achieve this goal, the relationship between academics and practitioners has to be developed and nurtured over time. The IHO suggests that the configuration of a knowledge platform allowing academics to manage and progressively diffuse the ecosystem-based learning mechanisms underlying each interorganizational innovation increases the ef-

fectiveness of academics in orchestrating an innovation ecosystem. In the next two sections we explain why a knowledge platform seems necessary, and why the diffusion of a tapestry of ecosystem-based learning mechanisms increases the effectiveness of orchestration.

4.2.1 Why a Platform?

The IHO proves that academics can orchestrate innovation ecosystems by engaging themselves to multiple actors through collaborative research approaches. On the one hand these approaches hold tremendous potential for the advancement and application of knowledge as well as ecosystem alignment, on the other hand they are highly difficult to control in an experimental sense (Bartunek et al., 2011). In fact, the collaborative research accomplished in multi-stakeholder settings tends to exceed individual research capabilities, and asks for multiple research perspectives, researchers, methods and resources (Mohrman et al., 2008).

From this viewpoint, a promising avenue that the IHO is exploring is the constitution of a knowledge platform—a socially-engineered knowledge framework (Stebbins and Valenzuela, 2004) able to: (i) constitute a critical mass of researchers to convey several perspectives on the same innovation stimuli; (ii) jointly overlap different theoretical and empirical frameworks to successfully tackle these stimuli; (iii) manifest a unique identity during the interaction with practitioners; (iv) push academics out of their comfort zone, which tends to be over-focused on peer citation logics; (v) engage academics with practitioners in each phase of the collaborative research processes underlying an orchestration effort; and (vi) convey the innovation initiatives present within an ecosystem at a systemic level.

The IHO suggests three motivations to establish a knowledge platform in the context of multi-stakeholder research that is oriented towards the orchestration of innovation ecosystems. The first motivation is related to the fact that a knowledge platform strengthens the effectiveness of collaborative research in supporting any academic orchestration. In fact, a knowledge platform allows to easily work on the six motors proposed by Tenkasi and Hay (2008) to foster academic-practitioner collaboration (Table 2). These motors are enabled and improved by the presence of a knowledge platform, which not only collects in a meaningful, circumscribed niche of inquiry the efforts of the nine applied researchers working in the IHO, but also allows to efficiently allocate their resources, prioritize the different interventions, seize all exploitable synergies, effectively share best practices, and easily convey the different innovation efforts at a systemic level.

Table 2 – Motors used by the IHO to engage practitioners and orchestrate CI ecosystems

Motor	Definition	Relating theory to practice	Relating practice to theory
Scaffolding	Identifying problems of double relevance by including a platform that, while leading practical actions, ensures theoretical outcomes	Development of an annual research agenda derived from a detailed literature analysis	Adding practical elements exceeding the needs of the stakeholders helped through each CIR project to increase theoretical outcomes
Framing	Using theory to give direction to a broadly expressed innovation mandate, and practice to frame a niche in which to test/develop a theoretical model	Considering ICT as a lever that a healthcare system can use to overcome the conflict between quality improvement and cost rationalization	Slight adaptation of the research agenda according to practitioner needs (mostly in terms of focusing on specific ICT-based solutions)
Influencing and legitimizing	Using theory to influence and legitimise the need for certain kinds of actions, and using practice to legitimise a certain kind of theoretical model	Fostering the usage of ICT as a lever to dynamically balance exploration and exploitation within healthcare	Leveraging the idiosyncrasies of the different regional healthcare systems in Italy to study the variables moderating the significance of ICT
Sense making	Using theory to make sense of practice, and practice to re-inform theory	Paradoxical thinking to explore the necessity of balancing exploration and exploitation in healthcare	Necessity to switch from an organizational to a network-based unit of analysis to not conduct an abstract research
Demonstrating	Using theoretical rigor to demonstrate that a solution is empirical successful, and practical impacts to provide evidence supporting the veracity of a theoretical model	Quantification of the benefits (in terms of quality and cost) associated with the investments in ICT in healthcare	Application of an ICT adoption model developed through a group of cases on another group of healthcare organizations in order to refine the model and test its veracity
Turns	Reframing a theoretical element to make it more palatable to a practitioner audience; and reframing an empirical element with similar aims for an academic audience	Graphical and interactive presentation allowing healthcare practitioners to understand the frameworks of paradoxical thinking	Legitimizing the methods used by IHO – with a specific emphasis on the collaborative and qualitative ones (e.g., definition of the strategies to reduce informant bias)

A second motivation for exploiting a knowledge platform concerns the possibility to increase the dialogue between academics and practitioners. Periodically, the IHO brings the two together to discuss research findings and their practical implications, to identify key emergent problems, and to facilitate networking, so that healthcare stakeholders can share their experiences and learn from one another. Being a research centre emphasizing the importance of its domain, the IHO serves as a hub, providing a structure and a process by which practitioners and academics can continuously co-interpret interorganizational issues. As exemplified by IHO’s advisory boards, the knowledge platform serves as a “safe” container for what may become difficult conversations, and from which an orchestration process can be set up and sustained. By adhering to the IHO, practitioners and academics agree on committing to attending regular meetings, confronting on a periodical basis, and cyclically reflecting on interorganizational innovation issues. Literature (Van de Ven, 2007) suggests that this form of collaboration is especially effective: (i) in learning from

past experiences, (ii) in adopting a shared vocabulary for capturing multiple dimensions of a phenomena, and thus, (iii) in orchestrating interorganizational innovation ecosystems.

A final motivation for establishing a platform to orchestrate innovation ecosystems is related to the creation of an adequate research rhythm. The IHO shows that if academics aim to play a substantive role as interorganizational orchestrators they have to undertake rapid research processes, which balance rigorousness and timeliness. The former is oriented toward providing enough sophistication to ensure that the evidence on which practitioners will base their decision is soundly based (Hodgkinson et al., 2001), whereas the latter ensures that this evidence arrives in a timeframe compatible with the decision-making. A platform like the one established by each IHO substantially helps in truly excelling at both these competing demands. In fact, on the one hand, a platform provides academics with resources and time to collectively reflect on interorganizational issues, compare alternative network solutions, and explore different orchestration strategies. On the other hand, it forces academics to train their capabilities of conducting collaborative research more quickly, and in a way that addresses the changing realities faced by practitioners.

4.2.2 Why Ecosystem-based Learning Mechanisms?

Learning, in one or more variations, is an integral part of any innovation initiative. Starting from this consideration, each innovation ecosystems underline the comprehensive character of the learning endeavours, which academics can foster and use. More precisely, it is possible to distinguish between learning 'in' and 'from' an innovation ecosystem (Huzzard and Gregory, 2008). In fact, this last one can acquire not just the declarative knowledge of its specified learning target, but also procedural knowledge about the management of the ecosystem itself: its setup, maintenance and survival. For instance, the IHO generates insights of interest for the entire Italian healthcare industry both through the data collected by its surveys/cases as well as thanks to its events, which provide opportunities to jointly reflect on the best way to collaborate on shared innovation issues.

The IHO suggests that the effectiveness of a knowledge platform in orchestrating innovation ecosystems is connected to its capability to design, implement, spread, and leverage mechanisms through which to learn 'in' and 'from' the ecosystems themselves. In fact, the learning issues are often not formally given a clear priority on the management agenda in most organizations, and—since interorganizational learning is effective if its conditions

and process are systematically designed and implemented (Shani and Docherty, 2003)—academics are among the best designers and developers of ‘learning mechanisms’.

At the most basic level, learning mechanisms are formalized strategies, policies, guidelines, methods, tools, routines, and any other arrangement that is designed to promote and facilitate learning (Lipshitz et al., 2007). Although learning mechanisms can apply at individual, group, organizational and ecosystem levels, most of the literature on the topic assumes an organizational perspective, and identifies three main learning mechanisms: cognitive, structural, and procedural (Fredberg et al., 2011). Starting from this viewpoint, it is possible to talk about three Ecosystem-based Learning Mechanisms (ELMs), which the IHO concurrently uses in orchestrating innovation ecosystems (see Table 3 for some examples).

- *Cognitive ELMs*: language, symbols, theories, values and concepts for creating an understanding among all innovation ecosystem on the character, need, and priority of a new ecosystem status as well as the changes required to realize it (Docherty and Shani, 2008).
- *Structural ELMs*: interorganizational infrastructures that encourage practice-based learning within an innovation ecosystem—housing and enabling the knowledge exchange required for interorganizational innovation (Shani and Docherty, 2006).
- *Procedural ELMs*: institutionalized procedures, routines, and methods that facilitate ecosystem knowledge exchange, and establish the core routines to effect innovation.

The experience of the IHO emphasizes that a knowledge platform that focuses on nurturing a tapestry of different types of ELMs has greater possibilities to ignite and sustain ecosystem innovation. The higher the interrelatedness of the ELMs, and their coherence to the specific purpose of the innovation ecosystem, the more effective the orchestration by the academics. The IHO represents an effective knowledge platform to keep practitioners abreast of the latest developments in their fields because it provides them with: (i) network data on which to reflect (e.g. on ICT budgets); (ii) opportunities to house these reflections (e.g. the online community), and (iii) processes through which to facilitate them (e.g. the benchmarking among different hospitals).

5 Conclusions

Organizations are increasingly shifting from innovation initiatives centred on internal resources to those that are centred on sharing resources, knowledge and expertise in ecosystems (Adner, 2011). In these settings, most innovation efforts have to be designed and accom-

plished at an interorganizational level to produce outcomes. The experience of the IHO suggests that academics can effectively orchestrate these initiatives. In order to concretize their orchestration role, academics have to extensively engage with practitioners, and leverage on their independence/compliance to the different types of innovation ecosystems.

The best way to accomplish this task in an innovation ecosystem seems to be the organization of a knowledge platform combining multiple approaches of collaborative research. The balance of multiple approaches of collaborative research tends to increase academic possibilities of activating virtuous cycles between research, communication and community management, which allow academics to effectively serve as knowledge management experts, and conveys the different innovation efforts at a systemic level.

Table 3 – Examples of Ecosystem-based Learning Mechanisms (ELMs) enabled and led by the IHO

Ecosystem type*	Cognitive ELMs	Structural ELMs	Procedural ELM
Professional	Report with quantification of healthcare ICT budgets (derived from surveys) ^[FROM]	Online community and public presentations ^[IN]	Benchmarking among hospitals and among regional healthcare systems ^[FROM]
Learning	Report with investment priorities of healthcare CIOs (derived from surveys) ^[FROM]	Advisory boards and annual public presentations ^[IN]	Regional guidelines for EMR implementation ^[IN]
Transformational	ICT-driven innovation plan for a regional healthcare system ^[IN]	Public presentations and online community ^[IN]	Regional guidelines for healthcare information system homogenization ^[IN]
Strategic	Regional governance model of the shared health-care services ^[IN]	Advisory boards (and their safety climate) ^[IN]	Maturity model of healthcare information systems ^[IN]

* For each ELM we have emphasised if it has realised its potential through an analysis of the actors/dynamics characterising the innovation ecosystem (learning FROM the ecosystem) or through an interaction with it (learning IN the ecosystem)

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Appendix

Table A.1 contains the main innovation initiatives instituted and led by the IHO. Table A.2 outlines the main deliverables that the IHO produced as a result of its orchestrator initiatives since its inception.

Table A.1 – *Overview of the innovation initiatives initiated and led by the IHO*

Year	Id*	Innovation Initiative
2008	CIR ₁	Development of the strategic specifications of an electronic medical record system in a small (200 employees; 80 beds) private hospital
	CIR ₂	Strategic assessment and re-organization of the ICT insourcer of a big (10 million citizens) region (emphasis on the healthcare practice)
	SQR ₁	Nation-wide collaborative reflection of the results of IHP surveys and the case studies
2009	CIR ₃	Assessment and strategic reconfiguration of the ICT department of a large-sized (3,450 employees, 1,200 beds) general hospital
	CIR ₄	Strategic reconfiguration of the ICT department of a medium-sized (170,000 citizens) local authority
	CIR ₅	Development of the guidelines that a big (10 M citizens) region uses to orient and govern the implementation of the EMRs of all the 33 public healthcare organization operating within it

2010	<u>SQR₂</u>	Nation-wide collaborative reflection of the results of IHP surveys and the case studies
	<u>CIR₆</u>	Development of the ICT-driven innovation plan for a big (4.5 M citizens) regional healthcare system
	<u>CIR₇</u>	Strategic reconfiguration of the ICT department of a large-sized (1,100 beds) general hospital
2011	<u>CIR₈</u>	Development of the guidelines that a big (10 M citizens) region uses to homogenize the information systems of all the 33 public healthcare organizations operating within it
	<u>SQR₃</u>	Nation-wide collaborative reflection of the results of IHP surveys and the case studies
	<u>CIR₉</u>	Design of the ICT-based system used by a large-sized (1,000 beds) hospital to interact with patients
2012	<u>CIR₁₀</u>	Strategic analysis of the benefits associated with the development of a computerized drug management system in a large-sized (3,450 employees, 1,200 beds) general hospital
	<u>CIR₁₁</u>	EU project to implement and scale up 7 pilots based on the concept of secure and user-friendly online access by citizens to their health data
	<u>CIR₁₂</u>	Comparison of 3 EE regional healthcare systems to improve the treatments delivered in rural areas
2013	<u>CIR₁₃</u>	Development (and pilot test) of a model that a big (10 million citizens) region uses to assess the maturity of the information systems of all the 33 public healthcare organizations operating within it
	<u>SQR₄</u>	Nation-wide collaborative reflection of the results of IHP surveys and the case studies
	<u>CIR₁₄</u>	Strategic design of an inter-organizational community connecting administrations of 5 hospitals
2014	<u>CIR₁₅</u>	Joint reflections on the role of ICT in the support of fragile/elderly patients, and strategic analysis of the business models of a telemedicine service with a medium-sized (700 employees) ICT provider
	<u>CIR₁₆</u>	Strategic reconfiguration of the ICT department of a large-sized (3,800 employees) general hospital
	<u>CIR₁₇</u>	Preparation of the technical specifications of a tender through which developing the new information system of a medium-sized (1,800 employees; 600 beds) general hospital
2015	<u>CIR₁₈</u>	Pilot (in Italy) of a benchmarking survey that will be run by the JRC of the European Commission to analyse the eHealth deployment of all the EU countries and identify good practices to be shared
	<u>CIR₁₉</u>	Assessment and benchmarking of the maturity of the information systems of all the 33 public healthcare organizations operating within a big (10 millions of citizens) region
	<u>SQR₅</u>	Nation-wide collaborative reflection of the results of IHP surveys and the case studies
2016	<u>CIR₂₀</u>	Development of a model to assess the maturity of healthcare business intelligence systems and tracking of the progress of 5 Italian public hospitals over this model
	<u>CIR₂₁</u>	Development of a plan that a big (10 million citizens) region uses to centralize and govern the ICT-based services that can be shared among the 33 public healthcare organizations operating within it ^{***}
	<u>CIR₂₂</u>	Strategic analysis of the benefits associated with the development of a electronic medical report in a large-sized (3,900 employees, 1,100 beds) general hospital
2017	<u>CIR₂₃</u>	Strategic analysis of the benefits associated with the development of a computerized drug management system in a large-sized (3,500 employees, 1,700 beds) private hospital
	<u>CIR₂₄</u>	Development of a plan that a big (5 million citizens) region in South Italy uses to centralize and govern the ICT-based services that can be shared among its public healthcare organizations
	<u>CIR₂₅</u>	Strategic analysis and improvement plan of the organizational models and the ICT-based solutions characterising the socio-care services delivered by a local health authority to 340,000 citizens
2018	<u>CIR₂₆</u>	Development of an evolutionary plan of the organizational models and the ICT-based solutions characterising the socio-care services delivered by a local health authority to 1,000,000 citizens
	<u>SQR₆</u>	Nation-wide collaborative reflection of the results of IHP surveys and the case studies

^{***} We have underlined the CIR or SQR that have an interorganizational nature

Table A.2 – Deliverables and findings dissemination of the IHO

Deliverable	2008	2009	2010	2011	2012	2013
Practitioner-oriented events	1 main conference (326 participants)	1 main conference (705 participants)	1 main conference (352 participants)	1 main conference (522 participants)	1 main conference (550 participants)	1 main conference (450 participants)
	7 workshops (60+ participants each)	4 workshops (100+ participants each)	9 workshops (50+ participants each)	4 workshops (100+ participants each)	4 workshops (80+ participants each)	4 workshops (100+ participants each)

Practitioner-oriented reports	1 free paper-based report distributed to all conference participants	1 free paper-based general report 4 electronic reports on vertical topics	1 free paper-based general report 1 electronic reports with detailed results	1 free paper-based general report 1 electronic reports with detailed results	1 free paper-based general report 1 electronic reports with detailed results	1 free paper-based general report 1 electronic reports with detailed results
General press articles	6 articles (4 in significant newspapers*)	12 articles (5 in significant newspapers*)	78 articles (12 in significant newspapers*)	86 articles (13 in significant newspapers*)	82 articles (25 in significant newspapers*)	136 articles (50+ in significant newspapers*)
CIR projects	2 organisational	2 organisational interorganisational 1	1 organisational interorganisational 2	2 organisational interorganisational 1 European 2	3 organisational interorganisational 1 European 2	2 organisational interorganisational 5
Academic-oriented publications	—	1 conference paper	5 conference papers 1 chapter in an international book	2 conference papers 1 paper in a peer reviewed journal	6 conference papers 2 chapters in international books 4 papers in peer reviewed journals	6 conference papers 1 chapters in international books 3 papers in peer reviewed journals

* A newspaper is considered significant if it has more than 400,000 copies/day

Practice-based learning approach in innovation ecosystem

Tiziana Russo Spena*, Marco Tregua,
Francesco Bifulco

Department of Economics, Management, Institutions
University of Naples "Federico II"
Complesso Universitario Monte Sant'Angelo - Via Cintia, 26 - 80126
Napoli

* *Corresponding author*

Structured Abstract

Purpose - We aim at investigating knowledge and learning mechanisms in innovation ecosystems as organizations and the surrounding firms' context – including businesses and institutional actors – takes an active role in innovation success. Several studies focus on knowledge as firms' asset and investigate on how knowledge could be transferred, integrated and managed (Blomqvist and Levy, 2006). The practice-based approach gained attention within organizational learning literature (Brown and Duguid 1991, 1999; Gherardi, 2000) to counteract the cognitive-based view of knowledge. We examine how learning perspectives enable collaborative innovation in a multiple context.

Methodology - Action research gave us the opportunity to focus on mechanisms at the base of knowledge and learning processes in an emerging innovation ecosystem (Ramos, 2002). This method is suitable when changes are ongoing. The ecosystem we investigated is linked to a project supported by the Italian Ministry of Research, set up as a mix of different actors to support the management of a smart city. We identified the "generating action" approach (Tacchi et al., 2003) as it fits with both new initiatives and relevant topics of our research, namely resources, knowledge and partners to be managed as a whole.

Originality - The paper contributes to knowledge and learning literature in innovation ecosystem. It identifies ecosystem as an innovation community of practitioners emerging as a form of integrating and organising activities, competences resources and tools lead by (and towards) common and negotiated goals, supporting one another. Collecting, integrating, and generating knowledge are pivotal practices for innovation dynamics and they allow ecosystem to be established. In contexts related to innovations such an approach is necessary to describe how different sources are combined to support projects and how knowledge can be generated, acting as a mean and as an outcome in innovation ecosystems.

Practical implications - The analysis led us to the rise of three different knowledge practices - collecting, integrating, generating - useful to describe the way in which

learning takes place in a networking innovation context, shaped by actors with different backgrounds, like universities, organizations, and government. More into detail collection, integration and generation emerged as the ways in which knowledge shapes the collaboration in ecosystems, before being upgraded, shared, and integrated in order to generate new knowledge to reach the fixed aims.

Keywords –innovation ecosystem, practices, knowledge, learning, collaboration.

Paper type – Academic Research Paper

1 Introduction

This article aims at investigating the mechanisms at the basis of knowledge and learning processes in innovation ecosystem. Ecosystem is emerging as a hot topic in innovation literature (Moore, 1996). It captures the increasing complexity of innovation in a multiple and interrelated context. The idea is that not only organizations but also the surrounding organisations' context, including business, users and institutional actors, take an active role in innovation success (Russells et al., 2011). The ecosystem innovation view implies to consider the different roles played by the wide range of actors moving around the innovation and the way in which entangled systems of subjects, interests and activities are composed. A loosely interconnected network of actors is seen to emerge through interactions. In the ecosystem, the actors simultaneously co-evolve their capabilities and roles, and tend to align themselves with the directions set by one or more central companies in order to better address innovation (Adner, 2006, Carayannis et al 2012).

Similarly others researches focus on the advantage of networking innovation and empirically investigate the mechanisms enabling or constraining collaboration and innovation in network (Nambisan & Sawhney, 2007). Much of these studies focus on knowledge seen as firms' asset and they investigate how knowledge can be transferred, integrated and managed (Ritter and Gemünden, 2003; Blomqvist and Levy 2006). More in to detail the dynamic at the basis of the emerging relationships in innovation network is assumed to be placed on the conscious and explicit creation of new knowledge and activity (Möller and Rajala, 2007) with all different forms of resources, competences and activities flowing through the threads and nodes of the network itself.

The dynamic aspect emerges as a specific feature of both ecosystem (Moore, 1996) and network innovation studies (Ritter et al., 2004; Möller, 2010) and different collaborative mechanisms are seen to be strictly linked to management of knowledge and innovation performance in a networking contexts (Adner and Kapoor 2010). These mechanisms

include the activation of relevant capabilities to manage and coordinate network (Dhanaraj and Parkhe, 2006; Hallikas et al., 2009) as well as the ability of effectively capturing and transforming available knowledge in a more properly form to be transferred and leveraged within and throughout the network. What is stressed is the manageable nature of knowledge and the need for processes, technologies, tools and other resources supporting the organisations in a network to acquire, gather, share and distribute knowledge (Dhanaraj and Parkhe, 2006).

Under different epistemology tradition, the practice-based approach has affirmed in the beginning of this century within organizational learning literature (Gherardi, 2000) to counteract the cognitivist view of knowledge seen as a commodity produced in individual mind and managed by organization. The common idea of practice scholars (Brown and Duguid, 1991, 1999; Nicolini et al., 2003; Gherardi 2000, 2001) is to view knowledge as an activity - that is knowing - situated in the system of ongoing practices the organisational members perform.

The discourse on practice has mainly affirmed as a critic to knowledge management and its managerial ideology (Gherardi, 2009), but it lacks in purposefully supporting the understanding of mechanisms at the basis of knowledge processes in a networking context.

Following this suggestion, in this article we examine how practice- based learning perspective enables to approach collaborative innovation in a multiple and differentiated context. More specifically we are interested in better understanding the mechanisms of knowledge and learning processes in an innovation ecosystem context. Our research aim unfolds under two main question: 1) we want to analyse how actors practices knowledge and learning in innovation ecosystem and 2) contextually by describing both the process and challenges actors are facing when developing knowledge practices to deepen how these practices support the establishment of the innovation ecosystem.

The practice approach contemplates that to understand knowledge and learning processes we need to analyse them in relation to the context in which they are generated. The social interaction and collective learning contribute to create structures designed to manage or influence innovation ecosystem and increase its goal-oriented and strategic activities. In our view the argument of both practical and manageable component of knowledge should be taken into account in the understanding knowledge and learning processes in an innovation ecosystem.

The article progresses as follows. After addressing the learning in multiple context from business and network literature perspective the paper opens up at the contribution of practice based theory on learning. The methodology section introduces our empirical setting and method. By bringing the concepts and ideas from theory and practice we contribute to identify a set of three knowledge practices. Finally we articulate the main conclusion on how knowledge and learning processes take place in an innovation ecosystem and provide some first implications.

2 Theoretical Background

2.1 Network learning perspective

In the recent years, knowledge and learning processes have become one of the hot topics in the agenda of many scholars studying innovation in the networks (Håkansson et al., 1999; Knight, 2002, Möller and Rajala, 2007). Based on the foundation of organisational learning studies, the network learning perspective represents a novelty in learning literature as its focus is on learning by a group of organizations as a group (Hallikas et al., 2009). The emphasis is on the aspect of multiple, emergent and interconnected business and institutional relations that combine knowledge, expertise and technology in the novel ways. The exploration of knowledge through weak connections has been discussed, as well as the essential flexibility of networks (Håkansson et al., 1999; Möller and Svan, 2003; Ford and Håkansson, 2006). Thus in many cases the knowledge and learning processes have been debated in relation to the nodal position held by an actor in the network *because an actor's task in network is to connect multiple actors in the net*"(Möller and Rajala, 2007: p 899). The leading actor is stated has the opportunity to learn new knowledge thanks to the different ties of the network enabling the access to several skills and competencies (Beckman and Haunschild, 2002).

The problem related to relational distance has also been discussed based on cognitive perspective (Argyris and Schon, 1978). The lack of feedback for effective learning processes is seen as very likely when a relatively large number of agents interact with each other in various process steps. So it has been concluded that striving to learn more effectively in network means to enable trust-based mutual communication and continuous feedback as well as that the coordination and co-operation links between the organizations must be strong and kept active (Blomqvist, 2004).

Miles et al. (2000, 2005) have pointed out that the ability to collaborate in the network is a meta-capability for innovation. Similarly, Sivadas and Dwyer (2000) have discussed cooperative competency as “*the ability of the partners to trust, communicate, and coordinate*” (*ibid*, p 40). Moller and Svan (2003) and Ritter et al. (2002) have developed a concept of network competence to understand the capacity of firm to drive innovation success through the effectively management of actors in the network. Many others authors furthered the role of coordination or orchestrator capability (Dhanaraj and Parkhe, 2006; Heikkinen and Tähtinen, 2006, Hallikas et al., 2009) and discussed them in term of: capacity to 1) support absorptive competences among the network actors, 2) foster articulation and codification of tacit knowledge when it is reasonable and possible, 3) develop long-term inter-firm relationships and 4) create a common network vision and identities for members (Hurmelinna-Laukkanen and Natti, 2008).

From different perspective other authors (Peters and Pressey, 2010) have stressed more the collective dimension of collaborative innovation and have discussed how the nature and purpose of the interactions between partners facilitate key learning capabilities, as well as influence what learning is shared and how such learning is utilized by partners.

Despite the fact that collaboration is considered an important source of knowledge and learning for innovation, studies about network learning perspective show some limitations. It is apparent that the social and contextual nature of learning in a network context has received less attention and that innovation emerges by a simply process of translating relationship and knowledge into tangible outcome. Often the focus has been placed mainly on the nature and structure of relationships; similarly the conditions for the effective sharing of knowledge and aims among participants have been reduced to a more general discussion of opportunities and threats instead of considering how interaction and knowledge really occur.

2.2 Practice-based learning perspective

In the last decade, the practice based learning approach has become influential among researchers studying organisation and organizational learning (Gherardi, 2000). Characteristic to practice-based learning studies is that they are multidisciplinary in their search for non-rational-cognitive view of knowledge.

Founding their roots in the long tradition of philosophy and sociology scholars (Bourdieu, 1990) the practice-based learning perspective has start to affirm in contrast

with the knowledge management trend that was in the interest of many of organisational learning scholars in the 1990's. Particularly, the practice-based learning studies deny the mechanistically and instrumentally approach of knowledge management scholars, where knowledge has been seen as something to be possessed. As Gherardi (2000, 2001, 2009) has showed in the practice turn the meaning of knowledge is challenged by the shift from *knowledge*, viewed as an object and a commodity, to *knowing*, which is the activity that people conduct together, collectively and socially (Cook and Brown, 1999).

The social learning perspective of Lave and Wenger (1991) has inspired a large influx on the first studies from practice-based learning authors. These authors have supported a view of learning as situated in communities of practice (Wenger, 2000), something that is located within the social- and material gatherings and that is not separated from doing (Cook and Brown, 1999, Brown and Duguid, 1991). Knowledge is integrated and distributed in the life of the community, and learning is seen as an act of belonging that requires active participation and involvement in a practice (Lave and Wenger, 1991). Within communities of practice, learning is not adequately understood as the transmission/acquisition of information or skill; indeed learning involves the construction of identities' (Lave and Wenger, 1991: 53). Knowledge and learning are about activity and relationship; they are mediated by common artefacts (tools, meanings, etc) and always rooted in interactions within a situated social-cultural context (Brown and Duguid, 2001).

Orlikowski's (2002) perspective of knowing-in-practice has provided an important contribution to the tradition of practice-based studies in organisational knowledge. She has argued that practice is a system of activities in which knowing is not separated from doing that overcomes the traditional distinctions between knowledge that exists "out there" and is encoded in external objects, routines, or systems and knowledge that exists "in here" that is embedded in human brains, bodies, or communities (Orlikowski, 2006). As a consequence, learning is an activity that is situated in social working and organisational practices. This collective knowledgeable doing supports the idea of situated activities and learning within a community that socially sustains it.

Other scholars have advanced the role of knowing in practice by looking at the range of mechanisms through which local practices are constituted and connected within and across organizations (Gherardi and Nicolini 2002, Nicolini et al 2003). In statements of these authors, practices are not simply viewed as routine actions of established group,

community or organization; rather they consist of a collective accomplishment, which depends on a range of spatially and distributed knowledge within a network of relationships (Sole and Edmondson, 2002; Amin and Roberts, 2008) knowledge communities (Lindkvist, 2005), communities of practices (Gherardi, 2009), or nexus of practices (Nicolini et al., 2003).

What becomes apparent is that knowledge and learning processes are not only situated in enclosed groups that pre-exist to activities of practitioners in the group; they are distributed in and between groups as well as involve interaction among human and non-human actors (technologies, objects, discourse carrying knowledge) (Gherardi and Nicolini, 2002, Nicolini et al., 2003). In this sense knowledge and learning involve a complex range of activities also including those of resolving and bridging differences that depend on a range of spatially and distributed knowledge. Carlile (2002, 2004) has referred to the boundary objects as mechanisms acting at the interface of different knowledge domains as an 'integrating device' through which knowledge is transformed and collective learning can be achieved. The bridging activity of boundaries objects provides the communities of practitioners with a venue to communicate coordinate and collaborate and they are both means and products of interaction and of learning in and between communities (Carlile, 2004).

Gherardi (2006, 2009) and Nicolini (2011), have contributed further to debate by emphasizing the dialectical and mediated processes of learning. They have diverted the attention from the practice itself to nexus of interconnected practices in which each practice is immersed and have stressed the idea of practices as socially recognized ways of ordering heterogeneous items into a coherent set (Gherardi, 2006, Nicolini, 2011, Nicolini et al., 2012) that remains attentive to the emerging events. Their understanding of practices underpins their interest in power relations and learning is also being understood as mediated by negotiation on established practices and knowledge, symbols and artifacts and objects.

Any form of learning is stated to be sustained and created in multiple interactions taking place in the nexus shaped context of practices and it is characterized by emergent, dynamic, provisional and unstable nature (Nicolini et al., 2003; Nicolini, 2011). The collective dimension of learning and practicing is emphasized, and it is conceived as the result of reflective activities emerging from a dialogue and questioning between and among practitioners (Gherardi 2006, 2009; Nicolini et al., 2012).

These discussions show that the debate on knowledge and learning in practice is still fervent. Recent view supports the idea of knowledge and learning that are developed from and manifested in activities, expertise and skills at work in interconnected nexus of practices. To investigate in-depth how practices are iteratively sustained by learning mechanisms within social and material interactions is marked as priority in the research agenda of many practice-based learning scholars (Gherardi 2009; Nicolini, 2011).

3 Method

Underpinning the findings presented in this paper is an action research study (Ramos, 2002) of an emerging innovation ecosystem.

We chose an emergent ecosystem as essential point of view in understanding the process by which a multiplicity of actors combine and integrated knowledge and practices and how the social process of learning take place to establish an ecosystem for innovation.

The innovation ecosystem we investigated is OR.C.HE.S.T.R.A. (Organization of Cultural Heritage for Smart Tourism and Real time Accessibility. The investigated ecosystem finds its roots on Italian project within National Operative Program supported by the Ministry of Research and Education started thanks to the contemporary presence of actors from different contexts. This project has been set up as a mix of different actors in order to support the management of cities with a smartization process. More into detail, we identified the “generating action” approach (Tacchi et al., 2003) as it fits with new initiatives, long terms plans and mainly with the focus of our research, namely resources, knowledge and partners to be combined and managed as a whole.

As it regards the research method, our choice to follow an action research study depends on the features of the topic, as this methodology is useful to depict contexts in which relationships among different actors, the system they compose and their perspectives have to be highlighted (Burns, 2006).

To follow action research method we have chosen to conduct a participatory action research study (Greenwood et al., 1993). This specific method has the predominant emphasis on genuinely involving and researching with the participants of a community and presented a number of advantages for investigating phenomena in this case study context (Greenwood et al., 1993).

The steps of our research are aligned with methodological suggestions (Burns, 2006) and they contain both “building and evaluation” in the same process (Jarvinen, 2007).

Empirical data was accumulated over 14 months (from January 2013 to April 2014) through undertaking multiple observations and through participation in plenary project meetings and brainstorming sessions related both to the whole set of partners and to teams resulting from the projects. We augmented data with information from serial semi-structured interviews and feedback sessions with the key actors; working sessions and workshop were organized in this sense too, with the researcher carrying on them; documentations reviews provided additional insights for our data analysis.

It is useful to underline how these steps shape methods linkable both to qualitative research in its classical meaning, like participant observation and interviews, and to other methods more fitting with action research like inquiry groups (Burns, 2006).

The themes of the interview and discussion as well as documented material covered the following issue: how actors experienced collaboration; which relationships of each partners impact on the ecosystem; in which way aims are negotiated and how they change time by time; what actors known and what were learned in terms of knowledge, social structures, and practices; how learning took place collectively and how influenced ecosystem for innovation. Moreover, we analyzed what seemed to be the main contributions of the learning process in social innovation context.

The transcripts of the interviews, working reports and all qualitative data collected were scrutinized for identifying patterns and recurring themes by all researchers involved in this paper.

Then, the approach of Jarvensivu and Tornroos (2010) served to code data. The researchers went through the insights from data by defying three knowledge practices at the basis of collective learning mechanism in an innovation ecosystem. We labelled these practices according to the common language emerging during the cooperative sourcing and analyzing of data research (Jarvensivu and Tornroos, 2010). The authors reviewed categories and discussed them in working session with participants to determine what further data collection was useful to provide a full description of the practices. The iterative process continued until the description of the practices, as well as all the elements related to the practices themselves, were accurate.

4 Context of Investigation

OR.C.HE.S.T.R.A. arises from a nationally funded project aiming to perform some smart interventions in the city of Naples. The project is built around the recent and arising concept of smart city. Nowadays this topic is up to date in public management literature as a lot of cities are carrying on – or still planning – projects to achieve smart improvements. These interventions are conveying a new idea of services to be provided in a different way, namely by taking into account the following features: efficiency, necessity to integrate several services to better provide them, sustainability – both from a socio-economical perspective and with reference to the environment –, and citizens' participation. The set of improved services and features are part of a hi-tech mosaic, known as platform. The platform is usually set up by one of the big corporations acting in this business context and it is useful to provide services, collect data emerging from them and elaborate them in order to improve the services themselves (Anttiroiko et al., 2013). More than 20 firms are acting in the business of smart platforms and this number has grown up recently (Lesgards, 2011), as ICT corporations, mobile operators and hi-tech companies are partnering Local Agencies in favouring this kind of interventions.

The need of a project based on the above cited aims led to some choices, performed by the University of Naples, as the founder actor of the ecosystem under investigation in this research. In detail suitable partners have to be chosen before starting the project, in order to set up an ecosystem aiming to the above cited goals. Thus the University has to be seen as a collector of actors, a resource integrator, and a project leader; first of all it has involved an Institution, due to the necessity of performing an activity on the urban context, related to the provision of services to the local community and to all the actors connected to this context. The choice led to a partnership with the Municipality of Naples, and this was a necessary step due to its unique role in providing services to the wide range of stakeholders of the city more than other local institutions.

5 Findings

5.1 Collecting knowledge

The first 'practice' we depict is the collecting knowledge, with the University as pivotal actor. This practice consists of the collection of knowledge through the involvement of different actors time by time, in order to achieve the designed aims. As it

will be described in the following lines it took place both when the project was firstly shaped and when the different actors involved actors belonging to their organizations.

The role of University had just started with the involvement of Municipality; when defining this relationship this practice went on when planning together the potential configuration of the actors to involve in the project, based on the aims to be achieved. The engagement with the Municipality – or of a similar institutional actor – was unavoidable in all smart city projects, due to the connection to city services and to the role as provider of these services. The ‘collecting’ kept going on to extend the research competences shaping the system of actors, and the need for a different and complementary set of knowledge acting on the same area has led to the involvement of the ‘National Centre for Research’, a public organization engaged in scientific investigation in different domains and transferring the knowledge to private businesses to support scientific, technological, social and economical development of the country. Then the businesses had to be pinpointed in order to complete the set of resources to be integrated to deploy the planned activities; thanks to this choice, two kinds of organizations have been involved: firstly a corporation related to platform has been invited to join the ecosystem in progress; secondly some corporations acting in business areas related to the goals of the projects – mostly tourism and mobility – have been involved. Thus some organizations were involved in order to allow the achievement of two aims: a path towards the platform and the provision of services through it. As it regards the first aim, ‘IBM’ was chosen to drive the path leading to the creation of the hi-tech platform useful to offer services to city stakeholders due to its wide experience in this business. As it concerns the provision of services and even when planning the activities, two relevant organizations were called to join the rising set of actors, namely ‘Lauro SpA’ and ‘Autostrade per l’Italia Spa’. The former is a firm acting in transports over the sea and in services in the harbour area, while the latter is the organization ensuring the building – in the past – and both maintenance and workability of the highways network all over the country, together with the definition of the fares system to be applied.

The set of actors shaping the rising ecosystem we are about to investigate has been created to submit a research proposal to the Ministry of Research and Education within the National Operative Program. The purpose is to receive both an institutional and a financial support to deploy the planned activities among the partners.

Moreover, after the positive evaluation by the above cited Ministry, the partners

started activities to be performed together and they arranged periodically round table and meetings to obtain updates about the results achieved by each partner and to carry on shared activities to deploy the project.

The ‘interacting’ can be seen in a different moment too, since the person-in-charge of each partner set up internal round tables to compose teams to be shaped inside the network of actors. In this way the interactions already existing inside the network was enlarged and enriched thanks to the involvement of new actors from each partner. More in detail the University had chosen a representative from different research areas and each of them brought other researchers in the team. A similar approach was adopted by National Research Centre and its different institutes. The approach was slightly different for firms as internal teams were already built in relation to different domains. The result of interacting can be achieved by sharing the ideas embedded in knowledge and experiences of different partners as already described and towards the aims to be reached, in line with the planned pattern. The participation of a wider number of actors from the same organizations shape the emerging of established ecosystem. It can be considered as an internal widening of the ecosystem itself and it represents a necessity due to the large amount of activities to be performed and of resources to lever on. With particular reference to collecting knowledge practice it is interesting to underline its role in shaping and re-shaping the ecosystem as time goes by and in order to be aligned with the expected aims.

The overall goal of the project can be described as a research activity aiming to both use and develop knowledge and a set of hi-tech solutions addressed to smartly improve value-in-use of cultural heritage in Campania – a region in Southern Italy – for different stakeholders. As the stakeholders are mainly linked to immaterial and material cultural heritage the stakeholders are several and among them it is possible to find Local Agencies, tourists, businesses linked to culture and tourism, citizens and so on. Moreover all the stakeholders are considered both from the city and outside it, and a wider perspective has to be adopted since the above described aims have to be reached in a sustainable and eco-friendly perspective. Tourism and cultural heritage have to be considered as starting points of smart interventions in Naples, due to the vocation of the city, but the way they can be improved is directly linked to other services, like mobility and environment. In a similar and large-scale effort the agenda of the project is composed by a lot of other middle term aims, like the improvement of security, health services,

services to businesses, facilities, and so on.

5.2 Integrating knowledge

The integrating knowledge is a practice describing the way the knowledge held by different actors are put together in order to create a unique set of complementary features to reach the planned aims. First of all this practice acted as a support to propose the project, then it is the way the activities are performed towards the aims defined when the idea had been conceived.

The role of University is crucial in this practice has the engagement in involving partners has to be carried on even to enable the integration of resources. Due to the relevance of this task a specific team was set up. The team consists of a person-in-charge chosen by each partner to act as a governing body for the whole ecosystem. This team has to plan the way in which partners have to cooperate to integrate their own resources in the ecosystem in order to favour the integration towards the creation of a unique set supporting the activities to be performed.

The ‘integrating knowledge ’ was carried on to depict a detailed report on the project to be submitted for evaluation to the Ministry; the partners shaping the upcoming ecosystem act together to compare their resources set and to create a shared set to be used in the project. More in detail the knowledge in service management was carried on by Municipality on a practical perspective and by University of Naples and National Centre of Research on a theoretical side. The three firms act as carriers of different kind of knowledge, linked to hi-tech and to the provision of specific services (especially for tourism and mobility). The experience held by some of the partners was crucial in this phase. More in detail this happen with IBM as this company has led lots of projects based on smartization, both in Italy and abroad. Some of the most important projects carried on around the world by IBM are represented by the smart services provided in Rio de Janeiro, Helsinki, Honolulu, Dubuque, Washington, and Singapore. Some of these cases, namely Helsinki, Singapore, and Dubuque, are considered as best practices in the smart project business. Helsinki is one of the best evidence due to the results achieved, Singapore had a pioneering role in the surrounding area, and Dubuque was one of the first city achieving results in all the smart domains. Among IBM experiences some of them were useful as they were directly brought into the ecosystem; one of them was particularly helpful to show to all participants in a meeting the way the platform can perform its activity in a city, with particular reference to the monitoring of public

transport network. The role of IBM was particularly depicted by this kind of contribution as it can favour the alignment of all partners towards the common aim to be reached.

The comparison among the different knowledge owned by different actors was necessary to describe the potentiality of the upcoming system in relation with the expected activities and aims. Moreover the private partners gave even a financial support to the ecosystem to be joined by the funds provided by the Ministry in case of positive evaluation of the proposal.

After the Ministry accepted the proposal the integration took place again and a focus on resources is a suitable way to describe the 'integrating knowledge' as the actors brought by each partner in the teams shaping the ecosystem are carriers of resources. The leverage on several skills, expertise, and knowledge together with the physical resources of each partner represented an integrated set of resources useful to deploy the project. In order to better contribute to the set of resources to be integrated, the partners defined the actors contributing to this process. More in detail University listed the researchers involved in this project through a selection performed by the actors taking part to the first practice, viz. the collecting knowledge . In order to have a deeper focus on this task and thanks to the financial support provided by the Ministry the University could hire young researchers to support the activities to be performed. The selection of these new contributors was based on the profiling of the knowledge to be integrated, so the issues used as criteria were the skills on service management, cultural heritage management, tourism activities, financial sustainability, and organizational activities.

The activities took place in two ways in the same time: each partner acts as a stand-alone for its research task through the researcher involved from the beginning and the ones hired in a selection. Then time by time meetings and round tables are arranged in order to share the achieved results, to exchange ideas and to define which activities have to be performed together, due to complementary resources brought by different actors. Moreover one important task to be achieved together during meetings was the alignment of different contributions to the common aims. The partners showed the necessity to be coordinated by the governing team, as there were some overlaps among the activities performed, leading to a partial unsatisfying efficiency. In order to solve this problem the governing team during the meetings proposed to create work groups shaped by actors belonging to different partners. The actors planned this new activity to be performed and they better negotiated the sub-aims to be attained, gaining a higher efficiency in the

research process, due to two features: the avoidance of overlapping when doing research and the detailed definition of the interconnections among the sub-aims to favour the internal exchange of knowledge.

5.3 Generating knowledge

The ‘generating knowledge’ took place through the development of the idea thanks to the contribution of all actors and as a consequence of the two previous practices, namely both collecting and integrating. This third practice consists of results held in the phase of definition of the project to be submitted to the Ministry and in the period when the activities were in progress towards the aims shaping the proposal approved and financially supported.

The depicted idea was carefully described to submit the proposal to the Ministry as it was described in the previous parts. The description of this practice was the outcome of the preceding practices, named as ‘collecting’ and ‘integrating’; this linkage takes place as partners planned the activities to be performed to attain the intended aims. Indeed the documents submitted to the Ministry contained the pointing of the resources carried on by different partners, the relationships among them and the way in which they can lever on the common set of resources to perform the activities planned together. Moreover each aim is structured in sub-aims in order to better describe the linkages inside the project and the way the periodic results are connected one another. In the above cited documents two more features emerged, namely the support of each partner in relation to each aim and the time in which each goal is expected due to their feature of being preparatory to favour the achievement of the overall result. As it regards the role, partners are classified on the basis of their participation to each aim and with regards to the location of each activity.

The ‘generating knowledge’ consists of the idea and is an activity in continuous progress as the previous practices described the interaction among partners leading to the definition of new details of the activities to be performed, both as a stand-alone and as a set of actors. The ‘generating knowledge’ kept going on after the approval of the project and it is still in progress as the activities will last until the end of the year. By the way it is already possible to depict which are some of the results generated through the support of different actors shaping the ecosystem. Some smart activities have been planned and some investigation on the territory has been carried on. The Municipality is evaluating together with the other partners which is the best way to provide the new services, especially taking into account the lack of public funding. During the meetings these issues

have been considered, leading to the proposal of some solutions. Meetings showed their usefulness to generate new knowledge and to set up researches to be performed by the partners together on the territory, both as investigation of the context and as testing of the new planned ways of services provision. As it regards financial sustainability the first results are linked to a series of options to be evaluated, even by considering the knowledge acquired through the investigation performed on a wide range of empirical evidences about smart services both in Italy and abroad. This kind of knowledge has been analysed with particular detail thanks to the support of University as the newly hired researchers took part to public meetings related to these issues to discuss about them with person-in-charge of similar projects. This research activity was carried on in some of the most important exhibition on smart projects, as ‘Smart City Exhibition’ the National Meeting carried on every year with the participation of project leader from all over Europe, or ‘Smart Med’, an exhibition consisting of experiences from Southern Italy. According to this kind of investigation, the knowledge acquired was shared inside the ecosystem during the periodical meetings and the partners discussed about the way in which the new information can be fruitful used in the project. The analysis of knowledge generated and of its spread in the ecosystem is particularly interesting as it takes place both during meetings and in an education activity, viz. to a class of about 25 students, selected on the basis of the relation between their background and the issues related to the project. These lectures took place parallel to the research performed by partners and they started with the results of the presentation of the project and the first results of the literature review from University; then they went on thanks to the experiences described by the other partners shaping the ecosystem. Moreover, the upcoming results and the knowledge already owned by different actors were transferred in general meetings to a group of actors interested to these issues. The members of this group were educated and their background was enriched with the knowledge generated through the project, leading to their direct involvement in the ecosystem to support the final part of the projects. The different backgrounds of each member of the group brought in the ecosystem were helpful to complement the existing resources and to favour the achievement of the aims. It is interesting to highlight the mix of knowledge these actors have acquired, due to their direct relation in front lesson with different partners; this can be explicated through the several research proposals presented by each of the member of the class. These contributions act as a support to be mixed with the already defined contributions by actors

shaping the ecosystem. This mix is a sort of bridge between the knowledge already owned by research organizations and firms and the knowledge generated thanks to their participation to the project and the set of knowledge is acting as the engine supporting the achievement of the overall aims.

6 Discussion

The paper aims at understanding the mechanisms of knowledge and learning processes in an innovation ecosystem context.

Drawing from recent practice-based studies we empirically investigated this topic under two interrelated questions: 1) how actors practices knowledge and learning in innovation ecosystem and 2) how these practices support the establishment of the ecosystem relationships for innovation.

Regarding to the first question our findings showed that the three practices of knowledge - we named collecting integrating and generating-are identified at the ground of collaborative working activities involving a multiplicities of actors to address innovation goals. These practices work together in enhancing the alignment among knowledge, aims and working activities in a high and heterogeneous networking context.

As our results show, even if under the process and knowledge leadership of main actor (University), the investigated project (Orchestra) emerges and act as an ecosystem made up and operating as interconnected communities of *knowledgers* (Lindkvist, 2005). In these communities actors interact and experiment new and apply their consolidated knowledge through collaborative working activities. The investigated ecosystem operates on distributed knowledge competences among an articulated set of internal and external partners and its way of enabling integrated collective actions relies on the well-connectedness of practices and knowledge in actions. The actors are held together, especially by knowledge and relations and collective aims. In these contexts what becomes evident is the complex and social activities involving all the actors in the ecosystem in combining, integrating and bridging the different perspectives across boundaries of knowledge domains and practices (Nicolini et al., 2013).

The collaborating, integrating and generating knowledge practices become crucial for innovation dynamics and they allow ecosystem to be established. Innovation dynamics are driven by the potential of collecting integrating and generating knowledge,

competences, tools, goals and all these practices together explain and steer the ecosystem. The learning is seen as emerging by a mixture of knowledge practices that work together and support one each other in the accomplishment of bridging and alignment actions. This view frames the ongoing dimension of learning process as an active and recursive state including multiple knowing process in action. These processes foster innovation and learning by bringing and aligning different knowledge domains and working context.

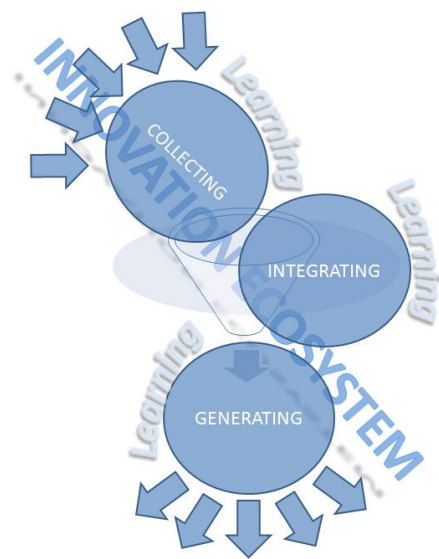


Fig. 1 Knowledge practices and learning in the innovation ecosystem

The practice based view contemplates that to understand knowledge and learning processes we need to analyse them in relation to the context in which it was generated. Innovation in an ecosystem context emerges in a non-linear pathway associated with the development of codified and practical knowledge (Melkas and Harmaakorpi, 2012) embedded and embodied in the ubiquity within and at the boundaries of a collaborative network.

The social interaction and collective learning also contribute to create structures designed to manage or influence the innovation ecosystem and increase its goal-oriented and strategic activities. The issue of establishing ecosystem innovation could be better understood as a question of boundary work (Carlile, 2002, 2004) involving the social dynamic aspect of bridging, translating and making use of the knowledge disseminated among different contexts and domains. This presumes that the focus is both on social

constitutive nature of innovation networking and on managerial decision-making process able to make knowledge and learning at work. In our view the argument of both practical and manageable component of knowledge should be taken into account in understanding knowledge and learning in an innovation ecosystem. The focus needs to be shifted from focal actor's skills to the process of organizing and ordering resources for action (Gherardi 2009) in a collective and reflexivity activity (Nicolini et al 2003; Nicolini 2011) including the idea of consciously and actively pursuing learning at whole..

This view allows to extend the debated question of knowledge transfer only as apparent front of the social driving force that leads and sustains innovations in the ecosystem. The need is to view learning in ecosystem innovation as an intermeshed and continuous ongoing application of collecting, integrating and generating exercise, useful to provide the exploitation that inspires exploration in an endless process as one moves from one context of application to another one.

7 Implications

The analysis leads us to the rise of three different practices useful to describe the way in which learning takes place in a networking innovation context.. More into detail collection, integration and generation emerged as the ways in which knowledge shapes the collaboration in an ecosystem, before being upgraded, shared, and integrated in order to generate new knowledge to reach the fixed aims.

The role of organising and ordering resources in such a complex ecosystem is pivotal in favouring the achievement of the expected goals (Nicolini et al 2013).

Each organization should be ready to think about a shared management of an ecosystem and to change their role when needed, in order to achieve common results. Some actors such as Universities or other research institutions can act as a support to this complex system through their experience in analyzing potential benefits from knowledge and in spreading the processes to fruitfully use it.

The approach to knowledge is a perspective performing positive results if complemented by organisations' experiences, as empirical contexts can be challenging and the definition of services to be provided with high standards is not an easy job. Thus, the integration of knowledge has to take in consideration even the experiences already owned by firms and the ones emerging from the ecosystem.

The results of this mix of knowledge and experiences, together with the resources brought by all different actors, is in the same time as the expression of a great potential to achieve innovation and as something hard to be managed. In order to get the most from the potential and to overtake the difficulties in managing such a complex set a focus on management in ecosystem is necessary, both from practitioners and from scholars.

The need to coordinate the collection of knowledge, the integration and the generation of knowledge towards common aims requires the settlement of a body composed by actors mirroring knowledge, experiences and resources of all partners. A deep focus on how to manage complex systems and on how different actors can do it together is necessary and the empirical context analysed in this research can represent a starting example to define linkages among partners and their activities.

The investigation on complex contexts can be performed through practices, as they are useful to represent actors, activities and results deriving from this mix and to create a model acting as a guideline both for managers and for management scholars (Nicolini et al 2003; Nicolini and Gherardi 2002, Nicolini 2011).

Moreover the knowledge showed a crucial role in activities in general and even more in complex systems as it is the starting point to collect contributions, the core of activities to be carried on, and even the result of the whole process, leading to the improvement of new activities to be performed in an ecosystem.

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Technology entrepreneurship eGosystem: a collective intelligence perspective to drive knowledge-based innovation

Gianluca Elia *, Alessandro Margherita,
Claudio Petti

Department of Engineering for Innovation
University of Salento
Campus Ecotekne, Via Monteroni s.n., 73100 Lecce, Italy

** Corresponding author*

Structured Abstract

Purpose – To be successful, the innovation and entrepreneurship processes require a systemic and dynamic search, evaluation and matching of purposeful knowledge, expertise and tangible assets. In this vein, the concept of ecosystem has been largely adopted at macro and organizational level to indicate the network of complementary actors needed by one company to succeed in this endeavor. This paper aims to define an individual perspective of innovation ecosystem and propose a model to drive the creation of entrepreneur-centric ecosystems aimed to support a more effective “idea-to-venture” process.

Design/methodology/approach – The review of relevant literature and the analysis of international initiatives has been used to identify the main theoretical constituents of the study. A design science approach has been thus adopted to conceptualize and define the components of the model through the phases of problem identification, objectives definition, artifact development, demonstration, evaluation and research communication. The model has been submitted to a preliminary face-validity test with experts in the areas of entrepreneurship and collective intelligence.

Originality/value – The paper presents an innovative application of the collective intelligence paradigm to design technology entrepreneurship ecosystems which are: a) context-independent, i.e. virtually global; b) specific, i.e. tailored to given technology domains and individual needs; and c) dynamic, i.e. able to gather relevant knowledge needed for the specific phase of the entrepreneurial process. The collective intelligence perspective allows to capitalize distributed ideas, knowledge, and competencies to take better decisions and actions respect to the case in which decisions and actions are taken by individuals alone.

Practical implications – The model can contribute to maximize the incubation, growth and sustainability of entrepreneurial initiatives thanks to a better gathering of critical resources and knowledge which is dispersed in a large network of actors. In particular, the model can support the design and implementation of technology entrepreneurship ecosystems tailored to the real needs of a specific entrepreneur as well as support more effective entrepreneurial processes within corporations and organizations in general.

Keywords – Collective Intelligence, Ecosystem, Knowledge Management, Innovation Ecosystem, Technology Entrepreneurship

Paper type – Academic Research Paper

1 Introduction

Entrepreneurship and innovation have long been recognized as engines of economic growth and societal progress (Wennekers and Thurik, 1999; OECD, 2009). In particular, technology-based entrepreneurship has gained relevance as a driver of economic development and renovation of regions and territories (Phan and Foo, 2004).

However, many good ideas based on technology and scientific research do not survive the “valley of death”, i.e. they are not able to generate successful products/services with appropriate levels of profitability (Auerswald and Branscomb, 2003). These failures have an impact at both individual level (for the entrepreneur, who wastes opportunities and money) and for the society (e.g. missed opportunities for new job creation and territorial development).

The main causes can be found in various areas of the entrepreneurial process, such as mistakes in market analysis, incorrect costs definition, or business models which are not consistent with the technology scenario. In general, the market success of innovation process is not only dependent on the quality of technology and the capability of addressing customer needs, but it also requires the innovator or entrepreneur to establish virtuous interdependencies with many stakeholders which build up a real ecosystem of innovation.

Indeed, to be effective, innovation needs a combination of systematic efforts which involve a much larger number of individuals and organizations that help build the framework conditions and contribute to the diffusion and adoption of innovation results within the market and the society at large.

Innovation ecosystems have been defined as collaborative arrangements through which firms combine their individual offerings into a coherent, customer facing solution, with a crucial role played by the explicit knowledge and formal relations (Adner, 2006). The concept has been largely analyzed at company level (Adner and Kapoor, 2010) whereas few attention has been addressed to examine the conditions to drive the development of entrepreneur ecosystems with a more individual-centric perspective.

Many projects and public initiatives are addressed to promote the creation of entrepreneurial ecosystems worldwide. Among the most successful ones there are those launched by the Babson College, the Kauffman Foundation, the MIT and Stanford University. However, such initiatives mostly attempt to create generically favorable contextual conditions fostering entrepreneurship, mostly geographically bounded and industry-specific. These are mostly static and based on a “pull” logic, where the entrepreneur is asked to identify, access and use available resources based on personal intuition and capabilities.

In this endeavor, this study aims to propose a new model that leverages collective intelligence and enhances networking to create entrepreneurship ecosystems which are *glocal and context-independent, industry-specific, and dynamic*. The model adopts a push logic to build proactively around the potential entrepreneur a system of actors, resources, knowledge assets, services, competencies and relationships needed to better support the idea-to-venture process. The key idea is to develop entrepreneurship ecosystems tailored to the real needs of the entrepreneur and which can be dynamically developed throughout the entire lifecycle of the entrepreneurial initiative.

The article is structured as follows: section 2 presents the literature background with a twofold focus on technology entrepreneurship ecosystems and collective intelligence; section 3 illustrates the model and its components; section 4 discusses the main findings achieved, whereas section 5 concludes the article and draws avenues for further research.

2. Literature Review

Technology is a crucial factor for stimulating and activating the innovation process (Schumpeter, 1934). Especially today, the impressive innovation trends and convergence of major technologies such as ICT, bio and nano-technologies are creating huge opportunities for creating new business ideas and companies, thus driving to a more entrepreneurial society and to a shift from a so-called “managed” economy to an “entrepreneurial” economy (Audretsch and Thurik, 2001).

Technology entrepreneurship enables the transformation of technology-enabled entrepreneurial opportunities into market valuable artifacts and technology applications (Kirzner, 1997; Venkataraman and Sarasvathy, 2001), thus venturing beyond the current state of the art to support new products, services or technological processes (Lumpkin and Dess, 1996).

The concept of technology entrepreneurship combines two main elements: 1) technology, i.e. the knowledge, skills and artifacts that can be used to design and realize new products, services and delivery systems (Burgelman et al., 2004); 2) entrepreneurship, i.e. the process of identifying potential business opportunities and exploiting them through the recombination of existing resources or the creation of new ones in order to develop and commercialize new products and services within existing or new markets (Hitt et al., 2001).

The technology entrepreneurship process includes identification, recognition, discovery, creation and exploitation of entrepreneurial opportunities arising from technology development (Petti, 2009). It can be considered as the bridge between technology development, business creation and market exploitation (Petti and Zhang, 2011), crossing the “*valley of death*” (Auerswald and Branscomb, 2003), that is the blur gap existing between a technological invention and a successful product launched on the market. In this perspective technology entrepreneurship can be conceived as the process by which, leveraging on the technology as enabling success factor, implements technology itself within the market (Byers et al., 2010), delivering new products, services or applications capable to satisfy existing or potential market needs.

Technology entrepreneurship can be characterized as an individual attribute (e.g. Byers et al., 2010), a strategy (e.g. Gans and Stern, 2003), a system (e.g. Abetti, 1992), or a process (e.g. Shane and Venkataraman, 2003; Antoncic and Prodan, 2008; Petti, 2009). At individual level (Byers et al., 2010; Dyer et al., 2008; Hayton, 2005; Suzuki et al., 2002), the behavioral aspects are considered, along with the competencies and the style of business leadership characterizing the profile of an innovative entrepreneur. The organizational level includes the matching of technology-based opportunities with market needs (Gans and Stern, 2003), as well as the organizational structure (Covin and Slevin, 1991), the internationalization attitude (Hitt et al., 1997), the phases to transform a technology development into a new business creation (Shane and Venkataraman, 2003; Antoncic and Prodan, 2008; Petti, 2009), and the components characterizing the entrepreneurial orientation of the firm (Lumpkin and Dess, 1996).

The logic of innovation ecosystem is more in line with the system (and network) level (Abetti, 1992; Kenney and Von Burgh, 1999). In this perspective, it is necessary to consider all the inter-dependent actors (individuals, companies, research centers, universities, financial operators and institutions), resources, relationships, policies,

standards, local conditions and environmental factors, operating as an entrepreneurial ecosystem within a geographic region and able to potentially influence the economy as a whole (Spilling, 1996; Iansiti and Levien, 2004; Cohen, 2006; Isenberg, 2010).

At policy and governmental level, the European Union RIS3 agenda (*Research and Innovation Strategies for Smart Specialization*) promotes the investment in research, innovation and entrepreneurship in every EU member state. In this perspective, the innovation and entrepreneurship process is strongly encouraged by the adoption of a triple-helix model (Etzkowitz, 2004; Etzkowitz, 2011; Etzkowitz and Leydesdorf, 2000), thus involving institutions, companies and research centers/universities working together to identify and develop promising ideas, concepts and proposals, and transform them into successful ventures. The approach is in line with an open approach to innovation (Chesbrough, 2006).

Many projects and initiatives have been launched worldwide to promote the creation of entrepreneurial ecosystems. By observing the different cases, four models can be empirically derived on the basis of the main force which has activated the entire ecosystem:

- *Industry-driven model*, characterized by a leading role played by the company which attracts international talents, protects and exploits the intellectual property (i.e. HP, Google or Apple in Silicon Valley, Infosys or Wipro in Bangalore);
- *University-driven model*, which puts in the center of the ecosystem the university which creates both physical and relational spaces to favor collaboration between students, researchers, companies and investors (i.e. the MIT in Boston, the Carnegie Mellon University in Pittsburgh, the Georgia Institute of Technology in Atlanta);
- *Entrepreneur-driven model*, initiated and activated by successful entrepreneurs who re-invest their incredible profits in new initiatives to promote innovation (i.e. Mike Lazaridis, founder of BlackBerry, who founded in Waterloo the quantum computing technopark, or Tony Hsieh, founder of Zappos, who created in Las Vegas the urban incubator to promote disruptive innovations);
- *Public-driven model*, in which governments invest public funds to create technology-intensive centers and incubators to promote innovation and

entrepreneurship (i.e. Tech City in London, Zhongguancun Science Park in Beijing, Paris-Saclay in France, Skolkovo technology park in Russia, or Israel technology security park).

To these, some projects have been launched to sustain and provide guidelines and support to create entrepreneurial ecosystem, such as the *Babson Entrepreneurship Ecosystem Project – BEEP* (<http://entrepreneurial-revolution.com>), the *Stanford Innovation Ecosystems Network (Stanford IEN)* (www.innovation-ecosystems.org), and the *Sustainable Valley Technology Group* (www.svtg.org).

At Italian level, some interesting cases refer to the *PoliHub* (www.polihub.it), *Area Science Park* (www.area.trieste.it), *H-Farm* (www.h-farmventures.com), *Kilometro Rosso* (www.kilometrorosso.com), and PNI Cube.

These cases are a good example of gathering experiences and resources into a unique ecosystem or complex network aimed to reinforce the potential of individual companies and start-ups, thus giving rise to possible applications of collective intelligence. The concept of collective intelligence emerged at the end of 70s, and it was formalized in the 90s (Lévy, 1994; Pór, 1995; Malone et al., 2008), with an increasing attention towards directing large groups of people towards the solution of relevant problems, such as global warming and earthquakes.

In the last two decades, the spectacular emergence of the ICT and Internet, has enabled unprecedented opportunities for a huge numbers of people dispersed all over the planet to work together and interact within collaborative scenarios. Principles of collective intelligence are today applied in sociology, business management, computer science, communication. The MIT has institutionalized the interest towards collective intelligence as a research field by creating the *Center for Collective Intelligence* - <http://cci.mit.edu>).

In its broad sense, collective intelligence is a shared or group intelligence that emerges from the collaboration and competition of many individuals. It signals groups of individuals doing things collectively that seem intelligent (Malone et al., 2010). It studies how people and computers can be connected each other so that, collectively, they act more intelligently than any individuals, groups, or computers have ever done before (Malone et al., 2010). It has also been defined as “the capacity of a human community to evolve toward higher order complexity thought, problem-solving and integration through collaboration and innovation” (Pór, 2008). In this view, the concept is applied as

approach to solve complex problems such as global warming, earthquakes, traffic management or garbage management. At this purpose, four basic elements have been identified (Boder, 2006) which are represented by the group of competent actors, a set of resources and interaction mechanisms, the results to reach and the evaluation criteria.

Collective intelligence describes a phenomenon where, under conditions of diversity (of the involved people), independence (contributions of one individual are not influenced by the ones of other individuals) and aggregation (mechanisms for pooling and processing individual estimations to a collective estimation), large groups can achieve better results than any single individual in the group since they form a so-called “wisdom of crowds (Surowiecki, 2004).

Generally, collective intelligence systems can be active (e.g. creation of pages in Wikipedia) or passive (e.g. search algorithm improvement in Google). Collective intelligence systems enable *cognition* (to make market judgments and predict the outcome of future events), *coordination* (to coordinate communities, collective actions and organizational processes, and *cooperation* (to enable people to collaborate in virtual and shared environments) (Malone and Crowston, 1994; Ellis et al., 1991; Engelbart and Ruilifson, 1999).

In the entrepreneurship development field, an example of collective intelligence stays in the use of crowdsourcing to support: a) the development of a start-up, with examples such as TopCoder, Innocentive, Elance, oDesk or BootB; b) idea screening and selection, with examples including Spigit, Imaginatik, and VenCorps; and c) crowd-funding, with examples such as Kiva, Kickstarter, GrowVC, Indiegogo, Springboard Ventures, Profounder and StartNext (Laubacher, 2012). Specifically to the crowd-funding, (independently on the type such as equity, donation, lending or reward), it strongly contributes to the diffusion of entrepreneurial culture world-wide, by sustaining innovative ideas and project mainly at the early-stage (Schwienbacher and Larralde, 2012; Lambert and Schwienbacher, 2010).

By considering the entrepreneurial process overall and not a specific phase (i.e. idea evaluation or funding), IStart and IBridgeNetwork powered by the Kauffman Foundation represent two interesting cases. IStart is a hosting competition platform to support networking among aspiring entrepreneurs, mentors and advisors, whereas IBridgeNetwork is an open web-based community for aggregating, searching, and communicating innovations from multiple research institutions. These examples try to

leverage on collaboration, cooperation and connection among all the community members to conceive, refine and develop innovative ideas and transform them into successful ventures.

3. The Entrepreneurship “eGosystem”

3.1 Method

The study was based on a preliminary review of relevant literature and the analysis of international initiatives which helped to identify the main theoretical constituents of the research. Besides, project documentation, technical reports and web portals of entrepreneurship-related initiatives have been analyzed. A design science approach has been adopted to conceptualize and define the components of the model through the phases of problem identification, objectives definition, artifact development, solution demonstration, evaluation and research communication. Design science supports a pragmatic research paradigm that calls for the creation of innovative artifacts to solve real-world problems (Simon, 1996; Hevner, March, Parl and Ram, 2004; Peffers et al., 2006). The model has been submitted to a preliminary face-validity test with experts in the areas of technology entrepreneurship and collective intelligence.

3.2 The Model and its Components

In order to build a new venture, an entrepreneur is required to access to and acquire a set of information, human skills, professional advices, and financial and technical resources which are present within a complex system of actors, institutions, markets, infrastructures, and technology tools. Such complex system represents an entrepreneurial “ecosystem”, a way of making interdependencies more explicit (Moore, 1996; Iansiti and Levien, 2004; Adner, 2006), leveraging on simultaneous cooperation and competition among partners (Brandenburger and Nalebuff, 1997; Afuah, 2000). What normally happens is that such ecosystem is well bounded, both by a territorial and industrial point of view. This has several limitations, but mainly: 1) different entrepreneurial initiatives have different characteristics and needs in terms of knowledge and resources and not all the required assets may be co-localized in one region; 2) entrepreneurial initiatives may be found to be at varying stages of the roadmap and each venture is thus actually involved in one specific activity or phase.

This article introduces a new conceptual approach to creating entrepreneurial ecosystems, i.e. the “eGosystem”, a word which synthesizes two complementary concepts: a) the “ego” of the potential entrepreneur who wants to succeed in his/her own venture; and b) the need to create a “system” of resources required to drive such success. An eGosystem has three distinctive features: a) global and context-independent, through the adoption of ICT and virtuality to expand the “reach” of the entrepreneurial process; b) specific, i.e. tailored to the specific technology domain to enhance the “richness” of available resources; and c) dynamic, it is phase and time-dependent.

In the eGosystem, the entrepreneurial actor does not have to search and put together all the “pieces” of the ecosystem, but it’s rather the system which proactively identifies potential entrepreneurs and put them in the right conditions to start a technology entrepreneurship project (“push” logic). Thus, the eGosystem builds proactively around the entrepreneur a system of information, resources assets, educational experiences, services, competencies and relations needed to successful go and stay on the market.

Five main components build up the model: 1) the Entrepreneurial Actor (EA); 2) the Entrepreneurial Stakeholders (ES); 3) the Innovative Entrepreneurial Project (IEP); 4) the Technology Entrepreneurship Roadmap (TER); and 5) the Technology Entrepreneurship Flows (TEF). The components are described in the following sections.

3.2.1 Entrepreneurial Actor (EA)

The Entrepreneurial Actor (EA) is at the core of the framework. The actor is a “meta-category” including all the different innovators, actual or to-be entrepreneurs who want to pursue the specific goal to bring innovation within their organizations, or in the society at large, through the launch of a new business, a new business unit, a new operating model, a new approach, and so forth. The actor is thus a person or team willing to create socio-economic value by capitalizing a good idea and valuable assets, including potential customers and partners, to accomplish a compelling entrepreneurial project. The distinguishing traits of the entrepreneurial actor which are common to all these categories of people are passion, resilience, self-confidence, flexibility and risk acceptance (Fisher, 2011).

3.2.2 Entrepreneurial Stakeholders (ES)

Around the core actor, several categories of entrepreneurial stakeholders (ES) can be identified which are involved in the definition and development of the entrepreneurial ecosystem. In general terms, a stakeholder is a party that has a peculiar interest in an enterprise or project. The primary stakeholders in a typical corporation are its owners and investors, employees, customers and suppliers. However, modern theory (Allee, 2000) goes beyond this conventional notion to embrace additional stakeholders such as the community, government and trade associations, to create jointly tangible and intangible value. For a generic entrepreneurial initiative, the following stakeholders can be identified (alphabetically):

- Banks and Other Funders (BF)
- Business and Management Consultants (BMC)
- Business Partners (BP)
- Existing Companies (EC)
- Generic Investors (GI)
- IP Offices (IPO)
- Labor Representatives and Trade Unions (LRU)
- Local, National and International Government Bodies (GB)
- Organizations and Associations (OA)
- Researchers and Professors (RP)
- Scientists and Technologists (ST)
- Social Leaders (SL)
- Standardization Entities (SE)
- Universities and Education/Training Institutions (UTI)
- Venture Capitalists and Business Angels (VCA)

Each stakeholder can play a different role, according to the relation that it establishes with the entrepreneur or with another actor. The 15 types of stakeholders can belong to one of different categories of roles involved in the definition and development of an entrepreneurial system, also by a (virtual) community based perspective (e.g. entrepreneurship portal).

In this sense, a relevant category would be that of service/content provider including all the companies, individual, agencies and other organizations which can provide

services (e.g. business, payment, educational, market analysis, knowledge provisioning, etc.) or content (e.g. videos, tutorials, other materials) available for the whole community or for a specific target actor. In the perspective of building community, another key role would be the champions and sponsors which includes testimonials, politicians, famous entrepreneurs, academicians or other public or private personalities able to support or enhance the growth and development of the entrepreneurial initiatives. By following with the possible roles, a project champion can support the community by providing moral, psychological and physical support as well as the needed resources. Besides, he/she advocates the benefits and advantages to all the stakeholders. However, the champion is not the community leader but only a person whose experience, resources, strength and reputation can guarantee the success of the project. Besides formal champions and sponsors, community animators would be crucial to enhance and stimulate the degree of participation and contribution of other actors in the life of an entrepreneurial community. Animators have specific skill in terms of getting people informed and excited about what happens within the community. In order to build an active community, the ecosystem must include also other members such as people which only have the curiosity to be in and participate without having or showing a specific interest towards the entrepreneurial dynamics.

3.2.3 Innovative Entrepreneurial Project (IEP)

The Innovative Entrepreneurial Project (IEP) is the challenging venture undertaken by the Entrepreneurial Actor and it can be of three basic types:

- creation of a new company (start-up or spin-off) which originates from a knowledge-intensive domain such as a university or research center; it valorizes on the market the results of a given research, capitalizes distinctive know-how and competencies, and realizes technology transfer and university-company matching activities (academic entrepreneurship);
- creation of a new company which industrializes/commercializes a new product, process or service (independent entrepreneurship), by starting from an entrepreneurial initiative conducted by an individual who has an idea to pursue deriving from an invention, a market gap or similar opportunity;
- development of a new product, service or process within an organized business context (corporate entrepreneurship) which promotes and supports the initiative

through different strategies and mechanisms (e.g. Google); in such a way, teams within an established company conceive, foster, launch and manage a new business that is distinct from the parent company, but leverages the parent's assets, market position, capabilities or other resources;

All the three types can also have a social impact, and be thus configured as social entrepreneurship initiative. The goal is to create a social venture aimed to achieve a desired social change, measuring performance not (only) in profit and return but also taking into account a positive return to society, furthering broad social, cultural, and environmental goals (commonly associated with the voluntary and not-for-profit sectors), and creating entrepreneurial ecosystems committed to sustainable development in terms of job growth, economic growth, improved environmental conditions, improved health and a reduction of poverty and homelessness. Besides, all of the initiatives can have a local impact or have an international/global scope and scale (international entrepreneurship).

3.2.4 Technology Entrepreneurship Roadmap (TER)

The Technology Entrepreneurship Roadmap (TER) is a complex multi-process roadmap including three main stages, i.e. "desk", "pre-market" and "market" stages, for a total of 12 different activities.

Desk Stage Activities are the preliminary explorative and design tasks which are aimed to prepare the venture creation steps. They include: 1) Scenario Scanning (SS); 2) Opportunity Recognition (OR); 3) Concept Definition and Value Proposition (CV); 4) Revenue Model & Value Capture Definition (RV); 5) Detailed Business Planning (BP).

Pre-Market Stage Activities are the real market preparation steps which precede the access to the market of the new venture. They include: 1) Funding and Capital Raising (FC); 2) Resources Acquisition and Team Organization (RT); 3) IP Analysis and Legal Formation (IL); 4) Product and Service Development (PS).

Market Stage Activities are realized when the venture is fully operating and active on the market. They include: 1) Operations Management (OM); 2) Profit and Harvesting (PH); 3) Venture Expansion & Development (ED).

3.2.5 *Technology Entrepreneurship Flows (TEF)*

The implementation of the eGosystem requires the definition of a shared “environment” where to create a community and cooperation context which can significantly increase the chances that the entrepreneurial venture is successful by avoiding the risk of solutions not adopted by the market (low acceptance), not innovative by socio-technical perspective (old-fashioned) or economically unproductive (un-economical). The environment is addressed to ensure a native and direct involvement of customers and end-users - as “co-designers”, “co-developers” and “co-validators” - of the same knowledge assets, products or services, thus contributing concretely to the creation, by defining specifications, evaluating prototypes and testing solutions gradually identified in the real life.

This purpose, collective intelligence can be assumed as an approach aimed to capitalize distributed ideas, competencies and experiences with the purpose to take decisions and actions which are more efficient and effective than they would be if realized by individuals alone. This is also allowed by the adoption of Future Internet which include innovative tools and technologies such as enterprise social software, augmented reality, semantic interactive research, immersive 3D environments, innovative intelligent agents, recommendation systems, automatic information extraction tools and social network analysis.

It is possible to envision the life of the community as built up from a system of workflows and information flows which are realized between two actors (“1 to 1” flow) ad between one actor and the community (“1 to N”). In this view, the main types of flows could be described in terms of following actions:

- *Conceive*, i.e. a flow involving the production of a primitive and original idea about a new product, service or solution;
- *Create*, i.e. a flow involving the production of an artifact or resource which has to be used or transformed;
- *Decide*, i.e. a flow involving the process of selecting one alternative among different possible solutions;
- *Inspire*, i.e. a flow involving one actor stimulating, also indirectly, another actor in the process of creation or conception;
- *Network*, i.e. a flow involving the enlargement of contacts possessed by an actor;

- *Recommend*, i.e. a flow involving one actor endorse one specific solution, alternative, resource or another actor;
- *Request*, i.e. a flow involving an actor addressing a demand to another actor or group;
- *Share*, i.e. a flow involving the collective availability of something created by a single or smaller group;
- *Suggest*, i.e. a flow involving an advise related;
- *Transfer*, i.e. a flow involving the movement of an informative or monetary resource.

Figure 1 shows the overall technology entrepreneurship model and its five components which are the Entrepreneurial Actor (EA), the Entrepreneurial Stakeholders (ES), the Innovative Entrepreneurial Project (IEP), the Technology Entrepreneurship Roadmap (TER), and the Technology Entrepreneurship Flows (TEF).

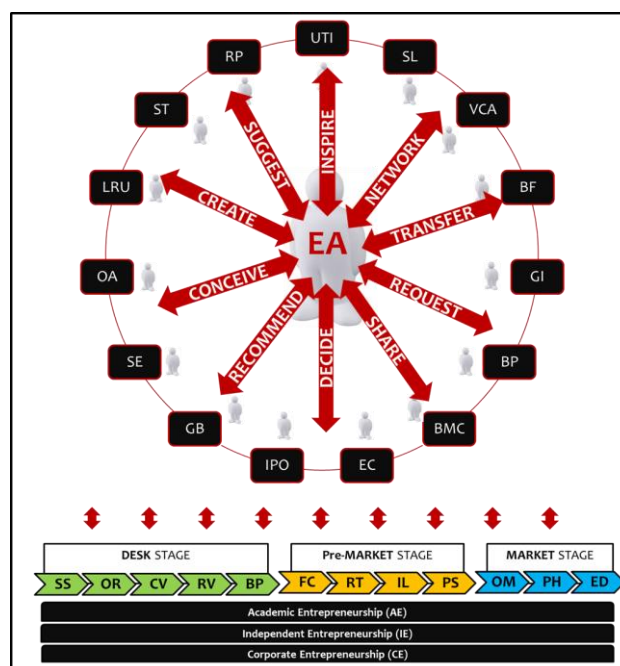


Fig. 1: The eGosystem model

Next section discusses the model and its applicative scenarios in the perspective to build high-performance entrepreneurial ecosystems.

4. Discussion

The eGosystem model can support the formation, incubation and expansion of new entrepreneurial ideas in academic, corporate and independent contexts, and build complementarities and network dynamics among university and industry stakeholders in order to generate a virtuous entrepreneurial context. The model can ensure market follow-up to entrepreneurial ideas, thus providing a relevant contributions to both individual entrepreneurs, companies and public managers. The eGosystem can contribute to the development of innovative entrepreneurial skills and entrepreneurial capital, as a combination of “entrepreneurial competence” and “entrepreneurial commitment” (Erikson, 2002; Elia et al., 2011).

The eGosystem approach combines individual goals with collective intelligence and resources, thus merging the static dimension of the ecosystem with the dynamic of the process and community, as well as with the work/information flows arising among actors and the system itself. In this way, the model transcends the geographical boundaries of where the entrepreneurial actor is physically operating.

Benefitting from a logic of virtual networks rather than agglomeration, the eGosystem may not only compensate for local disadvantages, but also leverages other territories “excess” entrepreneurial capacity or specific entrepreneurial resources, thereby facilitating the flows of entrepreneurial resources from where (and when) they are underutilized to where (and when) they are needed, thus moving from geographical proximity to organizational proximity enabled by the ramification of ICTs.

The model can support two main applicative scenarios: 1) design and implement ecosystems which are tailored to the real peculiarities of the entrepreneur and which can be dynamically integrated, developed and monitored throughout the whole lifecycle of the entrepreneurial initiative; 2) support more effective tech-entrepreneurship processes and innovation-oriented initiatives within corporations and organizations in general (micro or organizational level). The model can support the realization of some success factors which have also been defined as key principles or guidelines, such as (Isenberg, 2010): 1) leverage local conditions while thinking to global exploitation; 2) promote strong public-private collaboration and synergies; 3) focus on ambitious, growth-oriented entrepreneurs who address large potential markets through high-potential initiatives; 4) promote cultural change to support and sponsor entrepreneurial career; and 5) sensitize public decision

makers to renew legal, bureaucratic and regulatory frameworks supporting entrepreneurial activities.

The model can be the basis for supporting the creation of a virtual platform where to build a real entrepreneurial vision, by sharing and promoting the potential of entrepreneurship, and by identifying explicit and latent needs and requirements in terms of innovative products and services. Besides, the platform may support interconnections among actors, roles and mutual relations, and training of entrepreneurial individuals within the industrial world.

The model has also an impact on the entrepreneurship development roadmap. In the desk stage, the eGosystem can facilitate the scanning of scenario in search of opportunities since it involves from the beginning a variety of stakeholders able to extend the perspective, reach and likeliness of success of the entrepreneurial initiative. Besides, concept and value proposition may undergo a preliminary, community-based evaluation which contributes to make them stronger and business planning may become a distributed exercise, which may benefit of state-of-the-art expertise and coaching. In the pre-market stage, funding and capital raising are greatly reinforced by crowd-funding, resource acquisition (e.g. human capital) may benefit from a wide, global audience and product and service development may be done more rapidly and where it is more convenient through a broader network of partners. Finally, in the market stage, operations management and venture development find in the eGosystem a wide array of possibilities and opportunities for collaboration, innovation, efficiency and effectiveness-oriented actions.

The approach can streamline the entrepreneurial action, with the goal to create collaborative technology ecosystems which are *glocal and context-independent, industry-specific and dynamic*. A “push” logic is adopted to propose an eGosystem approach which proactively builds around the entrepreneur a system of information, resources assets, educational experiences, services, competencies and relations needed to successfully go and stay on the market. This differentiates the approach from existing models and initiatives worldwide which typically pursue a pull or “on-demand” accompaniment logic with potential entrepreneurs.

5. Conclusion

The article is mostly a theoretical contribution and it thus needs further development and validation. Nevertheless, the use of preliminary expert feedback framed within a real research project has allowed to introduce a comprehensive and practitioner-oriented framework.

Future research will be addressed to experiment the model in real-life settings. In particular, regional institutions, companies, universities, research centers and potential technological entrepreneurs will be identified with the purpose to design experimental applications of the model through practical use cases and scenarios.

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New ventures and the development of marketing capabilities: the role of business innovation ecosystems

Marco Bettiol, Valentina De Marchi, Eleonora Di Maria *, Roberto Grandinetti

Department of Economics and Management
University of Padova
Via del Santo, 33 – 35123 Padova (Italy)

** Corresponding author*

Structured Abstract

Purpose – The paper aims at pointing out how new ventures develop the capabilities they need to compete. In particular the paper focuses on marketing capabilities that, although are usually overlooked in favour of technical capabilities, are important for the survival of the firm. Literature on new ventures has explained the characteristics and dynamics of firm birth, but additional knowledge can be developed in exploring how new ventures can cope with initial capability gaps and the drivers of gap filling, by considering the characteristics of the founders, the structure of the size and scope innovation networks.

Design/methodology/approach – Based on this theoretical perspective, the paper empirically investigates initial capability gaps and focuses on the development of marketing capabilities by new ventures starting with an initial gap, looking for the impact of founding characteristics of new ventures and the structure, the size, and geographical scope of collaborations new ventures are involved in for innovation purposes. The quantitative analysis is based on an original dataset of more than 400 Italian new venture firms specializing in the mechanics and KIBS sectors.

Originality/value – The value of the paper refers to both the theoretical and empirical analysis. From a theoretical point of view, it wants to contribute to the literature of new venture pointing out how firms develop capabilities in the start-up stage, focusing on the overlooked marketing capabilities. Moreover the paper discusses the role the business innovation ecosystem for developing capabilities in the case of new venture. From an empirical point of view, the analysis is focused on new ventures in advanced manufacturing and service industries.

Practical implications – The paper offers an overview of the drivers supporting new venture firms in filling their marketing capability gaps and how the external sources of knowledge can support new ventures in improving their capabilities over time.

Keywords –business innovation ecosystems, knowledge management new ventures, capabilities

Paper type – Academic Research Paper

1. Introduction

As several streams of literature pointed out, capabilities play a crucial role for sustaining firm's competitive advantage (e.g. Teece, 1986). Those capabilities refer to knowledge acquired by the firm in different ways (learning by doing, formal training, entrepreneurs background, external partners, etc.). This process is particularly critical in the formation of a new venture where the firm is fragile because it is in the process of developing and refining its capabilities.

Literature on new ventures explored the processes of formation of a new firm and described how the new venture can start with a certain stock of capabilities at its birth (e.g. Helfat and Lieberman, 2002; Klepper, 2002). However, little attention has been given to describe and explain the following development of new ventures internal capabilities, beyond foundation. Further knowledge has to be provided to explain how a new venture can improve its capabilities and the drivers of such process. Specifically additional research should focus on considering the sources the new venture may rely on in order to cope with perceived capability gaps.

Our paper aims at pointing out how new ventures fill their capabilities gap with a particular attention to marketing capabilities. Even though many studies focused on technical capabilities, in our view even marketing ones are important for the survival of the firm. In order to address this question, we analysed data gathered from an original survey of more than 400 new ventures based in North Italy specializing in high tech industries. The results of our research point out the relevance of the business innovation ecosystems in which the firm is born and evolves.

The paper is organized as follows. Section 2 presents the theoretical framework and the research question related to how new ventures cope with capability gaps they suffer at their birth. Section 3 focuses on how data were gathered and the methodology used to address the research question. In section 4 we present the results of our analysis. Section 5 and 6 refer respectively to discussions of the results and conclusions.

2. Theoretical framework

2.1 The birth of capabilities

As far as the new venture literature is considered, one of the most discussed topics is how they can form the capabilities needed to operate in the market or 'the birth of capabilities', to quote the title of the seminal contribution by Helfat and Lieberman

(2002). In that paper, the authors analyze several types of mechanisms that drive the formation of new firms¹, which they group into two broad categories: i) the parent-company ventures (joint ventures, franchises and parent spin-offs), which born as a decision of the existing company; and ii) the *de novo* ventures, which are not connected with an existing company, nor proprietary nor quasi-proprietary-wise, which can take on different forms including spin-offs founded by employees of existing firms. Helfat and Liebermann define *de novo* spin-offs in a restrictive manner – requesting that the emergent entrepreneur belonged from an incumbent firm in the same industry of the one he is creating – whereas other authors adopted a broader definition including both intra-industry and inter-industry instances (Klepper, 2009).

The most interesting aspect of the typology proposed by Helfat and Liebermann is the link between the birth of capabilities and the resources that they entail. The authors, in fact, highlight that the pre-entry resources and capabilities vary by type of new venture and that such differences have important implications, in particular they affect the likelihood of entry success. For example, the initial resources and capabilities of parent spin-offs depend “on the extent to which the parent firms transfer personnel, organizational systems, physical assets and brand names to the new entities at the time of founding. Even if new ventures receive no assets other than initial financing from the parent companies, the ventures frequently access to parent-firm resources such as infusions of capital, and management advice (e.g. from board members who are executives in the parent firms)” (Helfat and Lieberman, 2002, p. 734). The other types of parent-company venture can count on the fact that the resources are not coming from a sole company but from two or more, so that their initial resource base is likely larger and more diverse. As far as joint ventures are considered, the strategic importance of their “hybrid” nature was highlighted already by seminal study by Kogut (1988): through their establishment, partners may combine resources and capabilities being diverse and complementary.

Moving to *de novo* ventures, they initially hold, on average, lower resources and capabilities of parent-company ventures. However, it is important to highlight that the *de novo* category is a rather heterogeneous one. More precisely, intra-industry spin-offs are favored with respect to the other *de novo* firms that at foundation are facing a market

¹ To be precise, the authors delve in the potential entrants to a market and therefore include in their analysis: a) the birth of new units of existing firms, from which they are still dependent, and b) the acquisition of firms.

situation with which they are less acquainted. Moreover, spin-offs founded by a team of entrepreneurs (coming from the same or different firms) pool different complementary stocks of resources and capabilities (Vyakarnam, Jacobs and Handelberg, 1999; Agarwal *et al.*, 2004) and are therefore favored as respect to spin-offs created by a single entrepreneur.

Among the resources that a firm need at foundation, knowledge necessary to develop the product so as to produce and market it (Teece, 1986) deserves a special attention, considering that this pool of knowledge translates into results useful for the company just if adequate capabilities are present (Amit and Schoemaker, 1993). Beyond the birth of a new company, being it a parent-company venture or a *de novo* one, there is a more or less sizeable stock of knowledge that it inherits. The heritage process has been analyzed mostly in the studies on *de novo* spin-offs (which from now on we will name simply spin-offs), where it gets a precise configuration: within a company, which can be interpreted as a knowledge repository, one or more employees and future entrepreneurs use their absorptive capacity (Cohen and Levinthal, 1990) to learn at least part of the knowledge embedded in the firm; by leaving the parent company such people apply the knowledge absorbed/inherited by creating a new firm (Klepper, 2001; Agarwal *et al.*, 2004; Camuffo and Grandinetti, 2011). Tacit knowledge – which employees acquire largely through processes such as learning by doing and learning by observing (Nonaka and Takeuchi, 1995), and which they keep when they leave to start new ventures (Agarwal *et al.*, 2004) – is of particular importance at this regard. The more the parent firm is rich in terms of knowledge, the larger the potential initial stock of inherited knowledge in the spin-offs that generated from it. For example, studying the new entries in the automotive industry in the United States between 1895 and 1966, Klepper (2002) discovers that the most competitive firms are those founded by people having a long experience within the industry leader firms. Such results support that the generalization suggested by Helfat and Liebermann (2002) has to be considered with caution, as the authors themselves suggests; a spin-off coming from one of the leading company of the industry can enter the same market having an important cognitive advantage as respect to a parent spin-off from an incumbent firm being far beyond the leaders.

The formation of the capabilities of a new venture does not occur just because of a heritage process, irrespectively to its link with a parent firm. Another, relational, factor plays an important role too. As far as *de novo* firms are considered, as suggested by a

wide literature, the interpersonal relations are a key factor. These relations are those the founder or the founding team have managed when developing the new-firm idea (incubation phase) and/or around birth time (resource assembly phase, in the wording by Stuart and Sorenson, 2007). The incubation phase can be considered as a period of learning and preparation for the entrepreneurial activity. The future entrepreneur, through the network of relationships that he develops in the course of time, i.e. his social capital, acquires knowledge that may have an equal relevance than that absorbed within an established firm (Garnsey, 1998; Furlan and Grandinetti, 2014). Even in the phase of resource assembly, interpersonal relationships play a crucial role (Birley, 1985; Starr and MacMillan, 1990; Hansen, 1995; Elfring and Hulsing, 2003). For instance, the new entrepreneur can manage to recruit an expert technician that he knew during his previous professional life, taking him away from an incumbent firm. Considering that the social capital gained by people is, on average, higher within geographical clusters, they have been considered elective places for the birth of new firms (Lechner and Dowling, 2003; Sorenson, 2003).

2.2 Capability gaps and their bridging in the start-up phase

To sum up our literature review on the birth of capabilities it is useful to position it with respect to two precedent theoretical approaches: the theory of liability of newness and the resource-based view.

New firms, at birth and in the subsequent period, suffer a disadvantage with respect to older firms in terms of resources and capabilities. This aspect depends on the so-called liability of newness, a phenomenon discovered by Stinchombe (1965) that depends from factors such as the fact that new firms operate inefficiently as long as organizational routines have not been developed. Stinchombe theory is still valid (Abatecola, Cafferata and Poggesi, 2012) because it explains the high average mortality of new ventures compared to older companies. However, whereas liability affects new venture in general, studies on the birth of capabilities suggests that firms are not all equal as far as resources and capabilities are concerned. Basically, they confirm and complement what the resource-based view discovered for established firms, i.e., that the distribution of resources and capabilities among firms is clearly asymmetrical (Rumelt, 1984; Amit and Schoemaker, 1993). Such an asymmetry at birth can be explained by different factors: the type of enterprise creation mechanism; the differential capability of employees to absorb

knowledge relevant for the future business at firms where they develop their business idea; the personal capabilities of the potential and then emergent entrepreneurs to use their interpersonal relations in the formation of resources and capabilities of the new firm; the relative advantage of entrepreneurial projects rising within firms with abundant knowledge and/or in geographical contexts with a dense web of relationships, i.e. geographical clusters.

The literature reviewed open up an important research question, that has not received adequate answers yet: if the firm suffers, at its foundation, of an important capability gap, how can it fill it in a short time, i.e., within the start-up phase? Such a question can be further specified considering for functional capabilities and more specifically adopting the traditional dichotomy between technological and marketing capabilities (Teece, 1986; Day, 1994). Several studies suggest that such a dichotomy is relevant even in the case of new ventures. For example, in the case of a peculiar category of spin-offs, i.e. academic spin-offs, studies highlight that many of them show a great disproportion in favor of technological ones (Chiesa and Piccaluga, 2000; Lockett *et al.*, 2005). Considering spin-offs founded by former employees of an incumbent firm, the study by Agarwal *et al.* (2004) hypothesizes and tests that organizations with high technological capabilities and low marketing ones, or being in the opposite case, are the ones that generate more spin-offs. The reason behind such evidence is that “asymmetrical” organizations tend “to create frustration among their employees, who perceive their organization as systematically missing out on either value-creating or value-appropriating opportunities” (p. 504). As a consequence, new firms born in the first or the second situation have or, better, inherit a capability gap that the emergent entrepreneurs may try to fill in the more or less short phase that precedes the creation of the new firm or have to do it in the start-up one.

Leveraging on the insight described we propose the matrix reported in Fig. 1. If the new venture has an adequate stock of both types of capabilities its survival probability will be quite high, whereas the opposite situation leads to higher mortality rate. Intermediate situations, when firms lack just one of the two types of capabilities, are the most interesting one. Indeed, the object of our study is to understand how such a gap can be filled in by new ventures in order to increase its probability to continue its activity over time.

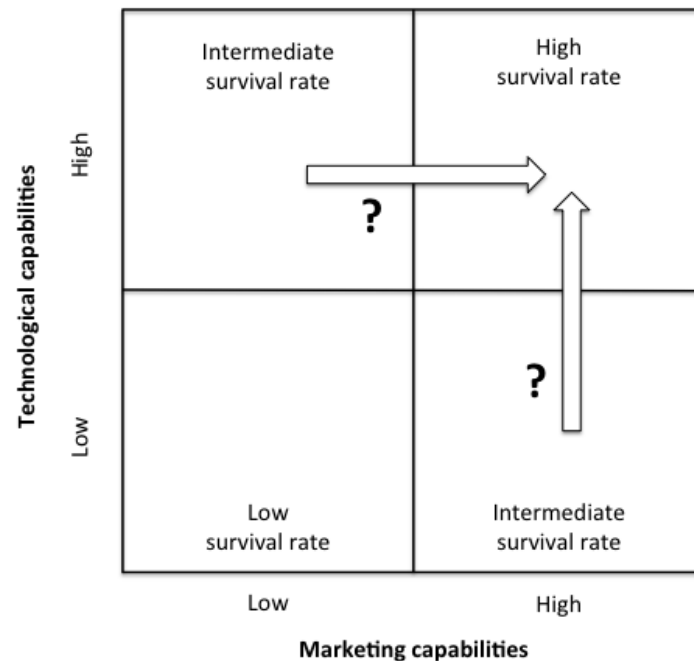


Fig. 1 - Capability gaps at the birth of a firm

3. Empirical analysis

The data for the analysis are drawn from an original survey that addressed specifically new-ventures and was conducted between February and June 2013. The universe considered for the purpose of the analysis consists of all the companies i) with share capital located in North Italy – the most industrialized area of the country; ii) born between 2005 and 2007 – the years preceding the great recession; iii) registered within the business register of the Italian Chambers of Commerce and being still active in 2013. The survey tackled just advanced sectors, in terms of the technology and the knowledge embedded. The sectors included, considered med-high technological industries according to the European classifications of industries, are: i) knowledge intensive business services (KIBS); ii) mechanics and iii) life science and bio-tech. Starting from such a universe, we created a stratified sample based on industry specialization and geographical locations (region). For the purpose of this analysis, the life science sample was disregarded, considering for the high specificity characterizing it. Table 1 reports the specific ATECO 2002 codes (the Italian version of the NACE rev.1 industry codes) used to identify each the sectors mentioned.

Table 1 - The industry considered for the analysis

Industry	ATECO 2002 code	ATECO 2002 description
KIBS	72	Computer and related activities
	73	Research and development
	74.20.1 and 74.20.2	Architectural and engineering activities and related technical consultancy
Mechanics	29	Manufacture of machinery and equipment n.e.c
	31	Manufacture of electrical machinery and apparatus n.e.c.
	34	Manufacture of motor vehicles, trailers and semi-trailers
	35 (excluding 35.1)	Manufacture of other transport equipment

A specialized survey company conducted the interviews with the assistance of the CATI (Computer Assisted Telephone Interview) and CAWI (Computer Assisted Web Interviewing) procedures, targeting firm’s entrepreneurs. The questionnaire was 6 pages long and included questions inquiring on firm’s structural characteristics and market strategies, on the characteristics and motivations of the founders and on the firm’s competences, innovation and networking activities both at foundation and in the following years. In order to be sure that companies were effectively born in the years considered and exclude from the analysis possible cases of older firms being registered in the business register of the Italian Chambers of Commerce with a different year than the true one because of phenomena such as transformations, merge and acquisitions and the like, a specific filter question was administered to firms at the beginning of the interview. Subsequently, we added in the dataset information about the financial performance of the firms, with information coming from the AIDA Bureau Van Dijk dataset and from the Chamber of Commerce databases. From the 2,341 firms initially contacted, we collected 504 valid responses, being 221 KIBS, 209 mechanics and 74 life-science firms.

3.1 Measuring the marketing competence gap

In order to evaluate the level of capability gaps of new ventures we classify interviewed companies based on a variable describing the capabilities the firm has initially and over time. Specifically, such a variable is built on questions asking firms to rate, on a scale from 1 to 5, their endowment both at their founding year and after three years of technological and marketing capabilities. Table 2 reports the average competences hold be the interviewed companies at the founding year and after three years.

Table 2 – Competences hold by companies at the foundation and after 3 years

	Average level of competences				% of firms with low (<3) level of competences			
	Technological		Marketing		Technological		Marketing	
Initial	3.76	(1.05)	2.58	(1.21)	11.2%	(31.6)	51.7%	(0.50)
After 3 years	4.40	(0.77)	3.42	(1.15)	2.6%	(0.16)	21.4%	(0.41)
Var.	17.0%		32.4%		-8.7 p.p		-30.3 p.p.	

S.D. in parenthesis

The average level of technological competences is already high at the founding years, being 3.76, whereas the contrary is true for marketing competences, for which the average level declared is beyond 3 on a scale from 1 (no competence) to 5 (very high). Such a difference in the average endowment of competence at the foundation is evident also when looking at the incidence of firms reporting a low (lower than the medium value, 3) level, being more than half in the case of marketing competences and just 1 out of 10 when it comes to technological ones. After three years of activity the stock of both competences increases, with a greater increment (+32.4% vs. 17.0%) in the realm of the competences for which the companies declared initially lower level, which get to 3.42, above the median value. After such a period of time companies that recognize to have low level of technological capabilities got a true minority (2.6%), but the strongest reduction is again in the realm of marketing competences where they got 21.4% vs. the 51.7% of the initial period.

In order to identify what factors impact on the probability that a firm will fill in the initial gap in terms of marketing capabilities, we use as dependent variable the dummy GROWTH-MKTG. First, we created a dummy variable to identify firms having initially low (lower than 3) level of marketing capabilities but a high (from 3 to 5) level of technological ones, which we named LOWMKTG-INITIAL. The dependent variable used in the main analysis (GROWTH-MKTG) splits the firms for which the variable LOWMKTG-INITIAL values one into two groups: i) it values one in the case of firms having filled in such initial gap, therefore reporting to have an high level of marketing and technological competences after three years from foundation; ii) it values zero in the case of firms that reported to have still a low level of marketing competences after such a period of time.

The data on which our dependent variable is built represent a great advantage for the present analysis, aimed at identifying firms with competences gap, since it allows avoiding possible respondent bias and to overcome possible limitations driven by the fact that it is based on subjective, qualitative responses. Such a question, in fact, asked interviewees a retrospective evaluation of the competences of their firms – reporting at time 3 to rate the competence stock held at time 1 and 2 – ensuring therefore that the same evaluation criteria is used to rate both periods. Having asked the same question at one of the periods under scrutiny (i.e., after three years) may have lead to over-estimated results, because is tougher to have a reliable idea of a phenomena while it is taking place; having asked the same questions at two different periods (i.e., at the founding year and after three years) may have lead to biased results considering for the different conditions affecting the firms and the markets at that specific time. The fact that the questionnaire was filled in just by ‘successful’ start-ups – firms that were still alive after 8-10 years from foundation – further indicated the reliability of the dependent variable we use. The qualitative evaluation of competences, in fact, has been reported by people that proved to be able to be competitive on the market they work in and therefore may have clear(er) ideas of what the level of competences needed are.

3.2 The independent variables used in the analysis

In order to understand the factors relevant to understand how firms have filled in the marketing competence gap, we included in the analysis a number of independent variables. The variable MKTG-EXT is built on a question asking firms to report how both technological and marketing competences were developed distinguishing between three options: just internally, just externally (both by acquiring external services or through collaboration with external partners) or both. The dummy MKTG-EXT takes on value 1 in the cases firms declared to have increased marketing competences in the second or third mode, therefore at least partially through the interaction with external partners. The questionnaire further investigated how firms learn about their market asking to rate, on a scale from 1 to 5 the intensity in which they use each of the following as source of information: i) participation to trade shows or conferences; ii) public research reports or database; iii) internally, ad-hoc developed reports or database; iv) suppliers or other industrial partners; v) KIBS; vi) industry associations; vii) universities or public research centers; viii) industry journals; ix) blog, newsletter, websites, social networks; x) other

sources. SOURCEDEPTH is a count variable that reports the average intensity through which the firms uses the ten sources just listed to improve the knowledge of its market. The variable COOPBREADTH, instead, is a proxy for the relational attitude of the firm and is built on questions asking firms to report the intensity of collaboration with external partners for innovation, among the following: i) suppliers; ii) clients; iii) other industrial partners; iv) KIBS; v) universities or public research centers; vi) other. COOPBREADTH counts the number of partner typologies among the six listed for which the cooperation intensity was rated high (higher than 2 on a scale from 1 to 5).

We included also the dummies SECTOR-FOUND and EDUCATION, in order to proxy for characteristics of the founders. In particular, the first variable measures if the founders of the start-up (being them firms or individuals) belongs to the same industry or not, which we use as a proxy for differences in the firm's initial competences endowment, considering that, having worked in different industries, the founders may bring different competences too. The second, instead, aims at evaluating the initial level of competences of the single founders: it values 1 if any of the founders (in case of individuals) has a tertiary education (holds a undergraduate, graduate or post-graduate degree) and 0 otherwise. Furthermore we included a number of control variables to control for possible industry effects (the dummy INDUSTRY values 1 if the firms belong to the KIBS sector, 0 if to the mechanics); size effects (including the natural logarithm of the number of employees at the founding year, SIZE); or geographical effects (the dummy LOCATION values 1 if the firm is based in the North-East of Italy). Table 3 summarizes the variables used in the analysis and reports their descriptive statistics.

Table 3 – Description and descriptive statistics of the variables used in the analysis

Variable	Description	Obs	Mean	S.D.	Min	Max
LOWMKTG-INITIAL	Firms having initially good technological competences but not marketing ones (d)	427	0,44	0,50	0	1
GROWTH-MKTG	Firms having initially low marketing competences having increased it (d)	187	0,57	0,50	0	1
MKTG-EXT	Marketing competences has been developed at least partly externally (d)	427	0,37	0,48	0	1
SOURCEDEPTH	Importance of external sources as source of info for competences development	430	2,33	0,61	1	4,1
COOPBREADTH	N. of external partners with which it cooperate deeply	428	1,83	1,55	0	5
SECTOR-FOUND	Founders (being firms of individuals) from different sectors (d)	430	0,12	0,32	0	1

EDUCATION	Founders with tertiary education (d)	430	0,57	0,50	0	1
INDUSTRY	Sector (KIBS vs. Mechanics) (d)	430	0,51	0,50	0	1
SIZE	Initial size (employees) (ln)	414	1,33	1,06	-2	6
LOCATION	Location (North-East vs. North-West) (d)	430	0,51	0,50	0	1
FINANCING	Incidence of initial funds by external sources	415	21,30	34,88	0	100
ONE-FOUNDER	Having just one founder (d)	420	0,22	0,42	0	1

4. Results

Considering that the dependent variable of the analysis (GROWTH-MKTG) is a dummy and that it focus just on a sub-group of the sample, we employed a binary outcome model that controls for possible selection bias arising from the exclusion from the analysis of the firms that had not a competence gap at the initial period (those for which the variable LOWMKTG-INITIAL values 0). The model chose is a two-part logit model (Cameron and Trivedi, 2005; De Marchi, 2012), which has proved to be appropriate for estimating actual outcomes and more suitable than a Heckman selection model since the dependent variable is not continuous (Haas and Hansen, 2005). Such a method consists in performing two, subsequent analyses. In the first stage, the probability for a firm to have a marketing competence gap (PR-GAP) is calculated by regressing exogenous variables available for all the observations of the sample on LOWMKTG-INITIAL. Variables included are SIZE, INDUSTRY and LOCATION – used as control variables also on the second stage – plus INIT-MARKET, FINANCING and ONE-FOUNDER and the dummies reporting the year when the firm was founded. INIT-MARKET values one if, at foundation, the company served an existing market producing products or services just marginally improved. FINANCING allows to capture the impact of initial source of financing, being the incidence of initial funding coming from external sources (namely banking and private or public venture/seed capital or business angels). Last, ONE-FOUNDER is a dummy valuing 1 if the firm was founded just by one firm or one entrepreneur.

In the second stage, the main model, just firm having initial low level of marketing competences but not of technological ones are considered (i.e., just firms for which LOWMKTG-INITIAL=1), so to verify what is the impact of the independent variables considered on the probability that the firms have been able to fill in that gap or not (GROWTH-MKTG). The inclusion of the variable PR-GAP on the second stage controls

for possible selection bias by including the effects of firms that did not have the initial gap. A logit specification is used for both stages, which passed tests for multicollinearity, goodness of fit and model mis-specification. Table 6 in the Appendix lists the correlation among the variables used for the main analysis.

Table 4 – First stage logit regression, explaining the propensity to have low marketing competences at foundation

LOWMKTG-INITIAL		
	Coef.	S.E.
INIT-MARKET	0.494**	(0.225)
ONE-FOUNDER	-0.580**	(0.272)
FINANCING	0.007**	(0.003)
SIZE	-0.244**	(0.116)
INDUSTRY	0.485**	(0.227)
LOCATION	0.363*	(0.219)
YEAR-D	included	
Constant	-1.019**	(0.456)
Observations	379	
Pseudo R-squared	0.0562	
Chi-squared	24.33	

Robust standard error. * p<0.1. ** p < 0.05. *** p < 0.01.

Table 4 reports the results of the first stage analysis, evaluating what factors impact on the probability that the firms have a gap in terms of marketing competences at foundation. Interestingly, the innovative attitude of the firms is negatively correlated with the probability to show a marketing competences lack. The coefficient of the variable INIT-MARKET, in fact, is positive and significant, suggesting that the more the firm has been founded to serve a traditional market, the higher the probability that it does not know its market well. Other interesting and counter-intuitive results regard the variables ONE-FOUNDER and FINANCING, being respectively negatively and positively related with LOWMKTG-INITIAL. The first supports that firms founded just by one entrepreneur (or firm) have larger probability to have already a high level of marketing competences. We interpret this result with the fact that, considering the higher risk entailed by such option, just entrepreneurs having a sufficient level of both technological and marketing competences go this way. Also the evidence of a significantly positive correlation of the

variable measuring the incidence of external financing on the overall funds raised by the firms to start up is rather intriguing, despite the level of the coefficient is very low. The interpretation of this result is twofold: on the one hand, it may signal a bad capacity of funding actors to identify which start-up has the highest and most complete competence stock to face successfully its market; on the other hand, it may be interpreted with the fact that firms having access to external funds may be less prone to equip with knowledge that may improve the probability to get successfully to the market.

Unsurprisingly, larger firms have lower probability to have an initial gap, as suggested by the negative sign of the coefficient *SIZE*: smaller firms may be endowed with good technological resources but rather lack marketing ones. Also industry plays a role, suggesting that *KIBS* firms are less likely to have marketing competences than mechanics firms. Geographical factors, instead, are just weakly significant in explaining marketing competence gaps, with firms based in North-East Italy having greater probability to be weaker. Year dummy have been included but are not significant.

Table 5 – Second stage logit regression, explaining the propensity to increase marketing competences if started from a low level

GROWTH-MKTG		
	Coef.	S.E.
SECTOR-FOUND	2.878***	(0.943)
EDUCATION	-0.056	(0.410)
MKTG-EXT	1.369***	(0.405)
SOURCEDEPTH	0.920**	(0.366)
COOPBREADTH	0.221*	(0.129)
INDUSTRY	0.114	(0.494)
SIZE	0.130	(0.220)
PR-GAP	-0.354	(1.636)
Constant	-2.834**	(1.227)
Observations	164	
Pseudo R-squared	0.216	
Chi-squared	35.74	

Robust standard error. * p<0.1. ** p < 0.05. *** p < 0.01.

Table 5 reports the second stage logit regression, explaining the propensity to fill in the initial competence gap in the subsequent three years three years. Results point to the

importance of combining diverse knowledge bases, being either internal or external to the firms. The variables impacting the most are SECTOR-FOUND and MKTG-EXT, having both the largest coefficient and significance level. Our analysis supports that firms being founded by entrepreneurs or firms belonging to different sectors (SECTOR-FOUND) have a higher probability to fill in the marketing gap in the subsequent years. On the contrary, the education level of entrepreneurs (EDUCATION) has no impact, suggesting that technical, learning-by-doing type of knowledge is still more relevant than more advanced competences.

Whenever an initial gap is identified, filling it in by engaging with external partners - both by acquiring specific services or by cooperation - is a most effective practice than trying to do it internally (MKTG-EXT). The relevance of knowledge and competences from external partners is underscored also by the positive and significant coefficient of the variable SOURCEDEPTH and COOPBREADTH, even if the second one is significant just at the 10% level and has a much lower coefficient. The higher the relevance of external sources to develop market knowledge and the larger the number of partners cooperating for innovation, the higher the probability to fill in the gap in a relatively short amount of time. Finally, control variables are not relevant, nor in terms of industry specialization (INDUSTRY) nor of the initial size (SIZE).

5. Discussions

Our analysis shows interesting results in terms of networking behaviour of new ventures and consequences on their improved set of capabilities marketing-wise.

As it emerges from the data, there is a non-negligible number of new ventures with low levels of marketing capabilities, compared to technology ones. The technology-driven process of company creation can explain this initial gap, where Italian companies show to focus more on competences useful for the development of the business offering than on competences valuable to reach and manage the market. In particular, a result that should be further investigated is the role of external financial sources and its negative link with the level of new venture's marketing competences. In fact, the research of external support should usually require a certain level of marketing competences to present the value proposition and convince external investors. From this point of view, new ventures may be pushed to improve their marketing competences properly due their experience in

interacting with supporters, such as through the management of innovation projects with external (non-financial) partners.

It specifically emerges the positive implications for new ventures that have a proactive approach toward the development of external relations, where the new firm strategically invest in collaboration with other players. This openness is crucial both in terms of quantity and quality of the partners involved and it couples with the internal variety the new venture has at its birth – through the different industry origin of the founding team. Investing in outsourcing activities – that is selecting right knowledge suppliers or source - and collaborations for innovation are important paths that sustain the new ventures. The new venture is able to internally improve if it has the absorptive capacity (Cohen, Levintal, 1990) to acquire external knowledge about marketing practices and this may be explained by the role played by the variety in the profiles of founders.

At the same time, however, this process requires the new ventures to be inserted in a context that facilitate this process of competence enlargement. According to our result the industry of new venture specialization - KIBS, mechanics – is not relevant in order to explain the differences in the process of competences improvement. On the contrary, we may refer to other approaches that can support the explanation of our results (Teece, 2007). Studies on business innovation ecosystems can help us in understanding the dynamics we observed in Italian new ventures. As described by Moore (1993) and others (i.e. Adner, 2006; Adner and Kapoor, 2010), an innovation ecosystem is a loosely connected network of companies that are mutually related and collaborate toward a shared (innovation) goal, in a framework of common knowledge and skills.

On the one hand, those ecosystems are characterized by the leading role of one or few firms that act hubs or orchestrators of the relationships and influence the innovation process (hub-based business ecosystems). Nambisan and Baron (2013) emphasize the opportunities that new ventures can have in acting within hub-based business ecosystems. “Ecosystem entrepreneurs” (Nambisan and Baron, 2013, p. 1072) have to cope with pressing forces of the hub firm as well as find out their own opportunity to develop with the business ecosystem. Through a self-regulatory process the new venture can recognize promising growth and innovation opportunities both within and outside the (hub-based) business ecosystems. On the other hand, according to Teece (2007) firms are able to shape the ecosystems in which they act in a dynamic way, specifically through innovation and through the collaboration with other firms or institutions and these processes are

intertwined with the firm's capabilities. In this perspective, as other firms, also new ventures can develop the process of "sensing" described by Teece (2007, p. 1324), in order to identify new opportunities and also new sources of knowledge that they can exploit on a collaborative basis. This process of searching has to be addressed to both the core and the periphery of the business ecosystem.

Our results show that neither the industry specialization nor the initial new venture size is relevant in explaining the process of gap filling concerning marketing competences. Hence, we may argue that the range of alternative opportunities of collaboration a new venture can have access to in relation to the business ecosystem the firm acts can positively influence this "upgrading". At the same time, the new venture over time develops and exploits dynamic capabilities of networking – i.e. partner selection and management – that sustain innovation activities (intense collaboration with external partners for innovation purposes) as well as the acquisition of marketing competences. Internal differences in the founding team in terms of past experience allow the new venture to be more ready to start the networking process – such as through previous relationships of the founders – as well as to combine inputs coming from different partners – also as far as marketing-related knowledge is concerned – and to internalize those contributions.

North Italy is characterized by a dense presence of medium and small firms, often strongly interconnected in a nested set of business relationships, where also agglomerative effects play a role in innovation processes (i.e. clusters). In this contest the new venture phenomenon has been related to spin-off dynamics within clusters as well as connected to strong entrepreneurial attitudes. From this point of view we can consider the environment of the observed Italian new ventures as a business ecosystem not necessarily hub-centred – that is led by a large enterprise – but an ecosystem as described by Teece: "the community of organizations, institutions, and individuals that impact the enterprise and the enterprise's customers and supplies" (Teece, 2007, p. 1325), where the new venture, with its strategy and its dynamic capabilities, is able to identify opportunities for growth and innovation through appropriate collaborations.

6. Conclusions

The paper explores the process through which new ventures can enhance their internal competences by relying on external partners, beyond the starting time of birth. Through

an original empirical quantitative analysis our study shows that through a proactive networking approach new ventures can fill their gap concerning marketing competences, in addition to the positive role of variety in the founding team.

According to our study, the role of industry specialization or size in explaining the evolutionary process of new ventures has to be carefully taken into account. On the contrary, the business ecosystem in which a new venture is acting – and the potentialities it could offer in terms of collaboration – can explain in more general terms the process of competence acquisition carried out by the new venture. The characteristics of the founders are important, but they are not the only determinant in new venture development. In addition is crucial to also consider the perception of the relevance of external sources of knowledge for the firm.

This is a first attempt to enrich literature on new ventures by exploring the dynamics of those companies beyond their birth through the analysis of the improvement of new venture's competences, the drivers of such process and firm implications. From a theoretical point of view our study proposes to integrate in the analysis of new venture dynamics also contributions from business ecosystems in terms of framework for innovation relationships and business-to-business ties. From a managerial point of view, our study suggests that new ventures have to invest in external forms of collaboration – through both breadth and variety of partners – in order to enrich their internal competences and overcome their gaps at the early stage.

A limitation of this study regards the lack of information concerning the reasons for networking and the detailed characteristics of the business ecosystems (hub-centred or not). An additional limitation concerns the specialization selected that consider only high-tech firms. Further research should be developed in order explore more deeply how new ventures are able to convert external inputs into marketing competences in terms of knowledge management processes and partners involved. Additional research should also analyse different firm specializations beyond high-tech as well as the geographic dimension. Finally, further attention should be given to describe the business ecosystems the new ventures are in to evaluate their capabilities to develop and retain knowledge produced outside the firm.

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APPENDIX

Table 6 – Simple correlations among the variables used for the second step analysis

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. GROWTH-MKTG	1								
2. SECTOR-FOUND	0.243*	1							
3. MKTG-EXT	0.345*	0.075	1						
4. COOPBREADTH	0.217*	-0.016	0.142*	1					
5. SOURCEDEPTH	0.268*	0.060	0.231*	0.310*	1				
6. INDUSTRY	-0.092	-0.003	-0.034	-0.082	0.036	1			
7. SIZE	0.020	-0.065	-0.014	0.068	0.063	-0.266*	1		
8. EDUCATION	-0.023	0.072	-0.005	-0.015	0.043	0.396*	-0.123*	1	
9. PR-GAP	-0.038	-0.008	0.010	0.004	-0.048	0.463*	-0.457*	0.236*	1

Coupled Open Innovation Processes and Collective Idea Creation in Multidisciplinary and Multisectoral Cooperation

Holger Breitenborn *

Fraunhofer IOF
Strategy and Marketing Department
Albert-Einstein-Str. 7, 07745 Jena

Oliver Mauroner

Bauhaus University Weimar
Helmholtzstraße 15, 99425 Weimar

** Corresponding author*

Structured Abstract

In our study, we scrutinized multidisciplinary and multisectoral cooperation to learn about the factors which influence idea generation and coupled open innovation in cooperation. We specialized on multidisciplinary and multisectoral cooperation because those collaborations seem to have a high potential of developing disruptive technologies and innovation. Our study is a pre-test to set up a research model and to prepare further investigations.

Purpose - The goal of this study has been the investigation of coupled open innovation processes and the mutual idea generation in multidisciplinary and multisectoral cooperation. We have scrutinized how idea creation and creativity processes work, and how the factors: partner's perspective (motivation, perceived risk, etc.) and cooperation background (rules, cooperation culture etc.) influence the performance of coupled open innovation processes in multidisciplinary and multisectoral consortiums.

Originality/value - Our study will give suggestions about the composition of collaborative relationships to create trusting environments to foster idea creation and knowledge/know-how exchange between the participating partners. Thus, coupled outside in and inside out open innovation processes can enable the development of products and services with the potential for disruptive innovations initiated by the input of multidisciplinary technology and multisectoral application knowledge and experience.

Key words - Coupled Open Innovation, Mutual Idea Generation, Creativity, Co-Creation, Knowledge Management, Multidisciplinary Cooperation, Multisectoral Cooperation

Paper type – Academic research paper

1 Introduction

An organization's capacity for idea creation is a vital source of new technologies, services, processes, and business models in today's competitive international environment and offers competitive edges (Gay, 2014). An organization can improve its idea creation capacity by working together with other organizations (outside-in and inside-out open innovation approach) (Chesbrough, 2007). Cooperation usually does not work when it is confined only to the outside-in approach. Ideas have to be exchanged and commonly evaluated and further developed (coupled open innovation approach). Many well-known companies, such as 3M, constantly improve their research and development abilities by even collaborating with competitors (Nonaka, 1994).

Enkel et al. (2009) stated that one of the most important sources of ideas for an organization has been organizations from other industries (multidisciplinary cooperation approach) and the combination of different industry-specific knowledge leads to new ideas. Consequently, many innovations are based on already existing inventions, technologies, concepts, etc. derived from other industries.

Ideas can also come from different application sectors such as information and communication technologies, environmental technologies, production technologies (multisectoral cooperation approach), and even biology. Cooperation with organizations from these sectors can boost the creation of new ideas.

Multidisciplinary and multisectoral cooperation are good foundations for industry-specific knowledge spillover and the development of common new patents, products, services, and processes. The intellectual interactions in that cooperation based on complementary partners provide a better framework for creativity and innovation when compared with homogeneous collaborations (Alves et al., 2007).

Nevertheless, the market success of new ideas, which become inventions is not sure. There are many influence factors such as regulations, customer preferences, country culture, and environmental matters that can influence the production or realization of new products and services. To improve the realization probability, organizations can include as much stakeholders in the cooperation e.g., federal regulatory bodies, technical standardisation agencies, environment of organizations, unions, and even psychoanalysts and cognition experts. Furthermore, the participation of all value creation chain members are helpful to create valuable ideas which could evolve to new innovations.

In earlier stages of research and development taking place mostly in research organizations, multidisciplinary mutual research might include fields such as physics, chemistry, engineering, as well as, economics and social sciences. In later stages of the development process, multisectoral cooperation approaches become important, which include knowledge and experience from different application areas and markets.

2 Coupled Open Innovation Processes and Collective Idea Creation

The benefits of cooperation are rising since more and more organizations have decided to implement open innovation in their organizational culture. (Enkel et al., 2009) “Not all the smart people work for us. We need to work with smart people inside and outside our company” (Chesbrough, 2003). Saint-Paul, (2003) stated that every company will suffer competitive disadvantages if it does not participate in interorganizational cooperation when it hits the industry. Even, “firms that do not cooperate and which refuse to exchange their knowledge decrease their knowledge base on a long-term basis and lose the ability to enter into exchange relations with other firms and organizations”. (Koschatzky, 2006, p.6) Enkel et al., 2009, argue that cooperation with externals is core to increase innovativeness and reduce time to market. The **coupled open innovation processes** (joined innovation and exploitation) is a mixture of the outside-in-process and the inside-out-process: internalization of external knowledge in combination with externalization of internal knowledge. Thus, other organizations and stakeholders should be actively involved in the development of innovations and at the same time innovations should be externalized to form a market. (Gassmann and Enkel, 2004). Consequently, forming a cooperation with complementary partners is a good opportunity to use the coupled open innovation effects to improve the own idea creation capability, to exchange and exploit knowledge. The unwanted exploitation or uncontrolled exchange of the organization’s know-how by partners and external companies etc. has been always problematic in cooperation. There are two ways to protect know-how - secrecy and legal exclusion rights (Henkel J., 2013), which are often necessary for a successful cooperation. (Arora et al., 2001; Chesbrough, 2003, 2006) In our case study, all partners signed a non-disclosure agreement and possess their own patents.

The **collective idea generation** depends heavily on the participants’ creativity. The concept of creativity can be defined as the generation of new and useful/valuable ideas for

products, services, processes and procedures by individuals or groups in a specific organizational context. (Martins and Terblanche, 2003)

In our study, we wanted to scrutinize multidisciplinary and multisectoral cooperation to learn how idea generation and knowledge management in cooperation work and which conditions and pre-settings the participating partners have regarding their goals and assumptions in cooperation.

We set up a **research model** about factors, which influence idea generation and creativity in multidisciplinary and multisectoral cooperation. As influence factors on the mutual knowledge management, we investigate the partner's perspective and the background of the cooperation. Furthermore, we observed if the mutual idea generation and the knowledge/know-how exchange leads to the development of new products, services and technologies, and a mutual technology exploitation.

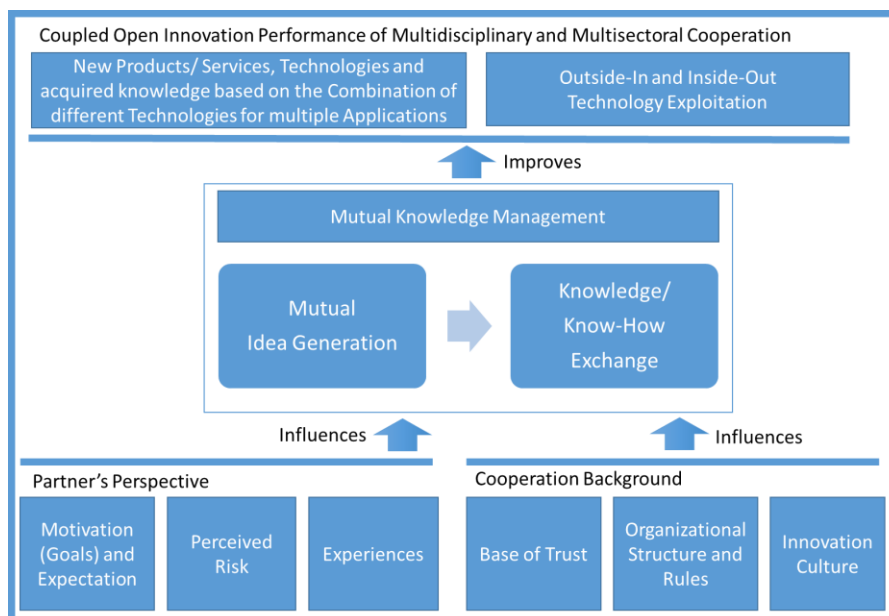


Figure 1: Research model of influence factors on the success of multidisciplinary and multisectoral collaborations based on coupled open innovation processes

3 A Case Study of a Multidisciplinary and Multisectoral Cooperation

3.1 *The Consortium*

Our investigation is based on a long-term highly-multidisciplinary and multisectoral conglomerate that wants to improve human-machine interactions by means of 3D-measurement technology.

Human-machine interactions have been a hot topic for many organizations and even governments for many years. The interface between computers/machines and their users is almost confined to keyboard and mouse. Voice recognition is an important technology that has already improved human-machine interaction. Visual interactions are another possibility to connect humans with machines. It offers a wide area of application possibilities. Machines try to recognise people and interpret their gestures and mimics. It is being used for analyzing human presents and reaction, important for example in security and production. Furthermore, by using visual interactions, humans can control machines and robots by the intentional movement of body parts etc. In that regard, the interpretation of movements that depend on intention and cultural background of humans play an important role for human-machine interaction. To investigate this area, the cooperation has needed a partner who focuses on the human factor by including the knowledge of psychological behaviour into the development of new human-machine interfaces.

In 2013, a research institute started building up the conglomerate with the idea to further develop human-machine interactions scientifically and transfer that knowledge into applications that lead to improvements in healthcare, production, security, and mobility. A goal of the consortium has been for example the recognition of humans in an automated production environment to improve people's safety and to enable those workers can interact with robots and can be present in a robot driven manufacturing environment. The research institute searched for company and research partners for the development of innovations most relevant to society such as autonomous mobility, efficient production, reliable security, and cost-efficient healthcare.

A governmental funding organization has been co-sponsoring research and development projects in the consortium due to their high potential of solving big social challenges. The consortium started in 2014 consisting of 70 organizations containing 20 research institutes and universities, as well as, 50 companies from all over Germany. 30

of them have been SME's. The organizations want to develop and commercialize technologies, services and products for the following application areas: information, production, health, and security. These areas offer the largest market opportunities and, thus, promise the best results for the alliance.

Since 2013, many of the partners have known each other or even had known each other before. The technology is about 3D measurement and visualization for a variety of applications. Image capturing and image visualisation are at the beginning of a revolutionary change. Two hundred years after the discovery of photography, the first devices for picture capturing and visualization of three-dimensional objects are available. The consortium targets the multidisciplinary combination of expertise in optics/photonics, IT/software engineering, and electronics with expertise in design, neuroscience, cognitive science, and ergonomics. Furthermore, social, creativity, medicine, legislative and engineering knowledge is included in the consortium. The target of the consortium is the discovery of new holistic human-machine interaction to bring new technologies to applications. The consortium hopes that the technology will find a rapid acceptance in industry and society. Beside of technical challenges, there are economic and society challenges to solve. Thus, the consortium includes not only the entire value creation chain but also all stakeholders, which the technology bundle pertains. The consortium hopes that the new technologies would penetrate markets quickly. Figure 2 shows the multidisciplinary and multisectoral approach of the consortium.

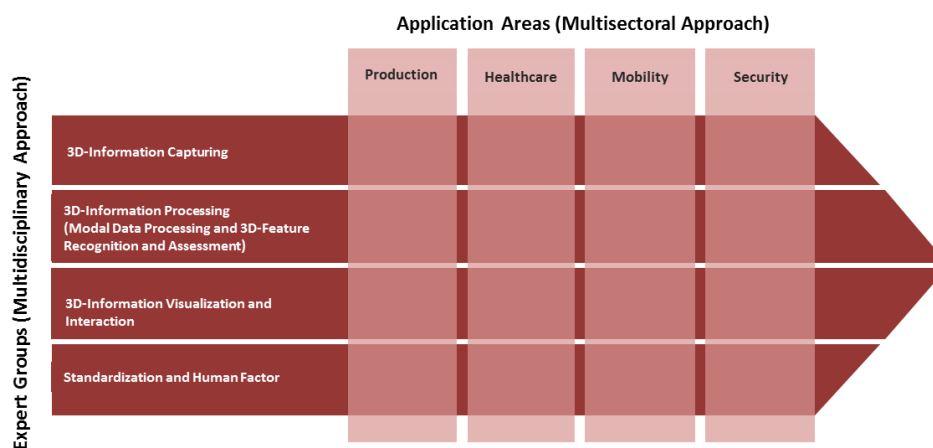


Figure 2: Multidisciplinary and Multisectoral Approach of the Consortium

The multidisciplinary approach is represented by four expert groups: 3D-information capturing, 3D-information processing, 3D-visualization and interaction, and standardization and the human factor. The multisectoral approach is represented by four application fields (production, health, mobility, and security). The combination of different scientific disciplines and application areas leads to cross-border idea creation effects and hopefully to a high potential of disruptive innovation development. Moreover, the technology usage for many applications leads to synergy effects such as lower research costs.

3.2 Establishing the Consortium - Consortium Start Phase

After had convinced the funding agency that the consortium is able to provide solutions in human-machine interaction, a strategy phase started. The goals have been: set up of a roadmap and strategy development, elaboration of an organizational and managerial concept, and development of a communication concept. For the roadmap and the strategy, a market and application analysis was needed. Furthermore, the coordination, project steering, quality control had to be ensured in the four expert groups. For the elaboration of an organizational and managerial concept, the definition of the organizational structure and the organizational processes in the consortium, the installation of a financial and organizational controlling system, and a concept for knowledge management in the alliance had to be developed. The development of a communication concept, the evaluation and analysis of the communication requirements, the creation of a communication strategy, and the implementation of the communication strategy were necessary. To be in line with all partners, the consortium organized several workshops.

The organization of the consortium were split up in seven areas: internal information and communication policy, external communication, information acquisition, project funding processes, consortium agency, contract/law, and conflict management. Figure 3 and 4 depict the sub-topics of the organization strategy. All these topics had to be addressed in workshops to form an effective administration and regulatory body of the consortium.

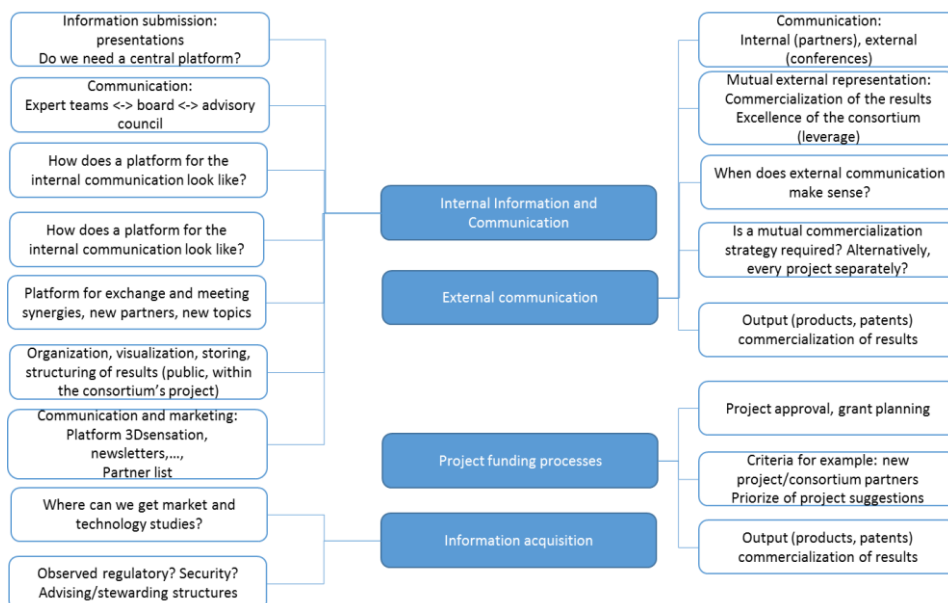


Figure 3: Important organizational areas of the consortium – I

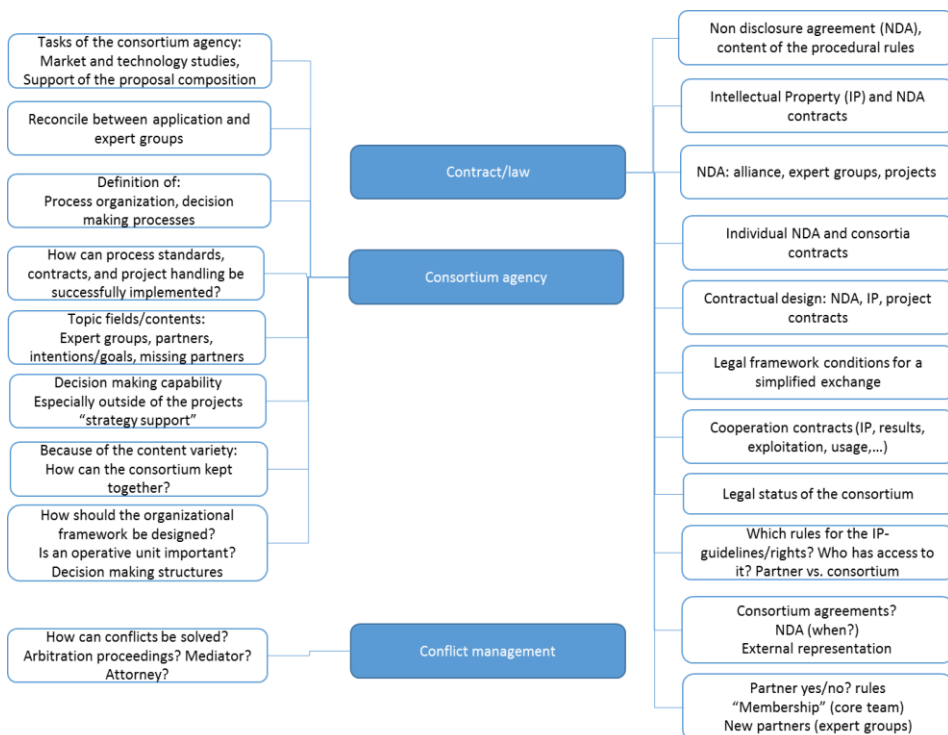


Figure 4: Important organizational areas of the consortium -II

3.3 Organization and Management of the Consortium

Multidisciplinary and multisectoral cooperation need an appropriate organization and management structure. The goal is to work together and maintain the economic independence of the partners. An efficient decision making process and work will be ensured by establishing a transparent organization structure, clear responsibilities and communication tools. Especially important was that the organization structure has allowed for and supported the extension of the consortium by new partners and new technological and social themes.

The ideas that have been invented in the consortium have been evaluated by the board and the expanded board. Those high potential ideas were partially funded from the funding organization. The funding is necessary for the companies and the research institutes because the high potential ideas are very risky and they will not realized otherwise. The financial loss would have been too much for most of the participating organizations if the ideas do not generate results. Furthermore, the funding pushes the development of technologies in which the government has a large interest in. The funded ideas in the consortium become projects and are done by several partners. However, all partners in the consortium will be informed about the funded projects and can participate in them if they have the necessary expertise. The intellectual property that is created in those funded projects is the property only of the participating organizations in the project.

3.3.1 Organisational Structure of the Consortium

The alliance has a board, an expanded board, an advisory council, a consortium agency, four expert groups, and a pool of partners (figure 5). The board and the expanded board are the most important managerial units in the consortium. The advisory council is the most important supervision unit of the consortium. The partners of the consortium participate in the decision making process by an annual general meeting.

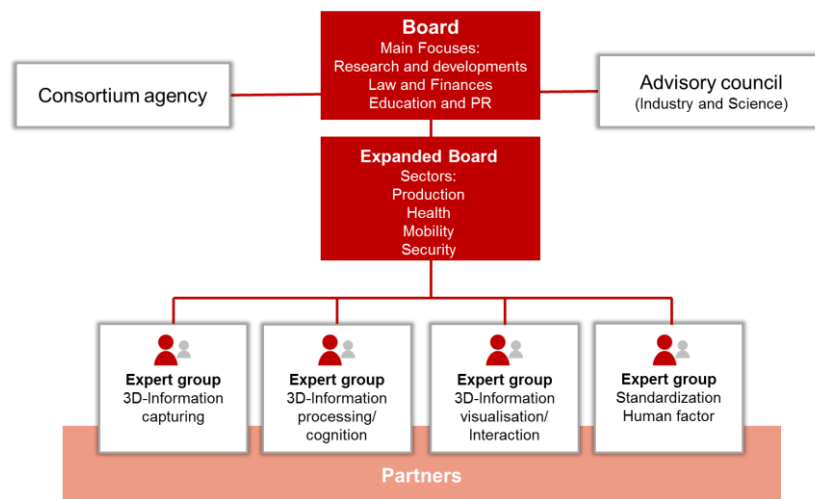


Figure 5: Organizational structure of the consortium

The **board** is responsible for the strategy in the following matters: research and development, law and finances, and education and public relation. The board determines the technical content, technology direction, and the funded projects of the consortium in coordination with the expanded board. The board must decide together with the expanded board which research and development projects, suggested by the expert groups, will be supported. Furthermore, the board decides about including new partners and technological and social themes. The extension of the consortium is possible in regard to current tasks and challenges. The board is also responsible for the financial and legal controlling of the consortium and must decide which dissemination and marketing strategy is appropriate. The board functions as the official spokesperson to the funding organization and the advisory council. Furthermore, the board calls up general meetings. The board members come from all sectors of the consortium. The board is supported by the expanded board, the advisory council and the consortium agency.

The members of the **expanded board** are subdivided in the four application sectors: production, health, mobility, and security. Each application sector is represented by one industry representative and each expert group by one scientific representative which ensures the representation of the different interests. The expanded board suggests ideas of high potential to the board. Furthermore, it sets up a roadmap and a long-term strategy of the consortium. Furthermore, the expanded board conducts target-performance comparisons of the funded projects and their results. Decisions should be made by mutual

agreement between the board and the expanded board. The general meeting elects the representatives for the expanded board every two years. Moreover, the expanded board suggests new members to the board and is responsible for conflict management in the consortium.

The representatives from the **advisory board** are experts who originate from industry, science, and society. The tasks are supervision and control of the consortium. The board gives advises about upcoming challenges in science, economy, politics, and society. Furthermore, it evaluates the consortium regarding its strategy and achievements in the light of the consortium targets. These measures make sure that the decisions of the board are in line with the interests of the partners and the funding organization.

There are four **expert groups**: 3D-information capturing, 3D-information processing, 3D-information visualization/interaction, and standardization and the human factor. The partners of the consortium are members of these expert groups and work closely with each other to solve the technical and social challenges. The workshop leaders and the expert group leaders are responsible for protocols and information as well as the dissemination on the prepared internet platform.

The responsibilities of the **consortium agency** are coordination and the support of the consortium such as diverse operative tasks and support of the strategic decision making processes by providing financial controlling figures. Operative tasks are for example the support of the board, expanded board, and advisory council, controlling and supervision of projects, communication, marketing and public relations, reporting, preparation of workshops and meetings. The consortium agency informs regularly about news. Important information/protocols/dates will be stored at a secured area on the prepared internet platform.

The **pool of partners** includes 70 organizations. They meet every year at a general meeting. The partners can always introduce ideas to the expert groups. The general meeting elects the board and the expanded board every year. Every partner is advised to be active in the consortium. Consequently, thematic workshops organized by the expert groups take place regularly and every partner is eligible to participate in those to bring in ideas, influence the expert groups, and partially determine the research direction of the whole consortium. A partner constitution defines the rights and duties of every participant. The consortium is based on open communication behaviour, trust, transparency and cooperation between its members. New members are accepted after

specific decision criteria for admission and resignation are met. When votes take place, a simple majority of the members decides.

3.3.2 Rules of Participation

The dissemination of internal information such as fact files, project ideas to externals is prohibit. As of the signing of a cooperation contract and memorandum/procedure rules, all ideas for products, services and processes have been the common property of the involved partners. It is prohibit to use an idea from the idea stock and no idea can be used exclusively by just one partner.

3.3.3 Project Creation Process in the Consortium

The ideas, as already explained, come from the partners or are created at the expert group workshops which take place regularly. The board and the expanded board evaluate and decide which proposed ideas should be funded.

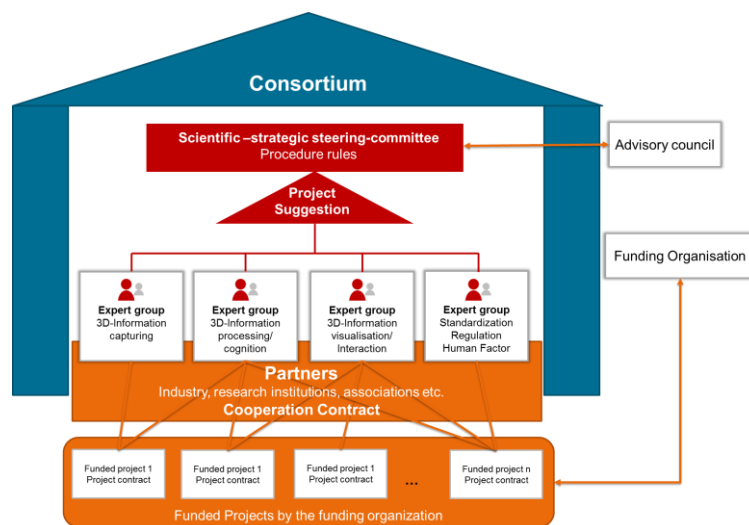


Figure 6: Project creation procedure in the consortium

The consortium uses a four step idea creation process adapted from Amabile (1983).

1. Identifying, structuring of central problems and challenges by the board and the expanded board (problem formulation)

2. Development of ideas in the technology and social science area by the expert groups and their members (Preparation and idea generation)
3. Evaluation/prioritization of ideas by the board and the expanded board (idea evaluation and idea selection)
4. Combination of the necessary expertise by the board and the expanded board (forming the project team)

The successfully evaluated ideas become funded projects and the project participating partners can start their common development. The outcome of these projects are evaluated regularly and have to fit in the overall research and development strategy to achieve the common goal of human-machine interaction and their successful adaption in applications in production, mobility, security, and healthcare.

4 Research Approach

The study is based on the consortium described in chapter 3. This publication is a pre-study to test our research model. For that reason, we tested our questionnaire by interviewing a research partner of the consortium. This research institute is the coordinator of the cooperation and has organized most of the events and moreover is responsible for the knowledge management, idea creation techniques, and organization of the strategy phase. The interview were audiotaped and transliterated. The results from that interview and further analyses will be the basis for advanced studies. At first, we plan to strengthen the research model by interviewing more partners of the same consortium. Afterwards, we plan to conduct a large survey covering multiple multidisciplinary and multisectoral cooperation. The interview was conducted with a partner that does research in 3D measurement systems.

5 Results

5.1 Motivation (Goals) and Expectation

Each partner has a specific motivation to participate in the cooperation. Reasons (goals) for participation can be for example obtaining funding, transferring technology, generating ideas, finding new employees, attracting new customers, using others infrastructure and resources, gathering complementary expertise, finding new partners for

further projects, gaining knowledge about technologies and markets, discovering new application fields of own products and services, etc. The partner of the case study consortium answered: *“The first reason for participation in a cooperation is of course the funding for the coming years. This is a totally banal expectation. [...] The next point is finding new applications for our technology. [...] Another expectation is that the industry partner will implement the technology in a product. A technology shift to application is important. [...] A further issue is that the project unveils new interesting research themes for further developments. [...] Actually, we are experts in specific technology areas... but we want to know where we can apply our technologies and which technology modifications are needed to create new applications [...] sometimes we get good application ideas from companies. [...] it is not only about finding new applications, we also want to get contact to new customers [...] usage of resources of other participating partners: I say that this is an issue at very interdisciplinary projects. At the standard technology projects, we have the necessary infrastructure and expertise [...] Maybe sometimes our partners provide a specific technical component [...] at very interdisciplinary projects for example in the biology area, we must provide a biochip for biomaterial analysing. That is more as we can offer and then we do need external resources.*

The expectations of the partners signify to which extend the cooperation goals can be achieved. Small expectations mean the partner does not believe that the goals of the cooperation can be accomplished and high expectations mean the opposite.

Each partner has a specific expectation and a specific motivation about the output of the cooperation. We wanted to know if the extend of the expectations influence the success of the cooperation and what influence the different motivations will have on the success of the cooperation.

5.2 Perceived Risks

Partners often perceive risks when they participate in cooperation. These risks might be for example draining of knowledge to competitors, poaching of labour, wasting time and resources, usage of own ideas by others, sneaking out of the organizational strategy by others. The test questioning resulted in the following statements: *“[...] I know other people think differently but in my opinion there is no risk. Indeed, I want to work together with the partner. [...] cooperation always mean that partner companies are interested in*

employees and know how [...] it is a matter of coping with those issues [...] of course, I won't unveil every detail to the partners [...] I believe it is critical if you see risks in a partnership, by doing so you will be restrained towards your partners [...] I know colleagues who do so but that is not a good way. A company understands if you do not want to give away everything [technology], but if you do so with such restrains such as I go my own way and I do not want to tell you something. The partner will notice. One might think, does they want to cooperate or not?"

5.3 Experiences

Experiences made in other cooperation might influence the partner's behaviour in the present consortium. Good or bad experience can be made in regard to know-how protection, fulfill the obligations and tasks that are agreed on (work, funding, etc.).

The case study interview revealed: *"There were cooperation with much trust and with less trust, but I think companies have to be more aware of being trustful regarding of their know-how protection. Research institutes do not need to be so."*

5.4 Base of Trust

Trust is one of the most important requirements of forming a consortium because without trust the partners hesitate to share ideas. Questions were for example: Do you trust the participating partners? What is the base of trust and is an open idea exchange within the consortium possible?

The research partner in our case study mentioned: *"[...] I think it is very important to tell your partners about your goals, what you are planning to do, about the chances and about the risks. [...] It is not good to tell your partners something out of the blue. It is better to tell them there are chances to have an outcome of the project. However, there are also some risks."* Furthermore, we wanted to know if the length of the partnership and knowing the partner for a long time play a role in the base of trust. Our case study partner answered no.

5.5 Organizational Structure and Rules

The case study consortium uses non-disclosure agreements, a constitution, cooperation agreements, and intellectual property regulations to provide a structural framework and to rule the consortium. Every partner has to sign a non-disclosure

agreement before being accepted in the consortium. The constitution rules the decision procedure and defines the organizational structure (see figure 5). Cooperation agreements rule the mutual work during the funded projects and the intellectual property regulations determine how to protect the ideas that have been developed during the expert group sessions. Issues to be ruled in these agreements and regulations are for example who makes decisions if controversy opinions occur, what is the procedure for problem solving, to which extend should be rules determined at the beginning of the project? Has it disadvantages if to many details are ruled by agreements and contracts? Alternatively, a consensus finding approach in the consortium could be a fruitful problem solving. Our case study interview resulted regarding these points: *“It should be determined in the consortium. Otherwise, it ought to be arranged in the contract.”* The interviewee said that it was mainly a matter of contracts and it was not about who had more power. Non-disclosure agreements are common in such consortiums. A matter of discussion is how detailed a cooperation agreement should be. If it is too detailed the partners will either discussing about minor point and this takes too long or the trust in the consortiums drops because a too detailed agreement signifies distrust. Our interviewee was that a cooperation agreement should not be too detailed. *“The best way is to provide a framework and be trustfully and the willingness to compromise when facing problems.”*

An appropriate organizational structure of the consortium is also a decisive factor for the success of a cooperation. Important questions are for example: can there be too much or too less organization? What can be improved regarding organizational structures and the consortium lead? Our case study interviewee mentioned to this subject: *“Every cooperation should have a structure. Who is going to be the coordinator depends on the funding. If the funding organization wants to have a strong applied and industry focus, it is be required that the coordinator is a company. Usually, the research institute is the coordinator or at least the hidden coordinator, because the administration effort is high and companies will not do it. [...] usually, there is too little coordination effort in cooperation. The people sometimes fall behind their goals and then try to cope with their duties when a report has to be composed. Project meetings are scheduled and the partners have to prepare their outcome presentations. This is always a good occasion to motivate the collaboration partners to keep up with the work. A problem is that sometimes there is no continuous work on the project. A project controlling would be a useful measure to improve the outcome and foster the project development. But it is not easy to*

implement if there are people who you cannot oblige to work further on the project. There should be some viable measures to force the project partners to keep on track with the project plan.”

5.6 Innovation Culture

The Innovation culture in a consortium is very important. Important factors play a role for example: openness to criticism, possibility to admit errors (failure tolerance), openness for idea exchange. We have wanted to know if a good innovation culture fosters idea generation and innovation culture. The interview partner from our case study example argued: *“Some partners give detailed hints regarding things to notice and things we have to scrutinize to have success. Furthermore, constructive criticism will be expressed.”*

5.7 Mutual Idea Generation

The research question for us has been: how can mutual idea generation work in cooperation and specifically how can it be fostered. There are many idea creation tools and techniques available. The question is if they are used? Our interviewee from our case study cooperation admitted: *“There are no tools that we have used to foster idea creation. There should but there was nothing.”*

Holding idea creation workshops is an effective possibility to develop mutually new ideas. We wanted to know from our case study interviewee if it had been used in his past cooperation. The interviewee answered: *“Most of the time, a project meeting is being used to exchange ideas and to present the latest developments. At the beginning of the project, there are sometimes workshops in which the problem is being defined and a fundamental solution is being searched. During the project until the end of the project, the idea search is getting gradually smaller. [...] An idea creation workshop might make sense at the beginning and in the middle of a project.”* Information technologies has given us many new ways to communicate and to exchange ideas. Are these technical possibilities used especially in research institutes as cooperation partners? Our interviewee from a research institute answered: *“Meetings are the best way to exchange ideas.”* That mean that face time is still the best way to exchange ideas regarding to our interviewee. Nevertheless, virtual meetings are a new way to connect and hold meetings face to face. We wanted to know if those virtual meetings are as effective

as regular meetings. Our interviewee's opinion was: *"There is a trend to hold virtual meetings. However, physical meetings are more effective."*

5.8 Knowledge/Know-How Exchange

For gathering and exchange knowledge (documents, studies, data, etc.) for example, tools can be used such as Intranet webpage, Dropbox, and Googledocs. The answer of our interviewee were: *"There has been no preferred way. There was one occasion in which one partner wanted to have a separate data exchange transfer with the research institute and did not want that other partners know."* Consequently, we asked if more knowledge management and tools for idea creation used should be used and if it is useful for the cooperation. Our interviewee stated: *"Yes I think. A project server as knowledge management tools is a useful tool. There is often a moment when you think about a presentation at a former project meeting and you want to see the slides. Then, if there is a well maintained project server one can download the presentation one needs."* The interviewee thinks a project server is the most efficient tool to exchange knowledge: *"A project server is a very practical tool and the implementation is easy."* Another tool to exchange knowledge are social networks such as Xing and LinkedIn but our interviewee thought it is not useful.

Is there a methodical approach? *"There is no methodical approach. It is just common sense. When a project starts one will know what we have to do, is there any problem, and how can we solve it. That is not a sophisticated method. It would be a good idea if there we use a method."*

There are many possibilities available how a consortium a mutual creation and development can design. Within the last years, many software and cloud services appeared and offer the possibility to share data, form work teams, and talk to each other. Those digital platforms are for example Live Link, Moodle, etc., data exchange platforms such as Googledocs, etc., information exchange platforms such as wikis, blogs, forums, social media platforms such as Facebook, Xing, Research Gate, etc.

5.9 New Products/Services, Technologies and acquired knowledge based on the Combination of different Technologies for multiple Applications

There are many ways to measure the success of cooperation and the opinions what a success is differ. Individual success depends on the goals of each participant. We measure

the success of the mutual idea generation and the knowledge/know-how exchange by the amount and the quality of new ideas. Moreover, it is even rated as success when knowledge has been learned in a common project and there has been no further outcome. Our case study interviewee replied that many interdisciplinary cooperation result in learning effects and knowledge which cannot instantly used for new products especially when research institutes are involved. This knowledge might be useful in the future at later projects.

5.10 Outside-In and Inside-Out Technology Exploitation

Furthermore, we screen the outside-in and inside-out knowledge exploitation. If the partners of the cooperation origin from different application and technology fields, it gives the larger opportunity of a better market coverage and a mutual exploitation strategy than partners from the same technology area. For example, an option is that different partners cover different stages of the value chain and built up a supply, distribution, and sales chain. That enables benefits for all participating organizations and is rated as success of the cooperation.

6 Conclusion

The study has shown that the factors partner perspective and cooperation background influence the idea creation and the mutual knowledge management in multidisciplinary and multisectoral cooperation. We tested our research model with a research partner of a large cooperation in the 3D measurement area. The following table provides a summary of the results of the case study.

Factors	First Results from the Case Study
Partner's Perspective	
Motivation (Goals) and Expectation	Important reasons for the participation in the case study cooperation were the idea generation about new applications of the existing technology and learning of multidisciplinary knowledge about technologies and their applications. Partners should have appropriate expectations towards the cooperation. Too low expectations signify bias and may hinder idea creation by an engagement.
Perceived Risks	Risk awareness can influence the behaviour of the participating partners regarding their idea generation potential in a cooperation. The interviewed partner has not seen risks, such as knowledge drain, and if there are risks it is a matter of coping with them. So,

	potential risks should not prevent partners from exchanging ideas. Otherwise, the cooperation will fail. Tools such as non-disclosure and cooperation agreements reduce those knowledge related risks.
Experiences	Prior made experiences influence the level of trust in cooperation. Research institutes in comparison to companies sometimes do not need to be so concerned about their know-how protection.
Cooperation Background	
Base of Trust	Goals of the partners should not be a secret in the cooperation. This rises distrust and hinders idea creation and knowledge exchange.
Organizational Structure and Rules	Rules especially regarding to ideas and knowledge exchange should be determined by contracts. Non-disclosure agreements are usually used. The cooperation agreement and the organizational structure should provide a framework for trust and improve idea creation and knowledge exchange. Over detailed agreements raise distrust and hinder idea generation. The coordinator of the cooperation also influences the success of the idea generation in the cooperation. Partners call fall behind their goals and stay inactive for a long time. A strong coordinator takes care of the idea generation and thus advances the knowledge output of the cooperation.
Innovation Culture	Getting feedback about ideas is important in a cooperation but the feedback must be constructive. Otherwise it will hinder idea generation.
Mutual Knowledge Management	
Mutual Idea Generation	There are many idea creation tools available but they are not used often. Project meetings are being used to exchange ideas and present latest developments. At the start of the cooperation, workshops are used for problem defining and searching for fundamental solutions. While the project is running, idea generation lowers. Despite of many new digital possibilities of meeting people, face to face meetings are always the most effective way to create and exchange ideas.
Knowledge Exchange	Regarding to our interviewee, a well maintained project server is the best way to exchange data and ideas, and keep a knowledge record of the project.
Coupled Open Innovation Performance of Multidisciplinary and Multisectoral Cooperation	
New Products/ Services, Technologies and acquired knowledge based on the Combination of different Technologies for multiple Applications	The transition of research and development ideas into products is always the top goal. If it is sometimes not possible, a learning process of multidisciplinary technology knowledge and multidisciplinary application knowledge and thus the extension of the knowledge base is a successful outcome.
Outside In and Inside Out Technology Exploitation	A mutual exploitation for example for organizations along the value creation chain is profitable. Furthermore, the access to diverse markets with new applications by using the help of partners is a success for the cooperation.

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Behavior-based performance management: the value of arts to human performance

Karim Moustaghfir*

Al Akhawayn University in Ifrane,
Avenue Hassan II PO Box 104, Ifrane, 53000, Morocco

Daniela Carlucci

Centre for Value Management, DICEM
University of Basilicata
Via dell'Ateneo Lucano, 10, 85100 Potenza, Italy

Giovanni Schiuma

University of the Arts, London (UK)

** Corresponding author*

Structured Abstract

Purpose – In an ever-changing business environment, organizations have begun to recognize the importance of behaviors that emphasize employee initiative, such as making constructive suggestions for change and innovation (LePine and Van Dyne, 2001). Different initiatives have been taken by private and public organizations to leverage arts as potential drivers and motivational factors spurring people to act in a certain way and create value. However, we still lack research that builds on behavioral studies to investigate the relationship between arts-based initiatives and individual and group performance. This paper recognizes such limitations, shows the centrality of understanding human behavior to optimize performance-oriented actions, provides a theoretical framework that emphasizes behavior's antecedents and consequences, and addresses the value of arts from both theoretical and practical perspectives in cultivating the right attitudes that have the potential to drive consequently people actions and performance.

Design/methodology/approach – This research is based on a thorough literature review including five major fields: human resource development, applied psychology, the knowledge-based view of the firm, performance management, and arts-based management. The purpose is to review the theoretical assumptions of each field and develop a theoretical framework that draws connections between arts-based initiatives, behavioral drivers, contextual factors, and human performance. This research will also draw on a few cases to provide empirical evidence on how arts-based initiatives affect human performance through behavioral alignment and outcomes.

Originality/value – This research provides a theoretical framework and empirical evidence on how arts-based initiatives drive behavior and human performance. This will help organizations to better understand the behavioral consequences of arts-based initiatives and how they translate into performance outcomes.

Practical implications – This research suggests new assumptions and perspectives that show the centrality of human behavior in organizations and lays the foundations of a behavior-based performance management model. Such an understanding will help both scholars and practitioners develop theories and tools linking arts-based investments to individual and organizational performance outcomes.

Keywords – behavior-based performance, arts-based initiatives, behavior antecedents, behavior consequences, performance management

Paper type – Academic Research Paper

1 Introduction

In the current era, characterized by dynamic societal, technological, and economic changes as well as an increasing diversity in the workforce, previous approaches to job performance are being challenged. We can identify at least two distinct perspectives to job performance: behavioral and outcome (Campbell et al., 1993; Sonnentag and Frese, 2002). Performance in effect encompasses different dimensions and there is a need to focus on specific behaviors that contribute to organizational effectiveness in particular jobs, work groups, and organizations (LePine and Van Dyne, 2001).

For over 50 years, scholars have recognized the importance of behavior that is not strictly role prescribed but contributes to organizational effectiveness indirectly through the development and maintenance of the organization's social and psychological context (e.g. Barnard, 1938; Katz and Kahn, 1978; LePine and Van Dyne, 2001). Borman and Motowidlo (1997) distinguished between two types of performance: Task performance that focuses on valuable behaviors that contribute to the core technical activities and contextual performance which includes behaviors that maintain or improve the organizational, social or psychological environment of work (Motowidlo et al., 1997). This view is also consistently reflected in team process research (e.g. Stewart and Barrick, 2000) where team effectiveness or success has been shown to depend on two

mechanisms: behaviors related to the task itself (technical) and behaviors that promote the socio-emotional context of the group (social).

Job performance in organizations is greatly influenced by organizational constraints (Evans, 1986). Individual behavior is also a primary determinant of two categories of organizational outcomes: the level of organizational performance and the level of organization members' individual development (Robertson et al., 1993). Researchers in the field of organizational behavior focus on the study and understanding of individual and group behavior and patterns of structure in order to improve organizational performance and effectiveness (Mullins, 2005; Robbins, 2005).

Investments have also been made in different organizational systems to direct individual and group behavior and enhance their motivation, commitment and engagement. Different initiatives have been taken by private and public organizations to leverage arts as potential drivers and motivational factors spurring people to act in a certain way and create value. However, we still lack research that builds on behavioral studies to investigate the relationship between arts-based initiatives and individual and group performance. This paper recognizes such limitations, shows the centrality of understanding human behavior to optimize performance-oriented actions, provides a theoretical framework that emphasizes behavior' antecedents and consequences, and addresses the value of arts from both theoretical and practical perspectives in cultivating the right attitudes that have the potential to drive consequently people actions and performance. This research sheds also light on the interplay between arts-based initiatives, contextual factors, and various behavioral drivers. The objective is to gain a better understanding of behavior dynamics in organizations and their effect on people performance through the lens of arts-based initiatives. Such an understanding will help to lay the foundations for a behavior-based performance management model linking arts-based initiatives to individual and organizational performance.

For this purpose, this research draws on the following guiding principles: (1) organizations are contexts within which people behave (Robertson et al., 1993), (2) effective behavior of individuals in organizations is multifaceted (Evans, 1986), and (3) any behavior is always a function of person and situation (Lewin, 1936; Rosenstiel, 2011).

This research is based on a literature review encompassing published scholarly articles in applied psychology, organizational behavior, organization development,

performance management, human resource development, and arts-based management. Specific keywords in relation to behavior and performance constructs were used to search two journal databases: EBSCO and JSTOR. The articles were then reviewed, and selected based on their relevance for the study. The retained articles were summarized and stored in a Procite database and the main findings are presented in this paper.

The aim of this paper is to show the importance of integrating the construct of behavior in performance management research and practice and provide guidelines on how performance management can learn from both research in organizational behavior and human resource development and practice in arts-based management to develop more appropriate tools that can help organizations enhance their effectiveness.

The remainder of this paper is organized as follows: first, we define behavior from both psychological and organizational perspectives. Then, we identify the major antecedents and drivers of individual behavior in organizations, emphasizing those factors that can influence and direct people behaviors in work settings, and we discuss the behavior consequences and their effects on individual and group performance and organizational effectiveness. Next, we investigate how arts-based initiatives represent behavioral and performance drivers. Finally, we provide guidelines showing the centrality of human behavior in performance management research and practice, and we present empirical evidence based on case studies to demonstrate the value of arts to human performance.

2 Explicating behavior

The study of behavior can be viewed in terms of three main disciplines – psychology, sociology, and anthropology (Chaneta, 2010). Effective behavior of individuals in organizations is multifaceted. Human behavior is both a function of person and context and a function of their interrelationships (e.g. Edwards, 1996: person-environment fit; Conrad and Haynes, 2001: actor-structure dualism). Weiner (1986) and other researchers have demonstrated the usefulness of distinguishing between internal and external as well as stable and unstable factors, which have distinct emotional and motivational consequences.

A central concept to understanding human behavior is the notion of attitude. An attitude is a learned predisposition to respond in a consistently favorable or unfavorable

manner with respect to a given object (Fishbein and Ajzan, 1975). When specific attitudes are organized into a hierarchical structure, they comprise value systems (Katz, 1964). Attitudes can be examined through the use of a model that treats the concept from the arousal process (Guerin, 1970): (1) a cognitive factor acts as a stimulus, (2) it is interpreted through the needs and value system of the individual, (3) then the attitude is aroused. Following this process, attitudes act as behavioral triggers based on a stimulus-response consistency (Katz, 1964).

The stimulus-response consistency refers also to our perception or the process whereby individuals organize and interpret their sensory impressions in order to give meaning to their environment and construct what they call reality (Robbins and DeCenzo, 2008). Different factors shape and sometimes distort perception and consequently our intention to engage or not in a certain behavior. These factors can reside in the perceiver (i.e. personality, motives, interests, past experiences etc.), in the object being perceived, or in the context in which perception is made. Hayek (1952) asserts that stimuli cannot be perceived by an individual in their original and pure shape, they are only perceived when connected with other stimuli. Also, perceiving is not a passive act; it entails an act of interpretation (Rizzello, 1999). Such an interpretation refers to individuals' genetic background and individual experience, but also to primary dispositions that developed over time in society. An example of such dispositions is habit whereby individuals engage in previously adopted or acquired behavior or thoughts, triggered by an appropriate stimulus or context (Hodgson, 2006).

Philosophy, psychology and sociology suggest that people explain intentional behavior differently from unintentional behavior, and these different explanations have typically been called respectively reason explanations (Kalish, 1998) and causal explanations (Heider, 1958). Most authors describe reasons as mental states like beliefs or desires that both motivate and rationally support intentional action (e.g. Anscombe, 1957; Davidson, 1963; Goldman, 1970), and they describe intentions as mediating between reasons and action (Brand, 1984; Bratman, 1987; Mele, 1992; Searle, 1993). Intentionality consists hence in a self-reflective control which we exercise over our current behavior (Joas, 1996).

Attribution theory has been the predominant psychological account of people's behavior explanations, focusing on the various causes that people assign to behavior (e.g. Heider, 1958; Jones and Davis, 1965; Kelly, 1967, 1973; Weiner, 1986). Through

processes of perception and attribution, individuals form beliefs regarding their organizational environment (Robertson et al., 1993). These beliefs, energize, direct, and regulate behavior (Bernstein and Burke, 1989). Actors tend to attribute their own behavior to situational causes whereas observers tend to attribute the same behaviors to stable dispositions (Jones and Nisbett, 1972). Cognitive dissonance theory asserts that individuals will behave in a manner that supports their attitudes and beliefs to avoid the dissonance (negative stimulation) that is caused by an inconsistency between opposed beliefs and behavior (Festinger, 1957).

It is largely recognized that people perception, attitudes, intentions and behaviors are driven by their personality. An individual's personality is the combination of the psychological traits that characterize that person (Robbins and DeCenzo, 2008). Nearly all personality traits that can be diagnosed in adults – whether cognitive or motivational – are genetically based to a certain extent and therefore largely stable (Rosenstiel, 2011). A widely used model to view personality is the Big Five Model (Digman, 1990) that delineates five factors of personality including extroversion, agreeableness, conscientiousness, emotional stability, and openness to experience. Research has shown that important relationships exist between these personality dimensions and job performance (e.g. Vittorio et al., 2001; Hurtz and Donovan, 2000; Hochwarter et al., 2000).

There is also a growing recognition that individual values play an important role in shaping employees' work behaviors (Higgs and Lichtenstein, 2010; Meglino and Ravlin, 1998; Cha and Edmonson, 2006). Hayek (1952) views individuals as driven by moral sentiments that can never be explained following a fully rational concept (Gick, 2003). Allport (1955) also emphasized that individual's value priorities influence their perception of reality and in turn their behavior. Caprara et al. (2006) found that values were more powerful in explaining behavioral variation than personality traits. Personality traits are largely endogenous characteristics whilst personal values are learned adaptations strongly influenced by the environment (Oliver and Mooradian, 2003).

While people respond to the way they perceive their environment this facilitates their learning. Learning theorists typically segment learning into three different distinct stages that represent the different learning processes occurring over time (Mone and Shalley, 1995; Kanfer and Ackerman, 1989): declarative stage, knowledge compilation stage, and procedural stage of learning. Social learning theory (Bandura, 1977) recognizes that

individuals learn through both observation and direct experience. In fact, learning is defined as any relatively permanent change in behavior that occurs as a result of experience (Robbins and DeCenzo, 2008). Motives, personal preferences and attitudes change and develop over time, and these changes have an impact on work behavior (Schalk et al., 2011).

Learning behavior is a process forming and storing a connection between a stimulating signal and a specifically resulting signal (Whitlock et al., 2006). Operant conditioning (Skinner, 1971) argues that behavior is a function of its consequences. Operant behavior is voluntary or learned rather than reflexive or unlearned behavior. When consequences are pleasant, people tend to repeat and reinforce their behaviors. Manz and Sims (1980) define reinforcement contingencies as environmental cues that precede employee behavior (i.e., discriminative stimuli), and to the rewards that subsequently reinforce employee behavior.

When learning occurs, new knowledge is acquired. Knowledge is memorized in rules of perception and in rules of conduct (Hayek, 1978). Rules include norms of behavior and social conventions as well as legal rules (Hodgson, 2006). Knowledge can also be regarded as mental model or belief (North and Denzau, 1994). Knowledge is a stable connection between one signal (event) and another signal (event) owned by an individual. New knowledge is from new signals. Accumulation of knowledge is the storage of the stable connections (Zhu and Zhao, 2008). Such stable connections are mainly synaptic connections in human brain transmitting, receiving and processing electrical-chemical signals from neurotransmitters within a synapse. Cognitive theory indicates that knowledge serves as the medium for the formation and maintenance of schemes (Gagnon et al., 2008). Schemes are cognitive structures that individuals create and use to make order of the world.

When receiving a signal or feedback signal from outside, an individual processes it, compares it with stable and unstable preferences and knowledge, then maintains the original preferences, knowledge and behavioral pattern, or adjusts them and forms the new ones (Zhu and Zhao, 1998). When a new signal just causes the unstable knowledge to change, an individual behavior pattern may be changed. Such complex dynamics make both rationality and bounded rationality very limitative in explaining human behavior in its entirety (Cosmides et al., 1994).

This discussion leads us to the following proposition:

Proposition 1: Behavior is a consequence of a perceptual process involving external stimuli and the individual value system. Individual personality plays a moderating role between perception, attitudes, intentions, and behaviors. Learning is a consequence to individual behavior and it occurs through shaping up the unstable patterns of personality.

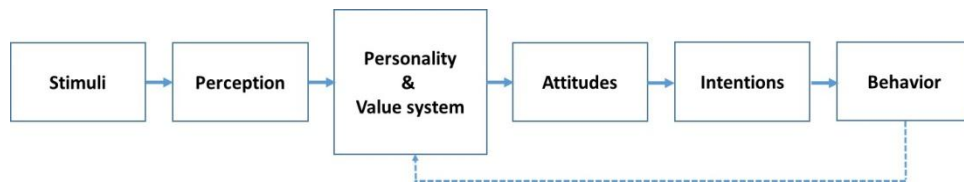


Figure 1: Explicating behavior

3.1 Behavior antecedents

Whilst the social psychology literature suggests that social norms and personal attitudes predict human behavior (Fishbein and Ajzan, 1975; Trafimow, 2000) the social cognitive theory explains human functioning in terms of a triadic model of dynamic interplay between the environment, individual cognitive state and attitudes (Bandura, 1977). Behavior is also affected by patterns of organizational structure, technology, styles of leadership and systems of management (Chaneta, 2010). An organizational work setting comprises four major interrelated subsystems: organizing arrangements, social factors, technology, and physical setting (Porrás, 1987; Porrás and Robertson, 1992). Rosenstiel (2011) states that “the behavior of people in organizations is not only dependent on the characteristics of the person but also on the general conditions, the rules, regulations, job descriptions and other explicit guidelines, but also on informal norms inside the group and the corporate culture, but also on hard conducive or obstructive conditions (i.e. resources and barriers).”

The variables affecting behavior fall into three major classes: (1) ability to do the job, (2) motivation to do the job, and (3) external factors that facilitate or constrain doing the job (Evans, 1986). Thorndike (1920), as well as contemporary scholars of intelligence (e.g., Gardner, 1983; Sternberg et al., 2000), recognized that a model of intelligence based only on intellectual capacity and abilities is insufficient to explain human capabilities and behavior in real life (Ashkanasy and Daus, 2005). Emotions should also be considered as

part of human intelligence. Some scholars have characterized this type of intelligence as emotional intelligence defined as an individual's ability to perceive emotion in self and others, to understand emotion, and then to manage emotion in self and others (Barsade et al., 2003; Salovey and Mayer 1990; Mayer and Salovey, 1997; Ashkanasy and Daus, 2005; Sala, 2002).

Motivation variables include the intrapersonal concepts of intention, cognition (sense of efficacy and performance-reward expectancies), and values (Evans, 1986). We can identify three major theories of motivation: expectancy theory (Vroom, 1964), goal setting theory (Locke et al., 1981), and achievement theory (e.g. Weiner, 1972). The rapprochement among these theories has been based on a large extent on the social learning theory developed by Bandura (1977) and articulated by Weiner (1985). Motivation is different from satisfaction. While motivation is generally defined as the energy spurring people to act in a certain way, job satisfaction is mostly viewed as an attitude to different facets of the work situation (Neuberger and Allerbeck, 1978). Satisfaction or the emotional states resulting from the positive evaluation of work experiences influence organizational climate. Motivation is also related to commitment defined as an individual's attachment and willingness to support his or her organization (Mowday et al., 1982).

The job characteristics model (Hackman and Oldham, 1980) posits that job characteristics (comprising skill variety, task identity, task significance, autonomy and feedback) should enhance work performance through three psychological states (experienced meaningfulness, experienced responsibility and knowledge of results). The job characteristics affect performance and satisfaction through motivation (Evans, 1986). For instance, feedback as a determinant of behavior receives much attention in the management literature (Balcazar et al., 1985; Locke and Latham, 1990). By feedback we mean objective data about performance against goals. Individual behavior is influenced by the goals that a person chooses or accepts. Although people have been shown to use search-reduction heuristics in past research (e.g. Payne, 1976), Mone and Shalley (1995) found that individuals with specific difficult goals on complex tasks actually engaged in greater change in strategy. Role conflict, role ambiguity, and experienced stress would also affect the extent to which goals and intentions can be translated into accomplishment.

Goal setting and acceptance as well as feedback-seeking behavior are influenced by individual and organizational cultural orientation (De Luque and Sommer, 2000). An

organization, too, has personality which we call its culture (Chaneta, 2010). Organizational culture is a system of shared meaning within an organization that determines, in large degree, how employees act (Robbins and Coulter, 1996). In every organization there are systems or patterns of values, symbols, rituals, myths, and practices that have evolved over time (Chaneta, 2010). Hofstede (1980) developed four value dimensions along which culture may vary: (1) individualism-collectivism; (2) uncertainty avoidance; (3) quantity-quality; and (4) power distance. Such dimensions direct individual behavior.

Individual work behavior is driven by personal goals and organizational factors as well as social networks (Robertson et al., 1993). For instance, group pressures and dynamics including groupthink and social loafing can have a major influence over the behavior and performance of individual members (Albanese and Van Fleet, 1985; Chaneta, 2010). In a social system, the behavior among the members is ensured by altruism, solidarity, sympathy and group decisions and is considered the morality of the small group (Hayek, 1979). Multilevel analysis showed that collective efficacy, or the shared perception of team capability, influences the extent to which an individual engage in a certain behavior (Bandura, 1977; Tasa et al., 2011).

Other organizational factors including leadership and empowerment can influence individual behavior. Leadership can be described as a process through which the supervisor structures reinforcement contingencies that modify the behavior of subordinates (Sims, 1977). Leadership has implications for developing commitment and increasing compliance in task behavior, influencing group maintenance and identification, and influencing the culture and climate of an organization (Guzzo and Salas, 1995; Bass, 1990). Similarly, Empowerment climate and psychological empowerment play complementary roles in engendering individual and team performance behaviors (Tuuli and Rowlinson, 2009).

This discussion leads us to the following proposition:

Proposition 2: Different individual and organizational factors influence the perceptual process and affect consequently individual attitudes, intentions, and behavior. Such factors include for instance individual cognition and intelligence, motivational characteristics, job characteristics, the management system, and the organizational culture.

3.2 Behavior consequences

Job performance behaviors are defined as the measurable behaviors that are relevant to the achievement of organizational goals (Campbell et al., 1993). A study conducted by Choi (2004) determined that both organizational context and individual characteristics influence employees' innovation-use behavior. In a similar vein, Dorenbosch et al. (2005) found a strong positive relationship, indicating that a proactive attitude as ownership promotes the generation and implementation of ideas within the work context. Motowidlo et al. (1997) also specify a stronger link between personality characteristics and contextual performance. Similarly, individual psychological characteristics including perceived self-efficacy, personality, and commitment were identified as determinants for knowledge sharing as an individual behavior (O'Reilly and Chatman, 1986; Bock and Kim, 2002; Cabrera et al., 2006; Wang, 2004).

Contextual performance research has focused primarily on conformistic or cooperative behaviors and not on change-oriented behaviors such as voice (Speier and Frese, 1997). Scholars have begun to recognize the importance of behaviors that emphasize employee initiative, such as making constructive suggestions for change (e.g., LePine and Van Dyne, 1998; Nemeth and Staw, 1989; Scott and Bruce, 1994).

Organizational qualities such as decentralization, job enlargement and participative management can also promote behaviors that result in beneficial experiences for organization members (e.g. Likert, 1967; McGregor, 1960). In contrast, organizational characteristics designed to control members' behavior can generate behavioral reactions such as aggression, withdrawal, apathy, and minimization of the amount of work performed (Strauss, 1963). An increased body of evidence suggests also that strong cultures are associated with high organizational performance through their effect on individual behavior (Chaneta, 2010).

Organizational researchers have been investigating the relationship between job satisfaction, job performance and productivity for decades. However, they have been unsuccessful in finding strong or consistent correlations between these constructs (Brayfield and Crockett, 1955; Vroom, 1964; Johnston, 1976). For instance, Waters et al., (1974) found no relationship between the climate dimensions and the effort and performance variables. Similarly, Fisher (1980) asserts that neither organizational climate nor leadership style has been unambiguously and consistently related to individual performance.

Early empirical research in psychology indicated that motivation and performance are significantly influenced by feedback (Ammons, 1956). Those in the field of organizational behavior continue to promote feedback as a cue for motivation, performance, and learning (Castellan and Swaine, 1977; Earley, 1988; Koestner et al., 1987; Lee and Yates, 1992; Vroom, 1964). The motivation of employees to engage in proactive or extra-role behavior is the focus of research on concepts such as ‘organizational citizenship behavior’ (Organ, 1988), ‘personal initiative’ (Frese et al., 1996), ‘employee creativity’ (Oldham and Cummings, 1996) or ‘critical reflective behavior’ (Van Woerkom, 2003).

Team effectiveness has also been shown to depend on two mechanisms: behaviors related to the task itself (technical) and behaviors that promote the socio-emotional context of the group (social) (Stewart and Barrick, 2000). Teamwork behavior is described as activities that are devoted to enhancing the quality of the interactions, interdependencies, cooperation, and coordination of teams (Morgan et al., 1993). Collective efficacy influences the relations between individual traits and behaviors in teams (Tasa et al., 2011). Collective efficacy has been shown to relate to group cohesion (Lee et al., 2002; Lent et al., 2006) and group cooperation and communication (Lester et al., 2002). In contrast, negative group behaviors such as ego-defensiveness resulting from the dissonance created by pressure of threat or inducement may lead to hostility, rationalization, and withdrawal may be the consequence (Guerin, 1970).

This discussion leads us to the following proposition:

Proposition 3: Individual behavior affects team and organizational performance. Such performance translates into cooperative and/or change-oriented behavior, positive working atmosphere, an organizational climate conducive to learning and productivity, and increased individual motivation and commitment.

4 Implications for performance management

The analysis of the interplay between individual characteristics and organizational elements, their influence on both intentional and unintentional behavior, and the subsequent effects in terms of satisfaction, motivation and performance will help us address specific principles that can guide the development of behavior-based performance management systems in organizations.

First, there is a clear need to distinguish between measuring behavioral antecedents and triggers, employee behavior at work, motivation and performance. Referring to job satisfaction and the difficulty to establish a relationship between this construct and employee productivity, Fisher (1980) suggests that attitude measures should be related to specific job behaviors, while general satisfaction measures should be related to the favorableness or unfavorableness of an individual's total set of work-related behavior.

Second, there is a need to integrate human behavior as a variable in existing performance management and measurement systems and tools. Most of the existing systems try to establish a cause-effect relationship between organizational investments in human capital, processes, and performance consequences taking for granted that these investments will help people achieve their goals and without a clear understanding of how such investments can push people to act in a certain way. Behavioral dynamics in relation to such organizational initiatives remains a missing area of research in performance management.

Third, there is a need for more qualitative measures to understand employee behavior and to link it to desirable organizational objectives. The majority of existing goal-setting studies that measure performance have a primarily focus on quantity rather than quality measures (Austin and Bobko, 1985). An alternative venue would be to integrate the four measurement criteria suggested by Kirkpatrick (1987) including subjective reactions, improvement of knowledge, change of behavior, and then 'hard' performance improvements.

Fourth, we should rethink the way individual and team performance are managed in organizations and adopt a holistic perspective that encompasses different organizational and managerial characteristics and considers the interplay between such elements and individual characteristics. Structural variables, culture, communication, job and process design, management functions and leadership styles all influence people attitudes through perceptual mechanisms that draw on stable personality traits, mental states and learned behavioral patterns. Efforts should be made to relate organizational, structural and managerial characteristics to desired behavioral patterns for a better alignment between strategic and operational objectives and behavior expectations and changes.

Fifth, to build a performance management system conducive to learning, motivation, and performance, we can open up the field's boundaries to integrate frameworks, models and applications from other fields like human resource management and development

(Swanson and Holton III, 2001), organizational behavior (Robbins, 2005), organization development (McLean, 2006) and applied psychology (DuBrin, 2004). Over the past years, large body of knowledge was consolidated in such fields to disentangle the complexities revolving around human and group dynamics in organizations and develop planned interventions using behavioral-science knowledge to increase organizational effectiveness. For instance, in human resource management different applications proved to be successful in boosting individual and organizational performance including behavioral interviewing techniques to ensure a better person-organization fit, employee orientation processes, training and development, performance and potential appraisal, talent management and succession planning, and total compensation and rewards systems to align between organizational goals and individual objectives.

Finally, while pursuing such a behavioral orientation, research in the field of performance management should also use more ethnographic methodologies, obtrusive and unobtrusive observations to grasp the soft attitudinal determinants of performance. As correctly stated by Thomas (1984), the survey still dominates in the analysis of employee behavior in organizations. Experiments and action research which could provide clearer statement regarding causality are rarely carried out (Rosenstiel, 2011). We pay much more attention to validity and reliability but sometime at the expense of data and finding accuracy.

This discussion leads us to the following proposition:

Proposition 4. Performance management must target individual and team behaviors while considering their respective antecedents and consequences. Investments to enhance performance should emphasize behavioral and contextual factors and must rely on soft and qualitative indicators to measure learning and performance outcomes.

In the next section, we will explore how arts-based initiatives used as performance management triggers can influence people behavior and help an organization generate value.

5 Arts-based Initiatives as behavioral and performance drivers

In today's socio-economic scenario, organizations have to become agile, intuitive, imaginative, flexible to change and innovative to meet the complexity and turbulence of the new business age. They have to shift their focus from efficiency to adaptability and

transformation to cope with emergent business challenges. Following such a view an emergent employee's challenge to be faced is how to engage, energize and inspire people so that they can exercise their feelings in everyday working activities and operate as innovation and transformational agents.

The arts can represent a powerful instrument that organizations can deploy to develop people's emotional and energetic dynamics and support the enhancement of organizational value creation capacity. Especially the planned managerial use of art forms (i.e. Arts-based Initiatives - ABIs) can sustain organizations in their efforts to face today's competitive challenges and improve their value creation capability.

An ABI can be defined as any organizational and management intervention using one or more art forms to enable people to undergo an art experience within an organizational context, as well as to embed the arts as a business asset. It is primarily and fundamentally an experience-based process involving and engaging people both rationally and emotionally through either active or passive participation (Schiuma, 2011).

The focus of an ABI is not the work of art in itself, but the arts experience instead. An ABI is intended to use works of art and arts as media to trigger, catalyze, drive, harness and govern the emotional and energetic dimensions of an organization which can have an impact on people and/or on the organizational infrastructure of tangible and intangible assets. Through ABIs new strategic organizational value drivers, such as passion, emotions, hope, moral, imagination, aspirations, and creativity (Boyatzis et al., 2002; Bruch and Ghoshal, 2003; Cross et al., 2003; Gratton, 2007; Steers et al., 2004) can be fruitfully developed, generally first at the individual level, engaging a person emotionally and intellectually, and then at group and organization levels.

Undoubtedly, the value generated from arts experiences is extremely difficult to quantify using money as unit of measurement. Regardless of artworks that can also represent investments and that their value can be measured through the price, assessing the outcomes of ABIs is challenging. This is because any arts experience tends to meet different needs which are subjective, idiosyncratic, context- and time-related. Moreover, their effects on individual and organizational change are basically intangible in nature, elusive and hard to quantify, especially in economic terms.

Despite this, the analysis of the adoption of ABIs within organizations has led to the definition of two fundamental implications which represent two essential assumptions for the assessment of the organizational value of ABIs.

The first assumption is that ABIs do not have a clear and direct link to the bottom line. Except those cases in which ABIs either correspond to specific business activities in the cultural sector aimed to generate cash flow, or equal to real estate investments, it is extremely difficult if not impossible to draw a direct link between arts initiatives and economic returns.

The second assumption is that the benefits of ABIs will be fundamentally found within the positive impacts that they have on individual and organizational behavior and on developing business value drivers. These mainly refer to intangible and knowledge-based assets, grounding business competencies and affecting the efficiency and effectiveness of business processes. In particular, an ABI can have an impact on two fundamental dimensions of a business: (1) the organization's human resources, and potentially any other organizational stakeholders; and (2) the infrastructure, or overall tangible and intangible structural assets grounding the working mechanisms of the business model. Therefore, the assessment as well as the planning of an ABI have to take account of both dimensions of a business: the change of people behaviors and the organizational infrastructure development.

In his book "The Value of Arts for Business", Schiuma (2011) proposes a framework, the "Arts Value Map", to support management in the understanding of how ABIs drive the improvement of business performance. The framework provides a mapping-based assessment methodology to grasp how ABIs can be converted into business performance improvements. In particular, the "Arts Value Map" elucidates the pathways through which the adoption of ABIs affects the development of the knowledge-based, competence-based and process-based dimensions of an organization and improves business performance (Figure 2).

The fundamental assumption at the basis of the Arts Value Map is that the growth of knowledge assets operates as a key driver to activate value creation dynamics (Carlucci et al., 2004; Carlucci and Schiuma, 2007). The development of organizational knowledge domains improves organizational capabilities enabling a better execution of business processes that in turn allows an improvement of organizational performance and, more generally, the achievement of business and strategic objectives.

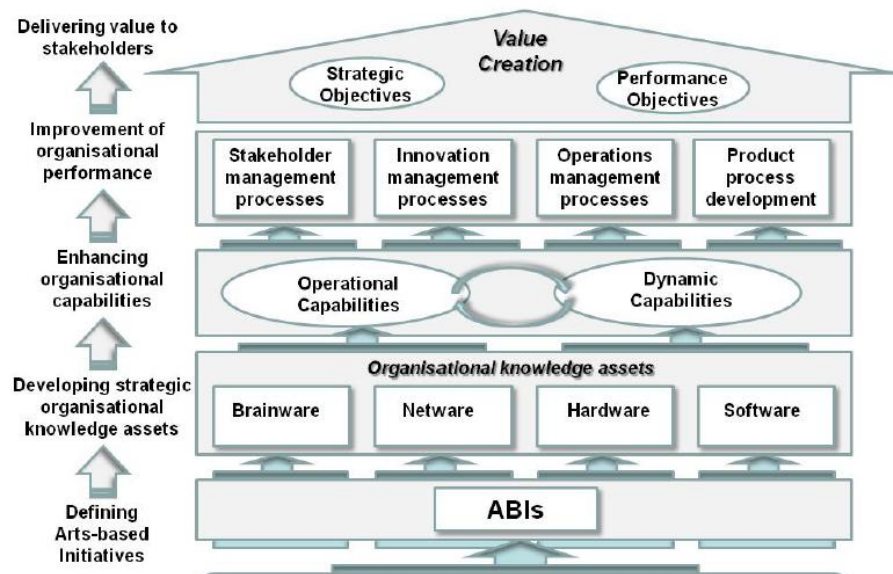


Figure 2: The Arts Value Map (Schiuma, 2011)

6 The value of arts to human performance: empirical evidence

When approaching the use of art forms in organizations, it is important to be aware that the benefits of ABIs can be understood at different levels of analysis. A pivotal role is generally played by individuals. Indeed, individuals are those that finally capture the benefits of using the arts in business.

ABIs are able to communicate and/or create aesthetic experiential processes that can affect people's emotional states and behavior. Undoubtedly, the intensity of people change and development produced by ABIs can be different. ABIs can have 'transient impact' on people and their emotional and energetic states. In this case people that experience an ABI feel engaged, emotionally and energetically aroused, but the ABI's effects fundamentally disappear after the arts-based experience has finished. Sometimes ABIs can affect people's way of seeing and approaching the reality around them for a longer period of time. This energy results in a short-term behavioral change that can be properly channelled for action. Finally, ABIs can lead people to analyze and eventually challenge their beliefs and values, deeply affecting their attitudes that in turn can drive change with the emergence of new personal behaviors.

In order to shed more light on the value of ABIs as drivers of people behavior and performance, we analyze hereafter some relevant case studies stemming from real-life applications of arts-based initiatives (source: Schiuma, 2011). The overall purpose of the case evidence is to highlight relevant insights on how the implementation of ABIs intervenes in behavioral change and development. Following the assumptions underpinning our theoretical framework, the analysis focuses on how ABIs can mould people's behavioral intentions and affect, somewhat, individual organizational performance outcomes.

Case study 1: instilling collaborative behavior

Nestlè has been pioneer in the integration of arts in its management system. Among the many ABIs, Nestlè has developed an initiative based on a mixture of the BBC TV shows *Dragons Den* and *The Apprentice with tradesecrets*. The aim of the artistic intervention was to enhance creativity as well as to develop communication skills and collaboration in terms of sharing ideas and expertise of team marketing.

Employees were taken to the venue where the original TV series was filmed and spurred on to develop ideas to generate new products with a combination of industry outsiders and brand specialists acting as facilitators. Participants were coached on their presentation style and then had to pitch to a panel of five 'dragons' made up of entrepreneurs and actors. The teams were allowed to view each other's presentation on monitors in a specially designed studio in the basement in order to learn from each other's successes and failures.

From a behavioral viewpoint, the initiative has galvanized people, arousing their emotions and energy and has increased employees' intention to adopt a more collaboratively behavior and perform generation and analysis of new ideas as a team.

Case study 2: reflecting on one's own behavior

ABI can be used to raise awareness of behaviors by tracking people's moods. In this regard, an interesting case example is represented by the arts-based project implemented at Unilever UK named 'Stimulating Reflection'. People were asked to choose between statements related to their daily business behaviors (such as: having fun; you have let a colleague down; this is the place to be; you have taken a risk; bureaucracy got in your way; you have passion for winning) by landing on mats, that had the statements written

on them. These mats incorporated sensors that made it possible to record the number of landings.

From a behavioral viewpoint, the artistic intervention provided an assessment of the organizational atmosphere and supported a self-reflection and self-awareness among employees about the individual behaviors that affect organizational climate.

Case study 3: changing people's attitudes in managing relationships with customers

Hall and Partners, a successful advertising research agency has developed a theatre-based program called 'Creative pitching', aimed at enabling employees to handle unexpected and strenuous situations. The agency was expanding rapidly in America, and needed their key personnel to develop the strength and confidence to win and keep clients and businesses such as Microsoft. As an extremely successful and rapidly growing company, people at Hall and Partners were asked to learn fast and particularly to understand how to deal with client relationships. Especially employees' behavior determinants, such as self-confidence, self-expression and communication skills needed to be developed.

To address this issue a theatre-based program was implemented. The premise underneath the initiative was that handling an encounter, a presentation and/or a relationship with a client is like a creative pitch. Just as in the theatre, where a performer must engage the audience both emotionally and intellectually to have an impact, relationship managers have to be able to engage client's hearts and minds. A theatre-based approach using improvisation skills was used. Theatre was used to rehearse meetings with senior clients, played both by actors and trainers. Many different live situations were tried out, with diverse things happening, involving improvisation and experimental approaches, tools and behaviors to improve employee competencies.

The initiative has contributed to increase the employees' intention not to be intimidated by senior figures; to get the best out of situations; and develop a self-management orientation and the ability to improvise. According to the CEO of the company, the theatre-based initiative, challenging and stretching people, made a real difference to employees' day-to-day performance, particularly in terms of changing people's attitudes in managing relationships with customers. Hall and Partners was voted as one of the top small businesses to work for by the Sunday Times. This can be

considered as a consequence, amongst other factors, of the adoption of innovative training approaches for employee development, such as the theatre-based program.

Case study 4: overcoming cultural barriers

Undergoing a takeover process from the French group Lafarge, Blue Circle Industries adopted percussion workshops as a team-building exercise and as a means of getting ready for the merger with a company of a very different culture. A percussion symphony was used as a metaphor for how different parts of the organization could work together. All the participants needed to learn to play in time together, working up to a grand finale.

The ABI was facilitated by the arts-based organization tradesecrets. The director of tradesecrets, played the role of a fictitious symphony orchestra conductor Gregor Timeriovich, who had an enormous ego and was obsessed with individuals. This subverted the whole procedure and he was eventually thrown out of the room.

The percussion workshop helped to look at the individual's role in the whole and what part they played for the ongoing success of the group.

The initiative has developed the employees' intention to overcome cultural barriers and establish fruitful relationships with employees of the merged company.

Case study 5: identifying "negative attitudes and behaviors" to look for better relationships

Television¹ had recently grown considerably in size as the result of a merger of a number of different companies, each with their own cultures and different ways of doing things. As a result, Television was looking to build a new corporate culture and establish new shared values and behaviors. For this purpose a set of questionnaires and focus groups at all levels of the organization were implemented to investigate perceived organizational values. However, Television recognized that simply talking about the new organizational values would be quite meaningless to people on a day-to-day basis and that they should make sure that the new values affected the way people actually behaved. The technical skills of Television's staff were second-to-none, but a culture had developed where staff relied on that alone and hid behind their technical expertise. This culture increased the employees' intentions to ignore the need for good relationships among colleagues.

¹ The real name has been changed for confidential reasons.

The training and development manager liaised with heads of departments and their staff, asking them to write short reports containing examples of 'bad behavior' between employees and between managers and staff. A great deal of material was produced, with examples of 'bad behavior' ranging from mild to very serious.

Thus, it was decided to use the approach of the forum theatre workshops to force people to reflect on the organizations' behaviors and to absorb and apply on day-to-day activities the new set of values. Ci: Creative intelligence was brought in with the task of designing and implementing the Values Roadshow, a program of forum theatre workshops to be run throughout the organization.

Starting from Television's reports on values and behaviors, Ci: Creative intelligence conducted an investigation to better understand the organizational context, interviewing staff, witnessing them at work, and viewing their finished products. They then wrote a play, with three scenes, incorporating many of the behaviors which had come out of the investigation. The play was rehearsed using actors which had an understanding of the corporate sector and the cultural and behavioral issues companies faced. The scenes illustrated familiar situations and issues with which people could relate. During the forum theatre workshops the audience was asked to correct the behaviors played in the scenes. The workshops were interactive with the actors responding to suggestions from the participants and re-performing the scene. By representing all of the behaviors found in the investigation into three short scenes as well as slightly exaggerating behaviors, they avoided stigmatizing participants as perpetrators of bad behavior and instead allowed them to discuss behavior through proxies, without individuals having to confront each other. The play was first presented to senior management at two levels prior to the running of 21 further workshops around the country, and ultimately being rolled out to the whole organization.

The ABI forced people to reflect on their personal and inter-personal behaviors. In addition, they also provided learning insights on how to modify and handle communication and feedback style in order to enhance the quality of the relationships with colleagues. Employees through the forum theatre workshops had the opportunity to identify and analyze the 'negative attitudes and behaviors' and experiment with how to improve them. This generated great benefits in terms of changing employees' behavioral intentions to create good relationships with colleagues.

As a result of the Value Roadshow, as reported by the evaluation feedback gathered after the program, employee behaviors within the organization changed and relationships between colleagues improved. It was also reported that some quite dramatic changes had occurred. Once behavioral norms were established, the senior management felt legitimate in reacting strongly to inappropriate behavior.

These short case studies show that ABIs create organizational energy and a tension for action by challenging people's way of seeing and feeling reality, stimulating reflection and observation on personal and business issues, enlarging and changing their perspectives, enhancing emotional responses, and changing behavioral intentions.

Artistic interventions can enhance people's skills and attitudes; can modify and improve people's behaviors; can develop relationships and networking approaches; can allow to recognize, absorb and share organization's new values and ethics.

From a strategic viewpoint, the case studies show that frequently ABIs are adopted as tools on the basis of specific needs related to management challenges or business problems to deal with. However, arts-based practices can be fully incorporated into the business model of the organization. The former considers ABIs as strategic management actions to be brought into organizations every time it is necessary. The latter assumes that ABIs can become part of the everyday organizational life.

7 Conclusion

In this paper, we defined behavior as a complex phenomenon driven by different individual characteristics and organizational factors. From an individual perspective, our intentional and unintentional behaviors depend mostly on our perceptions and reactions to stimuli. The perception processes are affected by our personality traits and the inner and outer hierarchy of knowledge, preferences, dispositions, mental states, and values. Such stable/unstable and learned/unlearned behavioral patterns affect our attitudes and determine the way we interpret the world and we attribute our judgments, the way we act and the way we interact with others and with our environments. Structural, organizational, and managerial characteristics present different stimuli, direct our perception, condition our motivation and hence trigger our behavior and action.

Since most of behavioral patterns are stable, they are difficult to change even with the use of positive and negative reinforcers. The objective of performance-driven investments

including arts-based initiatives becomes then to seek a better alignment between organizational goals and individual objectives. Besides meeting personal needs which may enhance satisfaction and organizational climate without any effect in terms of productivity, planned performance interventions and arts-based investments should spur people to act and put the necessary efforts to achieve both personal and organizational objectives.

Following a thorough analysis of behavior antecedents and consequences we addressed specific implications for performance management in general. Drawing on this analysis and its implications, we suggested then different guiding principles on how we can integrate such soft behavioral dynamics into performance management research and practice through the lens of arts-based interventions. We believe such principles have the potential to lay the foundations and constitute the building blocks of a behavior-based performance management system that can help organizations allocate their resources where it really matters and develop the right measures to capture the real value of performance outcomes.

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Knowledge Management: Assessing a Dynamic Capability.

Stephen McLaughlin

Innovation Value Institute
National University of Ireland, Maynooth
Maynooth, Co Kildare, Ireland.

Structured Abstract

Purpose – Over the last 24 months the Innovation Value Institute (IVI) has been working with a consortium of industry, academia, and government (Triple Helix) based organizations to develop a capability view of how organizations can effectively manage their knowledge. This has the potential to be a broad and complex endeavour, so the research workgroup (made up of triple helix members) focused on the IT influencing / influenced capability that drives an organization's ability to effectively manage their knowledge asset. The outcome of this research has resulted in an industry-tested assessment for organizations interested in driving knowledge asset management (KAM) as a competitive capability. This KAM assessment looks at 3 key areas: Governance, facilities & processes, and the knowledge life cycle. These are then broken down further into thirteen sub-capabilities, or capability building blocks. This paper will present in detail how the KAM assessment was developed, validated, and what value the assessment output can bring to those organizations using it.

Design/methodology/approach – This paper will present its findings in a case study format (Yin, 2002). However, the manner in which the IVI engages and conducts its research will be examined, as this is fundamental to encouraging a triple helix (academia, industry, and government) collaborative open innovation approach. IVI is mainly engaged in mode 2 research that follows an 'engaged scholarship' (Van de Ven, 2007) approach, with particular emphasis on a 'design science' (Hevner, et al, 2004) perspective. Through design science the desire to look for and encourage the development of artefacts as part of the research process is important as it provides an added incentive to industry and government partners to engage in research and any follow-on development projects.

Originality/value – This paper will outline the first capability maturity approach to assessing knowledge asset management from an organizational perspective. There are many frameworks and models that describe how organizations shape, and engage with knowledge management activities. Many of these frameworks (over 23) have been used to inform and shape the research thinking around this KAM assessment but this, the author believes, is the first framework that will help define an organizations knowledge capability – this is vital for organizations that view the understanding of capability in any form as critical to developing sustainable competitive advantage (Davenport et al, 2001).

Practical implications – This approach to developing a capability view of knowledge management is helping a number of organizations (both public and private) operating complex organizational structures drive clarity around defining the scope of their 'knowledge' activates, with particular focus on tacit-explicit-tacit knowledge transfer

activities. By assessing their capability against specific aspects of knowledge management organizations are given a relative scale against which they can assess their progress. The KAM assessment also provides the organization with a list of potential improvements to be made that will positively influence knowledge capability maturity. This means that the assessment not only 'quantifies' the organizations current capability, but it also provides a set of industry-validated practices, metrics and expected outcomes. This enables the participating organization the ability to build an improvement roadmap to move the capability up the maturity curve to the desired level of performance.

Keywords – Knowledge management, dynamic, capability maturity

Paper type – Practical Paper

Introduction

A significant body of literature has been written concerning the resource-based theory of the firm. Penrose (1995) defined the internal resources of the firm as the “*productive services available to a firm from its own resources, particularly the productive services available from management with experience within the firm*”. This view of the organization as a collection of resources has prevailed driving the view that the final output (products or services) at any given time merely represents one of several ways in which the firm is using its resources (Teece, 2013). What organizations looking to compete in today’s hyper-competitive markets must do is identify those resources that they can develop into unique capabilities that are hard to replicate (Boisot, 1999). In terms of ‘knowledge intensive service’ (KIS) industries, organizations still find the most difficult resource to accumulate, and manage is knowledge (Teece, 2013). This problem is being compounded by the global, and virtual nature of the way organizations operates. How can an organization begin to develop an organization-wide capability that helps manage its knowledge resources in a way that drives value for the organization? However, before this happens organizations first need to understand the current maturity of their knowledge management capability. This was the challenge the Innovation Value Institute (IVI) was tasked to do by its industry, academic and government based research partners.

The IVI has been developing the IT Capability Maturity Framework (IT-CMF) since 2006. This framework has been designed to help organizations view their IT resources from a capability-centric, as opposed to a process-centric perspective. The framework encompasses 35 critical capabilities, all of which are focused on a particular IT influencing, or influenced, capability. One of these capabilities refers to the capability of managing knowledge, or as it is titled in the framework: Knowledge and Asset

Management (KAM). The framework provides a detailed description of the capability, with capability maturity profiles ranging from level 1 (Initial) to level 5 (optimising). In the case of KAM, each maturity level is assessed against 3 category areas of capability: Governance of KAM, Facilities and Processes, and internal Knowledge Life Cycle.

Table 1 lists the three category areas, and the sub-capabilities (capability building blocks) that make up these areas.

Category	Capability building Blocks	Description
Governance of KAM	Knowledge Strategy and KAM Programme	<i>Defines a knowledge strategy, which may include a KAM roadmap and knowledge goals, to position KAM within the organisation. Prepares the KAM programme, outlining high-level action plans for the current period to translate the knowledge strategy.</i>
	Knowledge policy	<i>Establishes the set of principles to govern the role and contribution of knowledge activities and knowledge assets within the organisation.</i>
	KAM Roles and Skills	<i>Assigns roles with accountability for KAM. Defines and agrees requisite employee skills.</i>
	Impact Measurement Plan	<i>Develops a master plan to guide the measurement of knowledge activities and knowledge assets.</i>
Facilities & Processes	Knowledge Environment	<i>Creates an environment for the management of knowledge activities and knowledge. Includes features such as learning and knowledge workspaces, processes to guide knowledge work and, technologies to organise and streamline knowledge efforts. Promotes best practices in knowledge activities to enable collective learning in the creation, use, reuse and sharing of knowledge assets.</i>
	Knowledge Asset Repository	<i>Designs, develops and adopts a virtual repository that is based on agreed criteria of, for example: structure and content representation in order to facilitate access to the organisation's knowledge assets. Distributes information about the location of available knowledge assets.</i>
	Collaboration and Culture	<i>Promotes approaches that allow employees to communicate, coordinate and work together. Motivates and reinforces behaviour-shaping activities to build a culture of adopting knowledge across the enterprise.</i>
	Enhancement and Lessons Learned	<i>Establishes target elements of the KAM environment, the knowledge life cycle and knowledge assets that are to be enhanced. Collects, captures and maintains success stories of experiences with knowledge activities and knowledge assets. Defines recommendations to support the knowledge strategy, and to meet current and future work objectives.</i>

Knowledge Life Cycle	Register of Knowledge Domain Experts	<i>Captures information about knowledge domain experts to establish their areas of expertise and experience.</i>
	Identification, Collection and Capture	<i>Identifies records of knowledge within the organisation. Collects such records in order to conduct structured analysis, interviews of ownership and selection. Advises on the capture of defined knowledge assets and tacit knowledge, and ensures their availability for use.</i>
	Profiling and Classification	<i>Uses a procedure to develop definitions of individual knowledge assets (such as the basic types of their identity, domain reference and structure), and relationships between them. Applies classification schemes.</i>
	Storage, Maintenance and Protection	<i>Preserves the content of the virtual knowledge asset repository. Maintains the repository using evaluation criteria of, for example: accuracy, quality and relevance. Applies protection principles. Performs a discretionary advisory role on contractual and legal issues of knowledge assets.</i>
	Definition of Business Impacts, Analysis and Reporting	<i>Categorises knowledge asset use by type and impact. Applies analytics (such as descriptive/text and quantitative) to measure value contributions for business reporting. Develops an asset plan for the management of one or more categories of knowledge assets. Communicates regular reports (such as number and types of requests for knowledge, satisfaction of the knowledge assets' users, and business value of knowledge assets use) across the enterprise.</i>

Table 1. KAM Categories and Capability Building Blocks

By assessing the maturity of the KAM critical capability, organizations can determine the effectiveness of their knowledge management capability against each of the capability building blocks. The framework will also provide a set of industry-recognised, and validated practices, outcomes and metrics for each critical building block at each maturity level. This in turn helps an organization to identify and implement practices that will improve their current maturity.

2. Methodology

Although the author is employed by the IVI the findings outlined in this paper are being used to form the basis for on-going research and the building and managing current and future collaborative engagements. This in turn is part of an inter-disciplinary, and multi-sectoral research initiative coordinated by IVI. As there is little academic research on knowledge-resource capability management the author relied on his pre-understanding

(Gummesson, 1991, McLaughlin & Paton, 2008) of the process and organization as a valid starting point for conducting this research. Objectivity and academic professionalism was maintained by the need to conform to the requirement to engage with on going research initiatives.

Ultimately the aim of IVI's research initiative is to develop an underpinning theory and associated models relating to improving organizational performance through effective capability management. The research is exploratory in nature and a Case Study (Yin, 2002) methodology is being used to support this line of inductive theory building. The research and analysis outlined in this paper has been conducted using qualitative methods with all data gathering complying with validation criteria as outlined by Yin (2002).

How the KAM capability and critical capability building blocks manifest themselves as part of the IVI's research process will form the base case on which the author will look to develop an inductive emergent theory. In order to capture the data concerning knowledge capabilities and how those capabilities can be effectively assessed the author engaged with twelve lead researchers who in turn were responsible for 35 workgroups. As said earlier the research outlined in this paper only covers part of the overall research project. The author will validate the findings from the IVI case with other complex organizations, drawn from across both the public/private sectors. This will help validate and develop the theory underpinning the development of the KAM capability.

2.1 Conducting Our Research

The IVI engages in collaborative research with Multi-National Enterprises (MNE), and SME's on an on-going and continuous basis. The nature of the research is centred on the use of IT as a business enabler for organizations. The collaborative partners in this research cover multiple industry sectors (Utilities, IT, Health Care, Finance, Consulting, Local Government, Education etc.). This has provided the IVI with a wealth of understanding and knowledge around the many complex issues organizations are facing in aligning their ICT capability to the increasing requirement to develop and support sustainable innovative business practices.

In order to help organizations understand and manage their ICT capabilities the IVI use the IT-Capability Maturity Framework (IT-CMF) as the basis on which to help define and understand current operating practices. The IVI have been developing the framework since 2006, using a design-science methodology to support an academic / practitioner lead research agenda (Hevner, 2004). This collaborative endeavour has resulted in the

development and testing of 33 critical processes, which in turn have resulted in case studies concerning Sustainability of ICT, ICT Organization Design and Planning etc.,

The IT-CMF model helps put into perspective the IT resource in terms of four key aspects of business related IT management.

Through the process of engagement with organizations from differing backgrounds, in terms of business objectives, target sectors, organizational structure, service / product offering, culture, and nationality, the IVI has developed a mechanism that allows it to develop a consistent and thorough understanding of complex ICT issues. This approach has been refined to ensure research is conducted in a way that not only develops an understanding of how ICT is being employed across multiple industry sectors, but also informs those participating in the research how to improve and develop their ICT capability.

IVI obtains the level of detail required to understand an organization's ICT alignment issues through the use of 35 critical capabilities (Figure 2) that make up the four macro-capabilities.



Figure 1. Critical Capabilities

These capabilities have been developed, tested and refined through collaborative research with IVI's global network of research partners (i.e. BCG, Intel, Chevron, Ernst & Young, BP, SAP, Microsoft, and SME's including Sumerian, CSE, and Clarion Consulting. etc.,). The process by which IVI has engaged with its research partners demonstrates IVI's ability to conduct research at a global level, across complex business environments, whilst managing the expectations of all the participants in terms of what has to be delivered, and the time lines for delivery.

The diagram in Figure 2 identifies the process steps used by IVI in developing an understanding of the core-processes impacting ICT capability. This staged approach was used to ensure the IVI developed a clear understanding of how the core-processes manifest within the different organizations, and how these processes can be expected to mature. The development of these processes is rigorous and dependent on a continuous peer-review in order to ensure validity and relevance.

Intellectual property development for a critical capability divided into four phases separated by stage reviews

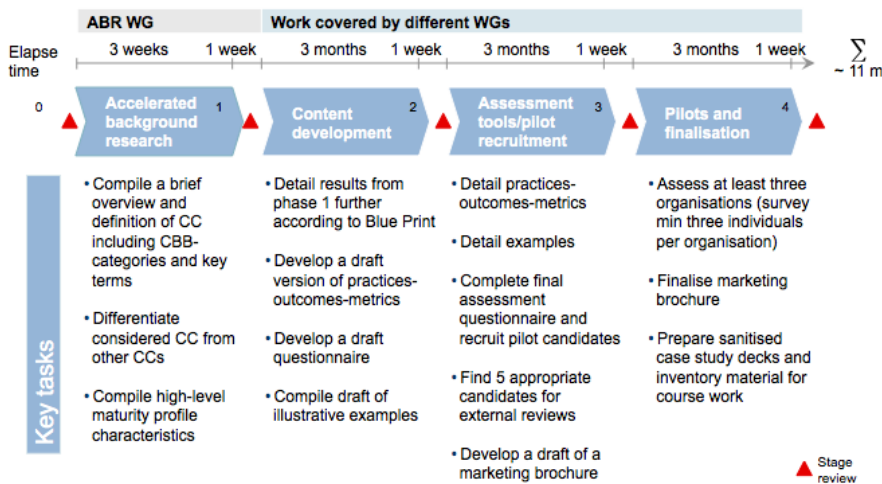


Figure 2. Research validation process

Once the capability has been developed to stage 3 the process is further tested for validity and relevance through a number of pilot assessments, and validation workshops. Although the validation process strives to ensure a balanced and objective view is maintained throughout the duration of the research engagement, the success, relevance,

and objective approach is based on the dynamics of the workgroups that are formed to drive and shape the research projects.

3. Capability Overview

As stated the KAM capability is just one of 35 critical capabilities an organization might have in terms of IT influenced or IT influencing capabilities. Because of this each capability needs to be developed in harmony with the other capabilities. The framework also takes into consideration that capabilities do not work or exist in isolation of each other, and will demonstrate varying levels of influence on each other depending on their maturity levels. To that end, when developing the capability three things needed to be considered: the definition of KAM, what's 'in scope' in terms of the capability, and what's 'out of scope'. In terms of what's in and out of scope this will be dependant on what's already covered in other capabilities.

For KAM the definition is as follows:

Knowledge Asset Management (KAM) is the systematic development of a unified and holistic way of addressing needs for knowledge and of exploiting knowledge assets in order to attain specific business outcomes.

Knowledge assets comprise a collection of organised, explicit and tacit knowledge that is captured from employees, processes, practices, products, services and stakeholders; and the outcomes of actions such as research, innovation and learnt experiences.

The categories of capabilities of KAM are:

- **Governance** ensures accountability of the KAM programme and long-term viability of the knowledge assets supported by knowledge strategy, knowledge policy, roles and skills and impact measurement plan.
- **Facilities and Processes** optimise the knowledge environment and repositories for the continued availability of quality knowledge assets; and include collaboration, culture, enhancement, and lessons learned.
- **Knowledge Life Cycle** constantly enhances information about knowledge assets; and, measures their business impacts and value contributions.

For what is defined as being covered and not covered by the KAM capability (in scope and out of scope respectively) are defined in Table 2 below.

In Scope	Out of Scope
<ul style="list-style-type: none"> ▪ Governance of directed accountability of KAM, knowledge assets including responsibility for behaviour-shaping activities and culture reinforcement. ▪ KAM programme supported by knowledge strategy, knowledge policy and direction of change management. ▪ Knowledge environment to support facilities, people, processes, technology and collective learning. ▪ Discretionary advisory role on contractual and legal issues about knowledge assets. ▪ Management of the following knowledge life cycle activities: <ul style="list-style-type: none"> ▪ Register of Knowledge Domain Experts ▪ Identification, Collection and Capture ▪ Profiling and Classification ▪ Storage, Maintenance and Protection ▪ Definition of Business Impacts, Analytics and Reporting 	<ul style="list-style-type: none"> ▪ Creation of knowledge as part of on-going organisation-wide activities. ▪ Recruitment of employees, expertise/skills, and rewards for existing skill sets for KAM functions (see People Asset Management). ▪ Education and training of employees for KAM effort (see People Asset Management). ▪ Training of employees on use of IT and business applications (see User Training Management). ▪ Assessment, management and resolution of change related to KAM projects (see Program and Project Management CBB – “Change and Risk Management”). ▪ Integration of KAM environment into the organisation’s technical infrastructure (see Technical Infrastructure Management). ▪ Development of organisation policy for contractual and legal protection of knowledge assets.

Table 2. In scope and out of scope

In the out of scope column there is reference to other capabilities, from the IT-CMF, that cover these abilities. These include People Asset Management, User Training Management, Project and Programme Management, Risk Management, and Technical Infrastructure Management. As one can see these cover a wide array of abilities, which highlights the pervasiveness of knowledge management activities. However, it is not the purpose of this paper to cover these additional capabilities.

3.1 Capability Maturity

The KAM capability provides organizations with a way of assessing their current maturity for each category, and even down to a capability building block level. Table 3 shows a high level view of the maturity descriptions at a categorical level.

Maturity Level	Governance of KAM	Facilities & Processes	Knowledge Life Cycle
5 (Optimising)	<ul style="list-style-type: none"> ▪ Knowledge strategy is aligned with overall business strategy and KAM programme continuously improved based on results. ▪ Knowledge strategy aligned with knowledge policy and 	<ul style="list-style-type: none"> ▪ Integrated knowledge environment adopted, customised and aligned with knowledge strategy and business strategy. ▪ Virtual repository with complete directories is adopted enterprise-wide, regularly 	<ul style="list-style-type: none"> ▪ Automated register of knowledge domain experts is adopted enterprise-wide and regularly optimised. ▪ Identification, collection, and capture automated and continuously improved. ▪ Classification schemes

	<p>regularly optimised.</p> <ul style="list-style-type: none"> ▪ KAM taxonomy of skills continually improved and matched to job fulfilments. ▪ Senior management assigned governance and revision of impact measurement master plan. 	<p>improved.</p> <ul style="list-style-type: none"> ▪ Employees manage collaboration tools and positive behaviours continuously reinforced towards desired culture. ▪ Enhancement plan is continuously improved; Lessons learned repositories adopted and recommended actions applied in work practices. 	<p>continuously improved and matched to business needs.</p> <ul style="list-style-type: none"> ▪ Storage, maintenance and protection continuously improved, and aligned with evolving business needs. ▪ Analytics and reporting extended to enterprise business intelligence: asset management plan enhanced with value principles and business value of knowledge assets.
4 (Advanced)	<ul style="list-style-type: none"> ▪ Knowledge goals aligned at enterprise level; KAM programme action plans developed. ▪ Governance processes for aligning knowledge policy with knowledge strategy established. ▪ KAM taxonomy of skills approved at enterprise level. ▪ Impact measurement master plan applied across most of the enterprise. 	<ul style="list-style-type: none"> ▪ Knowledge environment designs are evaluated , approved implemented with change programs. ▪ Repositories evaluated and codified directories defined. ▪ Work structures and practices to foster collaboration and use of IT tools; behaviour shaping projects across organisation. ▪ Enhanced features integrated into existing IT. 	<ul style="list-style-type: none"> ▪ Register of knowledge domain experts is evaluated. ▪ KPIs improve identification, collection and capture. ▪ Results of profiling pilot evaluated: classification schemes aligned and automated. ▪ Storage methods aligned with access service: and maintenance and protection guidelines adopted. ▪ Pilot analytics and reporting project is implemented: asset management plan for impact categories is in place.
3 (Intermediate)	<ul style="list-style-type: none"> ▪ Draft knowledge strategy developed and deployed ▪ KAM programme defined, designed and deployed. ▪ Knowledge policy framed with approved principles and stakeholder inputs. ▪ Some roles assigned; taxonomy of skills defined. ▪ Impact measurement process defined. 	<ul style="list-style-type: none"> ▪ Knowledge environment developed from approved blue prints. ▪ Knowledge asset repository developed and applied in pilot projects. ▪ Behaviour shaping, collaboration and IT tools workshops in place. ▪ Enterprise enhancement plan defined and project is sponsored. 	<ul style="list-style-type: none"> ▪ Register of knowledge domain experts is created. ▪ Knowledge assets identified, collected and captured on IT systems. ▪ Classification schemes defined and applied: profiling project defined, sponsored and piloted. ▪ Detailed guidelines for storage, maintenance and protection defined. ▪ Analytics and reporting function is established.
2 (Basic)	<ul style="list-style-type: none"> ▪ Basic goals and objectives for the 	<ul style="list-style-type: none"> ▪ Knowledge environment blueprints 	<ul style="list-style-type: none"> ▪ Basic guidelines to define work areas, topics

	<p>knowledge strategy and basic list of issues to be addressed in KAM programme are established.</p> <ul style="list-style-type: none"> ▪ Basic knowledge policy principles are defined. ▪ Roles and skills requirements are identified. ▪ Relevant impact measurement approaches and metrics identified. 	<p>designed.</p> <ul style="list-style-type: none"> ▪ Knowledge asset repository project is defined and sponsored. ▪ Collaboration on tasks and projects: behaviour shaping and cooperation introduced at department level. ▪ Enhancement actions identified: lessons learned collected at department level. 	<p>and experts.</p> <ul style="list-style-type: none"> ▪ Design of procedures to guide identification, collection and capture activities. ▪ Classification schemes identified at department level: business case for profiling defined and communicated. ▪ Storage methods identified: basic guidelines for maintenance and protection established. ▪ Scope of KAM analytics and reporting defined: basic process for measuring impact of knowledge assets.
1 (Initial)	<ul style="list-style-type: none"> ▪ Limited efforts to define knowledge strategy or KAM programme ▪ Knowledge policy not defined. ▪ Limited understanding of KAM roles and skills. ▪ Limited measurement of some knowledge activities. 	<ul style="list-style-type: none"> ▪ Knowledge environment confined to local IT tools. ▪ Silos of knowledge assets across organisation. ▪ Informal collaboration: no behaviour shaping for culture in place. ▪ Limited capture of lessons learned. 	<ul style="list-style-type: none"> ▪ Limited access to knowledge domain experts. ▪ Ad hoc knowledge identification, collection and capture. ▪ Ad hoc storage, maintenance and protection. ▪ Ad hoc analytics and reporting. ▪ Limited direct evidence of the impact of knowledge assets on business activities.

Table 3. Maturity Levels for KAM

Maturity level 3 is deemed to be the ‘Breakthrough’ level for the capability. This is the level at which this capability can demonstrate significant value add for the organization. Once an organization can objectively evaluate its current capability maturity, the next stage is to identify what, if anything, needs to be done to improve that capability.

3.2 Practices Outcomes and Metrics

As with all capabilities within the IT-CMF, KAM provides a detailed set of industry validated practices, outcomes and metrics (POMs). Once the maturity level is defined senior management can use the POMs to identify the practices most appropriate to their needs in order to improve the maturity of their KAM capability. The POMs are broken

down and aligned to each of the critical building blocks (as identified in Table 1). Figure 3 gives an example of what POMs look like at a high level (category level).

The POMs are expressed in generic form, to allow the capability to be applied across multiple industry sectors.

Knowledge Asset Management (KAM) Summary of key practices, outcomes, and key metrics

Maturity	Key practices	Outcomes	Key metrics
High	5 Optimising <ul style="list-style-type: none"> Alignment process for knowledge strategy, knowledge policy and business strategy. Integrated knowledge environment is adopted across the enterprise. Virtual knowledge asset repository is adopted with complete directories. 	<ul style="list-style-type: none"> Alignment for business value delivery. Integrated knowledge environment with "learning by doing" culture. Virtual repository provides timely availability of knowledge assets. 	<ul style="list-style-type: none"> Yes/No indicators for alignment. % knowledge assets accessed from repository – per time period. % achievement of knowledge strategy against measured results.
	4 Advanced <ul style="list-style-type: none"> Evaluation of results of KAM pilot projects. Knowledge asset repository is evaluated. Skill requirements identified. Positive behaviours and collaboration mechanisms reinforced. Impact of knowledge assets categorised in detail. Analytics and reporting function established. Asset management plan is developed. 	<ul style="list-style-type: none"> Virtual knowledge asset repository is fully defined with complete directories. Work processes defined to foster collaboration and culture. KAM taxonomy of skills. Managed categories of knowledge assets with defined business impacts and value contributions. Recommended actions from lessons learned are applied. 	<ul style="list-style-type: none"> % knowledge assets migrated to repository. % work processes with defined collaboration mechanisms in use. % of roles and skills fulfilment with KAM capabilities. % of impact categories available for use. % of knowledge assets with known business impacts and value contributions. % effective recommended actions.
	3 Intermediate <ul style="list-style-type: none"> Knowledge environment blueprints; knowledge asset & lessons learned repository prototypes are developed. Knowledge policy principles defined. Impact measurement approaches defined. Behaviour-shaping activities and collaboration, role and skills training. Knowledge domain experts register created. 	<ul style="list-style-type: none"> Approved designs of knowledge environment, knowledge asset and lessons learned repositories. Draft knowledge strategy and knowledge policy. Impact measurement master plan. Some assigned roles and domain experts are trained. 	<ul style="list-style-type: none"> % of blueprints approved for use. # of repository prototypes approved. # of successful training programs completed. % employees cooperating and applying positive behaviours. # of experts available for lead roles in defined key areas and topics.
	2 Basic <ul style="list-style-type: none"> Basic goals and objectives defined as input to knowledge strategy. Basic list of issues to be addressed are defined. Basic principles for knowledge policy are identified. Basic list of KAM roles and skill requirements are defined. KAM measurement goals are defined. Guidelines to knowledge activities defined. 	<ul style="list-style-type: none"> Basic alignment of department level goals and objectives. Checklist of issues of be addressed. Basic checklist of principles of knowledge policy. List of roles and skill requirements. Behaviours and measurement goals. Guidelines to knowledge activities. 	<ul style="list-style-type: none"> % of approved priority time-based goals that are matched to knowledge strategy. # issues to be addressed in KAM programme. # of basic principles. # of KAM role requirements. # of required KAM skills. # of measurement goals recommended. # of guidelines for knowledge activities.
	1 Initial <ul style="list-style-type: none"> Knowledge strategy, knowledge policy, roles, skills, and knowledge environment are not enforced. KAM programme is not defined. 	<ul style="list-style-type: none"> Knowledge activities are random. Identification of roles, skills and issues to be addressed in KAM programme. 	<ul style="list-style-type: none"> # of KAM programme issues approved in decision process.

Figure 3. Summary of POMs for KAM

4. Assessing An Organization’s Knowledge Capability

During the second half of 2013 an KAM capability assessment was carried out by a multi-national US bank. An internal team of 8 bank employees handled the assessment, with the assessment being carried out across 125 participants. The assessment was conducted over a period of 23 weeks, in order to fit in with the operational requirements of the Bank. Figure 4 shows an output report for the KAM assessment. The figure shows the current (actual) capability maturity against the desired maturity. The desired maturity is determined by the organization and is based on the strategic and operational requirements they may have for certain capabilities. Figure 4 also calls out some performance practices that are driving capability performance, and also some actions necessary to reach the desired performance targets.

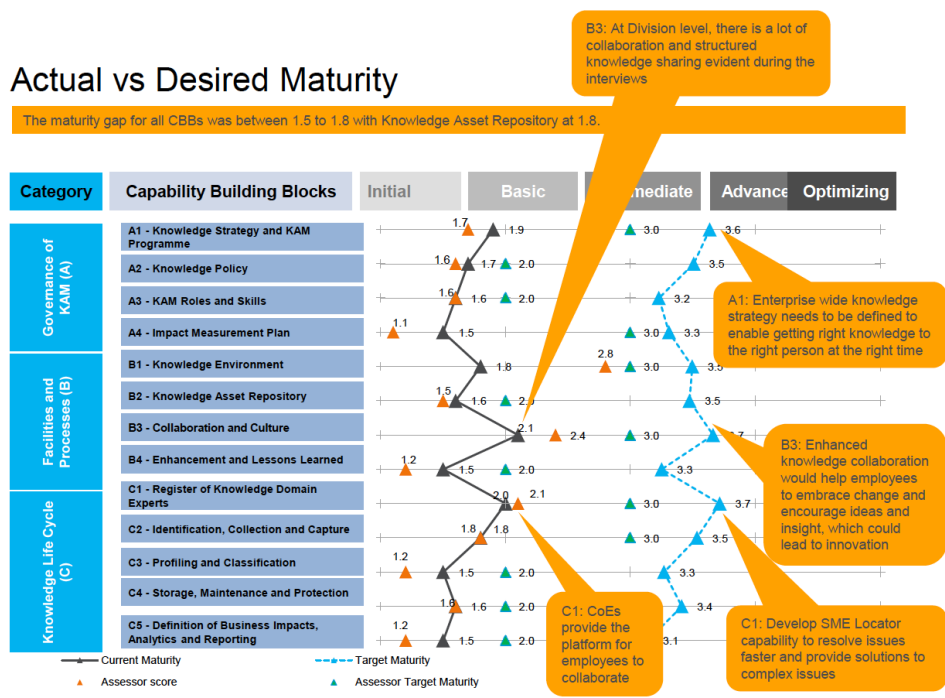


Figure 4. Assessment output for KAM

As an outcome of this assessment some existing strengths were identified, and some performance improvements recommended. These are outlined in Table 4 below.

Strengths	Opportunities for Improvement
The management is focused on enabling a knowledge management environment	Knowledge needs across the enterprise are not being identified
Capability owners have been identified to focus on improving KAM capabilities	A document policy and strategy that promotes the adoption of a knowledge management discipline and culture does not exist.
Communities of excellence act as a significant enabler for knowledge dissemination and collaboration	Definition of the roles and responsibilities for KAM initiatives have not been mapped out at an enterprise level.
At a divisional level there exists a strong drive to use collaborative technology based repositories.	An enterprise infrastructure for managing life cycle of knowledge assets does not exist.
There is a centralised knowledge based portal to enable employees to search and access relevant information from various repositories across the enterprise.	Subject Matter Experts from the business are not being fully utilised.
A digital workplace initiative has been launched to provide a seamless digital experience for employees	Communication between business and the IT providers in not formalised.
Business knowledge repositories are beginning to develop and connect across the enterprise.	Impact of existing KAM initiatives on service delivery is not measured.
	Rewards and recognition programme to encourage employee participation in KAM not implemented.

Table 4. Strengths and Opportunities for KAM

Because the KAM assessment can help identify clear areas for improvement, this allows for strategic targeting of specific improvement initiatives. Although the improvement roadmap developed for the Bank is confidential, many of the senior management team expressed very positive views of the capability assessment process and what it had to offer the organization. This comment sums up the overarching feeling concerning KAM.

“We need to have KAM in peoples goals and objectives – specific goals. The value of KAM is accepted, by prioritisation on KAM is lacking”.

5. Conclusion

By taking a capability-centric view of knowledge management, the IVI have been able to better link the notion of knowledge as a strategic resource to organizational performance. It is accepted that knowledge, as a capability, can be viewed from many perspectives, and that the one presented in this paper forms just one of them. However, the KAM capability, although developed from a codified knowledge perspective, has allowed a complex organization to identify where it is under performing in terms of its capability to manage its growing and complex knowledge landscape.

This capability view of KAM fits within the definition of a dynamic capability as defined by Helfat *et al* (2008). The definition of a dynamic capability ‘...*is the capability of an organization to purposefully create, extend or modify its resource base*’. Through the application of the KAM capability an organization is able to objectively understand how knowledge influenced, and influencing, resources are aligned across their organization. They can then best assess how to develop, or create, and modify these resources in a way that drive performance improvement. The notion of a dynamic capability is dependant on the ‘purposeful’ nature of how the organization views the capability. This word indicates some degree of intent. Helfat *et al* (2009) distinguish dynamic capabilities from organizational routines, which in turn consist of organizational routines that lack intent (Dosi *et al*, 2000). This also fits very well with the view of knowledge as a critical capability for developing organizational competitive advantage.

From the perspective of dynamic capabilities one of the most important questions is ‘How can organizations build or acquire new capabilities’. In an ever increasingly competitive marketplace, organizations have to address this question on an ever more frequent basis. Although the KAM capability will not provide the necessary resources to build knowledge management capability, it will provide a road map showing

organizations how to align, and develop their existing resources in a way that will develop strategically aligned capabilities. In effect the KAM capability provides organizations with a lens in which to view knowledge management. IVI believe that this version of the KAM capability is not necessarily the final word in what constitutes a knowledge management capability, but it does believe that by taking a capability-centric view on knowledge management it identifies a more explicit link between knowledge management, strategic capability, and competitive positioning.

6. Research limitations

Although the KAM capability was developed with input from individuals representing over 20 academic and industry based organizations, the case study findings presented in this paper only relates to one organization. Although the Bank that took part in the assessment was very positive with the findings from the assessment exercise, more assessments need to be carried out in order to further validate the structure of the KAM capability, and assess its relevance and importance for organizations looking to improve their knowledge management capability.

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From intellectual capital to company's competitiveness

Ramona – Diana Leon

Department of Management, Marketing and Business Administration
Alexandru Ioan Cuza University of Iasi
Carol I, no. 22, 700505, Iasi, Romania

Structured Abstract

Purpose – Researches made in the last 25 years presented knowledge as a dynamic and fluid resource, critical for company's success. Although there are some remarkable attempts of measuring knowledge assets and intellectual capital of a firm, their analysis tend to be static. They are either reflecting the current stage of development or they are highlighting an average performance. Besides, they overlook the fact that company's competitiveness depends on competitors' characteristics and actions. Starting from these, we aim to develop a benchmarking tool capable of capturing company's competitive position and future evolution, based on its efficiency of using intellectual capital.

Design/methodology/approach – Developing an exploratory research, we combine the qualitative with the quantitative analysis. We create a composite index, entitled Competitiveness Intellectual Capital Index (CICI), for 20 Romanian companies listed on the Bucharest Stock Exchange (BSE). Our longitudinal study has three phases. First, we establish CICI's value during 2009 – 2012, for each company. Then, we determine the average annual growth rate registered during 2009 – 2012. In the third stage, we develop a strategic knowledge map, using CICI's value and the average annual growth rate. Based on these coordinates, we split the companies in four categories: leaders, chasing stars, followers and traditionalists.

Originality/value – This methodology brings forward the relative character of intellectual capital and its long term relationship with company's competitiveness. First of all, it reflects that intellectual capital means more than money; it's about creating, disseminating and using knowledge; it's about valuing company's human resources and its relationships with all the stakeholders. Secondly, it highlights that a company is competitive only when it manages its knowledge assets more efficiently than its competitors. Taking this into account, CICI is the first instrument that evaluates a company's intellectual capital by comparing its performance with the one registered by the direct and indirect competitors.

Practical implications – The outcomes of developing and using this instrument focus on strategic issues. First of all, by using CICI, managers can have a complete image on what's happening in the environment in which they operate. Secondly, they can notice where do they stand (compared with their competitors and companies from different fields of activity); they can identify potential threats and opportunities, they can monitor

change and they can develop future strategies. In other words, it may serve as a managerial early warning system.

Keywords – Intellectual capital, Competitiveness, Human capital, Turnover rate, Stock price.

Paper type – Academic Research Paper.

1 Introduction

Evolving from the post-industrial economy to the knowledge based one brought to forefront the importance of knowledge as an organizational resource. On a broad sense, this exists in any company and is related to employees' skills, abilities and competences. But, although their role in the process of knowledge creation, dissemination and use is fundamental, they are not the only source of knowledge that a company may access. This can also be brought from other companies under the form of licences, patents, equipments etc. Taken these into account, for more than 25 years, knowledge has been described as a fluid and dynamic resource (Lilleoere and Hansen, 2011; Nonaka and Takeuchi, 1995); it comes from different sources (employees' skills and competences; firm's relationships with its stakeholders; other companies products and services etc.), it can be transformed inside company's boundaries and it can be incorporated in firm's processes, products and services. This unique character captured managers' interest and emphasized its capacity to generate competitive advantages (Amiri et al., 2010; Drucker, 1993; Grant, 1991; Kamukama et al., 2011; Sveiby, 1997).

Since the mid-1980s when Karl Erik Sveiby analyzed the "know-how" companies (Sveiby and Riebling, 1986), the value of knowledge assets created and used by a company was labelled as "intellectual capital". The development of this concept has, so far, two phases. The first one began in 1990s and focused on analyzing case studies, concepts' operationalization and establishing definitions (Edvinsson and Malone, 1997; Roos and Roos, 1997; Stewart, 1998; Sveiby, 1997) while the second one started in 2000 and concentrated on measuring, modelling and extending its levels of analysis (Bontis, 2002; Bueno et al., 2011; Chen et al., 2004; Marr et al., 2004; Molodchik et al., 2012; Tóth and Jónás, 2012).

In almost 15 years of research, some remarkable attempts of measuring the intellectual capital of a firm had been made. Some models reflect the current stage of development (Bueno et al., 2011; Pulic, 2000; Sveiby, 1997) while others highlight the

average performance recorded during two or three years (Lev, 2001; Stewart, 1997). In other words, they tend to forget that knowledge is dynamic and the current level of development does not guarantee a similar performance in the future. Besides, they do not take into consideration that intellectual capital competitiveness depends on the characteristics and actions of the direct and indirect competitors and business partners. As a consequence, although plenty of models had been developed, there is no general accepted method and evaluating the performance of intellectual capital remains a challenge for managers (Tai and Chen, 2009).

Starting from these, we aim to develop a benchmarking tool capable of capturing the competitive position and future potential evolution of a company, based on its efficiency of using intellectual capital. In the next section of this article, we will review some of the models developed for measuring the intellectual capital of a company. Then, we will present our research methodology and the principles we followed in order to develop a benchmarking tool, entitled Competitiveness Intellectual Capital Index (CICI), for the Romanian companies listed on the Bucharest Stock Exchange. In the fourth part of this article, we will discuss the performance of intellectual capital in Romanian companies, in 2012. We will analyze their progress during 2009 – 2012 and will include them in a specific category (leaders, followers, chasing stars or traditionalists). Based on the elements that characterize these categories, we will estimate their potential future evolution. We will close this paper highlighting the utility of CICI and indicating some further research directions.

2 Intellectual capital – an embryonic research field

Since the early 1990s, a large number of studies analyzing various aspects of intellectual capital were undertaken (Bontis, 2002; Bueno et al., 2011; Edvinsson and Malone, 1997; Marr et al., 2004; Stewart, 1998; Sveiby, 1997), but the field is still embryonic. New dimensions of the intellectual capital are highlighted and new measurements are developed.

If Sveiby (1997) identified 3 dimensions of the intellectual capital, namely: employee competence, internal structure and external structure, Liebowitz and Weight (1999) emphasized 4 components, entitled: human capital, customer capital, process capital and innovation capital. A couple of years later, Bueno et al. (2011) described the intellectual capital using 6 dimensions: human capital, organisational capital, technological capital,

business capital, social capital and entrepreneurship and innovation capital. Despite the fact that most of the previous studies concentrate on classifying intellectual capital in human capital, structural capital and relational (customer) capital, this continuous development proves that the intellectual capital research field has still a lot to offer; not all the variables of intellectual capital were brought to forefront.

This may be one of the reasons that stimulate the appearance of new instruments for intellectual capital measurement. Since there is no general accepted framework, developing a valid measurement of intellectual capital performance becomes a challenge. Some researchers focused on the financial statements and tried to bring forward what lies behind the numbers while others developed complex instruments in order to offer a holistic perspective on company's intellectual capital (Table 1).

Table 1. Models usually used for measuring the intellectual capital performance

Model	Characteristics	Limits
Market to net book value	<ul style="list-style-type: none"> • it defines intellectual capital as the difference between market value and book value. • it offers information regarding the value of intellectual capital of a firm at a given moment. • it is easy to use. • it is the most widely known and used indicator. 	<ul style="list-style-type: none"> • according to this, intellectual capital includes all the elements that increase company's value and are not registered in accounting. Therefore, it depends on the national and international accounting rules. • it highlights the lack of vision; an increase in company's market value may be the result of external factors and not necessary a consequence of using intellectual capital. • it perceives firm as an independent entity and not as part of a system; it neglects the influence that competitors and business partners may have on intellectual capital performance.
Calculated intangible value (Stewart, 1997)	<ul style="list-style-type: none"> • it reflects the value of intellectual capital based on an average performance. • it focuses on a three-years period. • it facilitates comparison within industry and between industries. • it is easy to use. • it allows trend analysis. 	<ul style="list-style-type: none"> • it is based on financial information when the value of intellectual capital goes beyond the monetary expression. This reflects a set of skills and abilities which are incorporated in firm's procedures and business methods and cannot be resumed to a monetary unit. • it does not emphasize the elements that define intellectual capital. It

		presents the results but not what lies behind it.
Value added intellectual capital (Pulic, 2000)	<ul style="list-style-type: none"> • it defines the intellectual capital performance as the sum of the value added by human capital and physical capital. • it brings to forefront the importance of human capital. • it facilitates comparison between companies. • it is easy to use. 	<ul style="list-style-type: none"> • it evaluates human capital based on its cost and not its abilities, skills and competences (its real value). • it is based on financial information.
Intellectus Model (Bueno et al., 2011)	<ul style="list-style-type: none"> • it measures the intellectual capital performance using 342 indicators which are organized based on a “relevance tree” approach (more indicators are defining a variable; more variables are defining an element; more elements are defining a specific type of capital). • it uses a “multiplying factor” in order to determine the future value of intellectual capital. 	<ul style="list-style-type: none"> • some indicators included in the model are redundant. • indicators distribution among variables and capitals is unequal (in example, for Business Capital 71 indicators are taken into account while Social Capital is measured using 41 indicators). This increases their influence on the general result. • it is difficult to use.

We may notice that the models which are usually used for measuring the intellectual capital performance focus on obtaining a value, on labelling the results gained (or assumed to be gained) by using knowledge assets. None of them takes into account the relative character of competitiveness; this mainly depends on the actions of direct and indirect competitors and business partners. Although the Value added intellectual capital method facilitates comparison within industry and between industries, this is presented as an option and not as a “must”, like it should be.

When it comes to intellectual capital, monitoring its evolution is not sufficient; this should be compared not only with competitors’ results but also with the ones obtained by companies which are operating in other industries. Intellectual capital is like a metal; it changes its shape under different condition (from one domain of activity to another) and it generates complex reactions (along the supply chain and not only). For example, if you put a metal in an acid solution, it will produce a salt and a gas; if you put it in a bases solution, it will not react unless it is strong enough to precipitate a metal hydroxide. The same happens with intellectual capital performance. One way or another it exists in any company in a more latent or active form. If the environment in which the company operates is “acid” (highly competitive, based on innovation and quality), then the internal

mechanism will be adapted (a “salt” will be created by developing an organizational culture and structure that encourages creativity, initiative and thinking outside the box) and innovative products and services will be delivered to the market (the “gas” that will affect company’s customers, competitors, partners and other related domains of activity). On the other hand, if the environment in which the firm activates is a “bases solution” (customers demand is predictable, the market is split between a reduced number of players, prices are the only ones that make the difference between competitors), then the intellectual capital will remain in a latent state until some coordinates of the internal or external environment will change.

Synthesizing, the models developed so far are internally oriented and lack of strategic orientation. They focus on measuring firm’s performance without taken into account the influence of the external environment. They neglect the fact that knowledge becomes a source of competitive advantage only if a company uses it more efficiently than others. We will fill this gap by developing a benchmarking tool, entitled Competitiveness Intellectual Capital Index (CICI).

3 Research methodology

3.1 Research purpose and objectives

We aim to develop a benchmarking tool capable of capturing the competitive position and future evolution of a company in the Romanian business environment, based on its efficiency of using intellectual capital. Therefore, we focus on:

- analyzing the intellectual capital of the Romanian companies;
- determining the aspects on which the Romanian companies tend to concentrate on when it comes to intellectual capital;
- identifying the most competitive Romanian companies, based on their efficiency of using intellectual capital.

In order to achieve our goal, we employ an ethic approach and develop an exploratory, holistically, interdisciplinary and diachronic research. The exploratory character of this research drove its essence from the fact that there is no other benchmarking tool that analyzes companies’ performance in terms intellectual capital valuation. As we could have noticed most of the previous models adopt an internal approach; they focus on what are firms doing in order to increase their value without

taken into account competitors' performance. We aim to address this issue by developing a benchmarking tool that highlights the position that a company occupies compared with other economic agents.

The holistic approach is the result of using objective data and quantitative methods while the diachronic approach is reflected by the fact that our analysis is based on the time evolution of the main components of intellectual capital. Interdisciplinary appeared as a consequence of combining knowledge management with strategic management, statistics and informational technology.

3.2 Sample

In order to achieve our goal, we concentrate on the 106 Romanian companies listed on the Bucharest Stock Exchange (BSE). Our decision is based on the fact that in order to be listed, firms must develop their social responsibility and they have to make their information publicly available. The first aspect not only reflects company's responsibility to the environment in which it operates (Anderson, 1998; Dodd, 1932; Schwartz and Carroll, 2008; van Marrewijk and Were, 2003), but it also facilitates firm's access to stakeholders' knowledge (Mura et al., 2013). Therefore, it is interested in being competitive in the knowledge economy era. The second issue assures our access to data describing the organizational environment.

After excluding the financial institutions and the tradable but unlisted companies, 62 firms remain. From these, we select 47 enterprises with export activity. We used the presence of export activity as a selection criterion because it reflects company's capacity of penetrating international markets. In other words, it highlights its ability of using efficiently its intellectual capital and its capacity of disseminating knowledge on an international level.

Only 20 enterprises were profitable during the economic crisis and in the years after (2009 - 2012). Their profitability in time of crisis proves they are capable of reacting in a faster pace to market challenges and they are aware of their knowledge assets value (Economist Intelligence Unit, 2009; Fodor and Poór, 2009). Therefore, these 20 firms that are activating on both internal and external market and managed to be profitable during 2009 – 2012, represented the research sample.

3.3 Research instrument

Our longitudinal study has three phases. *The first one* focuses on establishing the value of the Competitiveness Intellectual Capital Index (CICI) during 2009 – 2012, for each company. This offers a unique opportunity to analyze the intellectual capital landscape in Romanian companies.

For each year and each firm, CICI is determined as a weighted mean of its pillars scores: human capital, structural capital and relational capital. The weights are distributed following the same principles as the ones used by World Economic Forum (2013) for evaluating the global competitiveness. Therefore, the elements that constitutes basic requirement, namely the organizational capital, receives 20%, the efficiency enhancers (human capital) – 50% and the innovation and sophistication factors (relational capital) – 30%.

Structural capital represents the basic requirements since it reflects the internal structure. Company's routines, processes, information and technology are the ones that support decision-making and knowledge creation, dissemination and use (McKenzie et al., 2011; Stewart, 1997). If these stimulate and encourage creativity and innovation, then human capital may become an efficiency enhancer.

Human capital defines employees' knowledge, abilities, skills and competences (Edvinson, 1997). It is the only one capable of transforming all the other organizational resources and generating innovation and strategic renovation (Bontis, 1998; Curado, 2008). Its unique character makes it the most important source of firm's sustainable competitive advantage (Cabrita and Bontis, 2008).

Relational capital includes the relationships that a firm has with its stakeholders (Nahapiet and Ghoshal, 1998; Saint-Onge, 1996; Subramaniam and Youndt, 2005). It emphasizes company's capacity to make its present visible on the market and to access stakeholders' knowledge.

Table 2. Variables included in CICI's structure

Pillars	Weight	Variables
Human capital	50%	<ul style="list-style-type: none">• proportion of professionals in the company;• share of expenses with human resources in total expenses;• average length of employment;• value added per employee;• turnover rate.

Structural capital	20%	<ul style="list-style-type: none"> • number of hierarchical levels; • age of organization; • intangible assets; • share of expenses with research, development and innovation in total production expenses; • share of executives in total staff.
Relational capital	30%	<ul style="list-style-type: none"> • stock prices; • number of social responsibility activities; • share of sales to international customers in total sales; • number of economic sectors in which the company's activities are carried out; • share of expenses with external parts in production expenses.

Each pillar includes 5 monetary and non-monetary variables (Table 2). Variables were selected based on a documentary study and information regarding their evolution was collected from company's annual reports using content analysis as a research method.

The pillars scores represent the arithmetic mean of its variables. In order to make variables aggregation possible and to provide a comparative assessment of the intellectual capital performance of the Romanian companies, data are normalized on a 1 to 10 scale (Lin and Edvinsson, 2008; WEF, 2013), based on the following relation:

$$y_{ic}^* = 9 \times \frac{\text{company score} - \text{sample minimum}}{\text{sample maximum} - \text{sample minimum}} + 1,$$

where, y_{ic}^* is the normalized value of variable i for company C ;

sample minimum is the lowest value recorded by a company, for variable i ;

sample maximum is the highest value recorded by a company, for variable i .

For those variables for which a higher value indicates a worse outcome (like, turnover rate, number of hierarchical levels etc.), the normalization formula takes the following form:

$$y_{ic}^* = -9 \times \frac{\text{company score} - \text{sample minimum}}{\text{sample maximum} - \text{sample minimum}} + 10$$

By applying a min-max transformation, we manage to maintain company's position in the business environment.

Since the sample size was too small we could not use the principal component analysis (Gorsuch, 1983; Hatcher, 1994; MacCallum et. al, 2001) or the partial least square modelling technique (Bontis, 1998; Bontis et al., 2002; Hulland, 1999) for assessing the consistency of the CICI framework in terms of number of pillars and

adequacy of indicators in describing each pillar. Still, CICI's validity is tested using univariate and multivariate statistical analyses. The univariate analysis is carried out indicator by indicator and focuses on the presence of missing data, outliers, and the impact of asymmetric distributions (skewness) on CICI.

The reliability of the measurements is evaluated using Cronbach's alpha test. As suggested by Nunnally (1978) and Churchill (1979), this should be the first measure taken in order to ensure the quality of metrics. After performing this test and obtaining a Cronbach alpha score higher than 0.7 for each pillar (human capital – 0.872; structural capital – 0.895; relational capital – 0.728), we claim that the measures used for developing the Competitiveness Intellectual Capital Index are reliable.

The second phase concentrates on determining, for each company, the average annual growth rate registered during 2009 – 2012. At the beginning, we define growth for each company C per variable i (r_{ic}^t) as the ratio between the non-normalised values for year t (y_{ic}^t) and year $t-1$ (y_{ic}^{t-1}).

$$r_{ic}^t = \frac{y_{ic}^t}{y_{ic}^{t-1}}$$

Then, we determine the average yearly growth rate (\bar{r}_{ic}^t) which indicates variables' progress from one year to another. In order to do so, we use the geometric average of these variables growth rates:

$$1 + \bar{r}_{ic}^t = \prod (r_{ic}^t)^{w_i}$$

where all variables receive the same weight w_i (since CICI includes 15 variables, w_i is equal with 1/15).

Next, for each company C, we calculate the average annual growth rate (R_C) as the geometric average of all yearly growth rates:

$$1 + R_C = \prod (1 + \bar{r}_{ic}^t)^{w_t}, \text{ where } w_t = \frac{1}{\text{no. of years}-1}$$

In the third stage, we develop a strategic knowledge map, using the value of CICI for 2012 and the average annual growth rate for 2009 – 2012. This reflects company's position in the national business environment, based on its efficiency of using intellectual capital. Taking into account these two coordinates, we split the Romanian companies in four categories (Table 3):

- *leaders* – the value of CICI and the average annual growth rate are above the average;

- *chasing stars* – the value of CICI is below the average and the average annual growth rate is above the average;
- *followers* – the value of CICI is above the average and the average annual growth rate is below the average;
- *traditionalists* – the value of CICI and the average annual growth rate are below the average.

Table 3. Companies typology based on CICI's value and the average annual growth rate

		CICI value	
		Below the average	Above the average
Average annual growth rate	Below the average	<p><i>Traditionalists</i></p> <ul style="list-style-type: none"> • remain faithful to the traditional business models and procedures; • focus on maintaining the status-quo; • progress appears as an accident. 	<p><i>Followers</i></p> <ul style="list-style-type: none"> • develop new business models and procedures for specific problems; • focus on generating changes in the internal environment; • progress is the result of internal and external factors.
	Above the average	<p><i>Chasing stars</i></p> <ul style="list-style-type: none"> • improve their business models and procedures only if they have to; • focus on adapting to market challenges; • progress is generated by external factors. 	<p><i>Leaders</i></p> <ul style="list-style-type: none"> • their activity is based on new, innovative business models and procedures; • focus on generating changes in the external environment; • progress is generated by internal factors.

4 Competitiveness Intellectual Capital Index of the Romanian companies

Intellectual capital becomes a source of competitive advantage if a firm use it more efficiently than its competitors. Starting from this assumption, we developed a benchmarking tool, entitled Competitiveness Intellectual Capital Index (CICI). Based on a comparative assessment, this tracks the progress in intellectual capital performance in Romanian companies.

According to data presented in Figure 1, the intellectual capital performance of the Romanian companies is modest; on a scale of 1 to 10, the highest score achieved was 6.29 points. Besides, we must remark that there are no significant differences between the analyzed firms. Despite the fact that they are operating in distinct domains of activity, CICI's value for the analyzed companies varies in a range of 0.01 to 3.04 points. In other

words, there is an interest in using intellectual capital as a source of competitive advantage among the Romanian firms but managers' efforts are still underdeveloped.

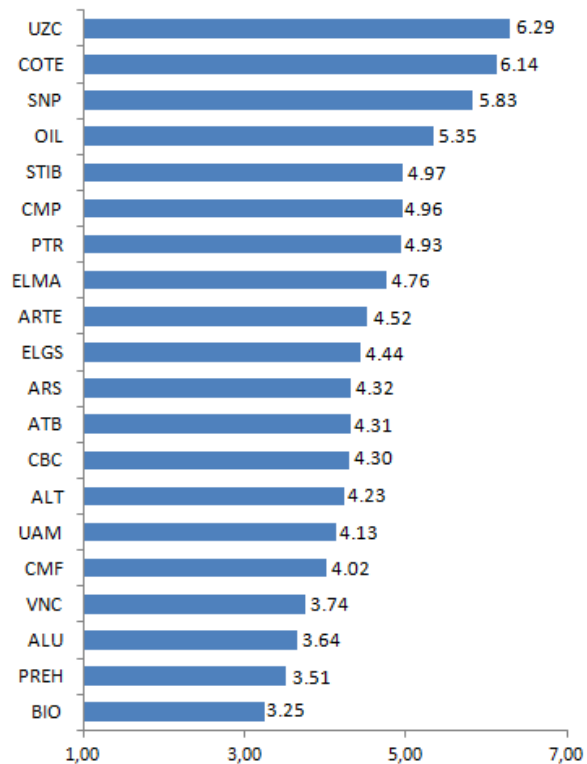


Figure 1. CICI's value for the Romanian companies, in 2012

The best performers belong to four different domains of activity which are present among the same supply chain. On the first position, we have UZC (with 6.29 points on a scale of 1 to 10) which is a company that manufactures motor vehicles, trailers and semi-trailers. On the second place, on a difference of 0.15 points, we have COTE which is uncharged with land transport and transport via pipelines. On the third position, with 5.83 points, we find SNP which is responsible with extraction of crude petroleum and natural gas while the fourth place is occupied by OIL (5.35 points), a firm that activates in the domain of warehousing and support activities for transportation. Since these four companies do not have business agreements with one another, this distribution highlights that a firm's interest in developing and using its intellectual capital has a domino effect among the companies from the domains with which it interferes.

But these results are nearly the tip of the iceberg. They reflect companies' performance on general basis and not the ones obtained in the specific area of human capital, structural capital and relational capital.

The relationship between domains is also described by the Human Capital Index (Figure 2). OIL (7.55 points on a scale of 1 to 10), COTE (7.14 points), SNP (6.80 points) and UZC (6.19 points) remain the best performers, although their position in the top is changed. OIL occupies the first position while UZC is placed on the fifth position (on a difference of 1.36 points). Besides, there is a new entry on the top 5, namely PTR (with 6.80 points). This operates in the area of mining support service activities.

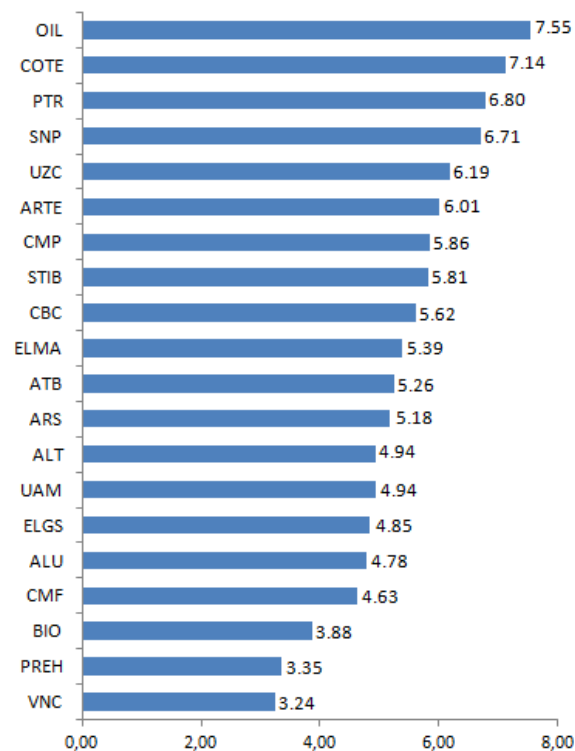


Figure 2. Distribution of the Romanian companies based on the value of the Human Capital Index in 2012

Since the highest score achieved was 7.55 (on a scale of 1 to 10 points) and 60% of the analyzed companies obtained more than 5 points on the Human Capital Index, in 2012, we argue that the Romanian managers became aware of the human resources

impact on company's success. Still, their performance tends to be diffuse if we take into account that the differences between companies scores varies from 0 to 4.31 points.

Although human capital represents the “piece of resistance” in the process of developing company's intellectual capital, its performance depends on the development of structural and relational capital. This should not be neglected since they ensure knowledge dissemination and use inside and outside firm's boundaries. Some Romanian enterprises seem to overlook this detail (Figure 3). Firms like ELMA, CMF, ELGS and PTR concentrate on developing their relational capital and ignore the importance of structural capital. As a result, they are among the best performers when it comes to relational capital and the worst ones when their structural capital is analyzed. They focus on the outside, on improving their image on the market. These results will be ephemeral if they are not supported by proper organizational structure, procedures and routines (elements that characterize the structural capital).

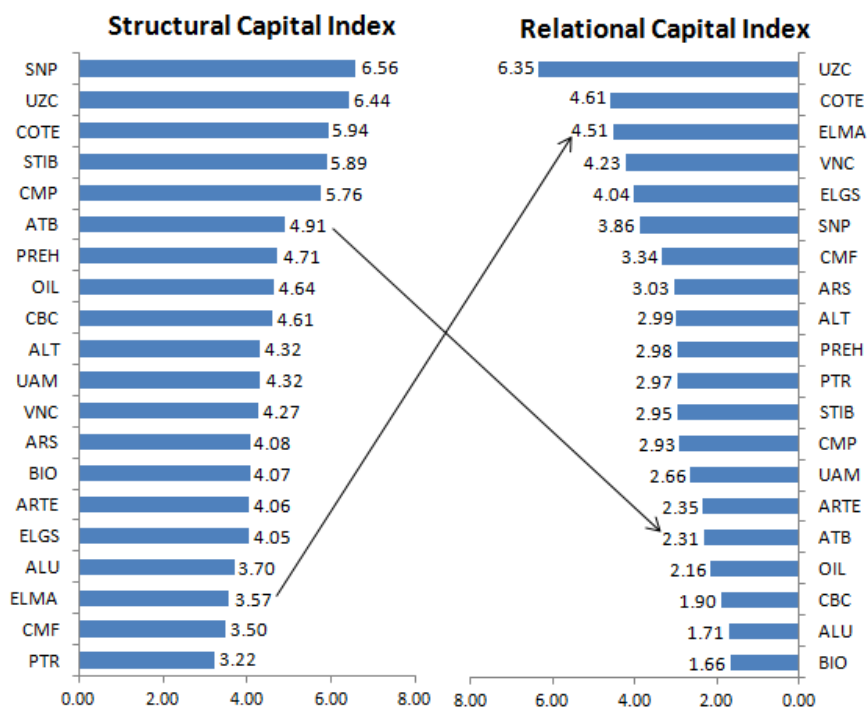


Figure 3. Distribution of the Romanian companies based on the values of the Structural Capital Index and Relational Capital Index, in 2012

The situation is reverse in the case of ATB. Its competitiveness is higher at the structural capital level compared with the one achieved at the relational capital level. This

describes a firm that realized the importance of intellectual capital and tries to adapt its business models and procedures. Besides, the results obtained by these companies on the Structural Capital Index and Relational Capital Index are below 5, on a scale of 1 to 10 points which highlights a very modest performance.

If we analyze the general performance of the Romanian firms at the structural and relational capital level, we observe that the last one is the one that manages to make a remarkable difference. The Relational Capital Index for 2012 varies from 1.66 to 6.35; the difference between the best performer (UZC which gained 6.35 points on a scale of 1 to 10) and its challenger (COTE which obtained 4.61 points) is equal with 1.74 points. These results emphasize firm's capacity of coping with its stakeholders and disseminating their knowledge.

Last but not least, we have to remark that the most competitive companies, according to CICI's value, are the ones that managed to maintain a balance between their human capital, structural capital and relational capital.

CICI not only highlights the intellectual capital performance of the Romanian companies but it also tracks its evolution over the time. As we can notice from Figure 4, during 2009 – 2012, some firms focused on increasing their intellectual capital performance while others decreased their efforts. Based on this dynamic, the Romanian companies may be split in four categories: leaders, followers, chasing stars and traditionalists.

The "leaders" category includes those firms that registered a high value for CICI in 2012 and a positive average annual growth rate during 2009 – 2012. Almost 30% of the analyzed companies belong to this category, namely: UZC, CMP, OIL, ELMA, STIB and ARTE. These are the type of firms that aim to develop themselves continuously and to generate changes in the external environment. They don't just wait for things to happen; they challenge the status-quo and go beyond the limits. Their knowledge assets and the relationships with their stakeholders assure their position as best performers in their domain of activity. These enterprises serve as a model for their competitors and business partners.

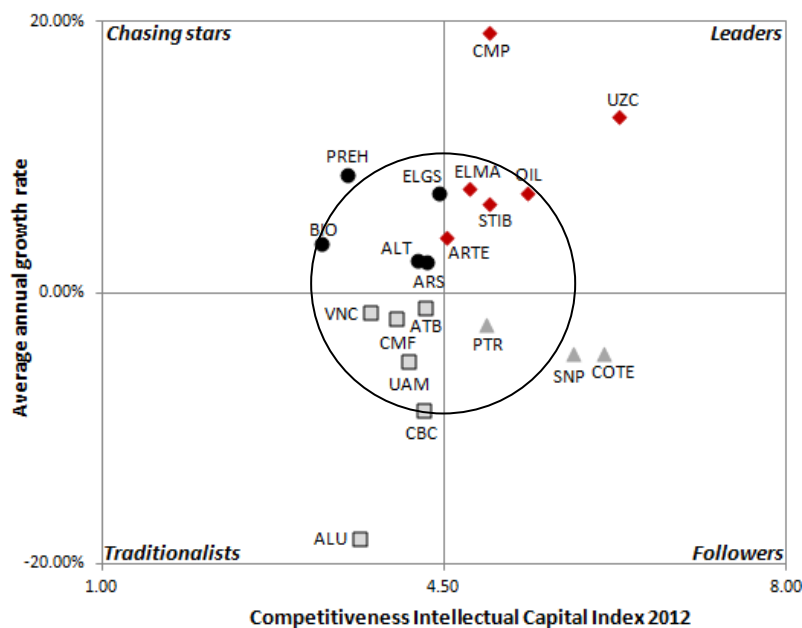


Figure 4. Growth of intellectual capital performance in Romanian companies, 2009 - 2012

The “followers” category reunites those companies that obtained a high value for CICI in 2012 and a negative average annual growth rate during 2009 – 2012. These firms are in a “transition” period. They realized the importance of intellectual capital but they are still learning how to manage it effectively. This position is temporary; if they learn how to manage their knowledge assets in a more productive manner, they may become leaders. But, if they experience difficulties and they do not find the “power” or the motivation to move on, they may become traditionalists; they may go back to the safety of the traditional business models and procedures. Only 15% of the analyzed firms are included in this category, namely: COTE, SNP and PTR.

The “chasing stars” category includes those enterprises that are guided by the “here and now” principle. They will do what they have to do in order to achieve their goal. Their motivation for changing is induced by external forces (like, market challenges, competitors behaviour etc.) and that is why they obtained a low level for CICI in 2012 and a positive average annual growth rate during 2009 – 2012. They realized that knowledge is a potential source of competitive advantage and they try to exploit if they have to. As a consequence, they improve their business models and procedures so they

can adapt faster to market demands. In this category are included 25% of the research sample represented by, ELGS, ARS, ALT, PREH and BIO. They may become “leaders” if they realize the global utility of intellectual capital or they return to the “traditionalists” stage once their objectives are achieved.

The “traditionalists” category describes those companies that maintain the status-quo; CICI’s value for 2012 is below the average and the average annual growth rate during 2009 – 2012 is negative. They developed once a “success recipe” and since this is still working (providing an income) then there is no need to change anything. They remain faithful to the traditional business models and procedures until they become obsolete. 30% of the research sample belong to this category, namely: VNC, CMF, ATB, UAM, CBC and ALU.

Last but not least, we should take into consideration that more than half of the research sample (65%) oscillates around the average. In other words, the managers of the Romanian companies recognize the importance of knowledge in the current business environment and are interested in developing the intellectual capital of their firms. But, their attempts are still modest.

5 Conclusions and further research

In the current unpredictable economic environment, intellectual capital represents a significant and unlimited source of competitive advantage. As a result, it captured researchers’ and managers’ interest. They tried to analyze it and to determine its value but the works created so far are on an embryonic stage of development. They don’t seem to agree on the dimensions and variables of intellectual capital (each model has a different set of indicators, variables and dimension) and they neglect the fact that competitiveness is reflected by comparison.

The models that focus on measuring intellectual capital performance tend to be internally oriented and lack of strategic orientation. They focus on measuring firm’s performance without taken into account the influence of the external environment. They neglect the fact that knowledge becomes a source of competitive advantage only if a company uses it more efficiently than its competitors.

We filled this gap by developing a benchmarking tool, entitled Competitiveness Intellectual Capital Index (CICI), for the Romanian companies listed on the Bucharest Stock Exchange. This brings forward the relative character of intellectual capital and its

long term relationship with company's competitiveness. First of all, it reflects that intellectual capital means more than money; it's about creating, disseminating and using knowledge; it's about valuing company's human resources and its relationships with all the stakeholders. Secondly, it highlights that a company is competitive only when it manages its knowledge assets more efficiently than its direct and indirect competitors and business partners. As we could have noticed, the best performers, according to CICI's value for 2012, were belonging to four different domains of activity that were part of the same supply chain, namely: manufacture of motor vehicles, trailers and semi-trailers; land transport and transport via pipelines; extraction of crude petroleum and natural gas and warehousing and support activities for transportation

Although the results of this research are representative only for the exporting Romanian companies listed on the Bucharest Stock Exchange, CICI is the first instrument that evaluates a company's intellectual capital by comparing its performance with the one registered by the direct and indirect competitors and business partners.

The outcomes of developing and using this instrument focus on strategic issues. First of all, by using CICI, managers can have a complete image on what's happening in the environment in which they operate (who are the best performers when it comes to using efficiently company's intellectual capital; which lessons could be learned and from whom; what changes should be done etc.). Secondly, they can notice where do they stand (compared with their competitors and business partners); they can identify some potential threats and opportunities, they can monitor change and they can develop future strategies. Therefore, it may serve as a managerial early warning system.

Starting from these, in a future research we aim to:

- analyze the influence of the exporting activity on companies' intellectual capital performance;
- determine the impact of national intellectual capital on organizational intellectual capital.

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Intellectual Capital Management in European Universities in times of changes: an IC Maturity Model

Giustina Secundo *

Department of Innovation Engineering
University of Salento
via per Monteroni, s.n.73100 Lecce Italy

Susana Elena Perez¹

European Commission - JRC
Institute for Prospective Technological Studies (IPTS)
Ed. Expo. C/ Inca Garcilaso 3, 41092 Seville Spain

Žilvinas Martinaitis

Visionary Analytics
Kęstučio st. 4/14, LT-08117 Vilnius, Lithuania

Karl Heinz Leitner

Austrian Institute of Technology
Innovation Systems Department
Donau-City-Straße 1 , 1220 Vienna, Austria

* *Corresponding author*

Structured Abstract

Purpose –The purpose of our paper is to develop a *IC Maturity Model (ICMM)* for Universities which is a flexible model of implementing Intellectual Capital (IC) approaches within Universities. The ICMM provides a theoretical continuum along which the process of maturity can be developed incrementally from one level to the next one moving from IC Data Collection, Awareness of IC, Adjustment of IC specific indicators, Measurement of IC, Reporting of IC, Interpretation and decision making, Strategy and Planning.

Design/methodology/approach – The Maturity Model has been developed in the course of three Mutual Learning Workshops (MLW) organised in Romania in the period October 2012 – May 2013. 15 international experts and practitioners have worked together aiming to develop a Model for IC Management in universities. The MLWs have been developed in the frame of the Project "*Quality Assurance in Higher Education through Habilitation*

¹ *The views expressed are purely those of the author and may not in any circumstances be regarded as stating an official position of the European Commission*

and Auditing" initiated by the Executive Agency for Higher Education and Research Funding of Romania (EUFISCDI).

Originality/value – Although several methods for IC measurement and management exist, most of these are not able to affording the trade-off between the comparability aims and the efforts to capture the institution's uniqueness when designing an IC model or framework. Pathways for adoption of IC management and reporting model strongly depend on the characteristics of the university, its previous experience with management tools and its managerial orientation. The *IC Maturity Model for Universities (ICMM)* explicitly allow to take in consideration these aspects hence enlarging the wide spectrum of Strategic Management approach inside the different University settings.

Practical implications – The IC maturity model provides a staged framework to initiate a step-by-step change within a University based upon its current level of IC management maturity. It allows Universities to follow different paths not necessarily the linear sequence; while some universities may start with the formulation of a strategy and a consecutive operationalization by using some IC indicators, others may gain experience in using some basic indicators and get aware about the necessity to use more specific IC indicators.. The ICMM can be used as a controlling and monitoring instrument in times of radical transformations and reforms.

Keywords – Intellectual capital, University, Maturity Model, IC Management, IC reporting

Paper type –Academic Research paper

1 Introduction

Universities are considered critical players in the knowledge-based society and are at the core of the policy agenda at national and EU level. The 'Europe 2020' Strategy recognized explicitly their central role to help Europe to become a smarter, greener and more inclusive economy (European Commission, 2010). Moreover, they have a pivotal role in regional development and a great potential in the development and implementation of Smart Specialisation Strategies (S3), which are key in the new Cohesion Policy framework (Kempton et al., 2013). During the last decades European universities have been immersed in important transformation processes aiming to make them more autonomous, transparent, economically efficient, more competitive world-wide and financially sustainable (Elena and Sanchez, 2013; De Dominicis et al., 2011; European University Association 2005, 2007; EUA, 2006; Estermann and Nokkala, 2009). Despite the general policy recommendations towards the implementation of new management tools and governance modes (European Commission, 2011), in the realm of practice, most European universities are trying to cope with the increasing social and policy demands

without significant changes in the way they manage their internal affairs (Elena and Sanchez, 2013; Ramirez Corcoles et al., 2011).

Management of universities has become, at the same time, the main solution and barrier to tackle the emerging challenges. Moreover, increasing stakeholders' demands for greater transparency, competition between universities and greater institutional autonomy push universities towards organisational innovations in designing management and performance systems. The key issue at stake is represented by the effective management of intangible assets and Intellectual Capital (IC) that constitute the largest proportion of universities' assets (Secundo et al., 2010; Sánchez et al., 2009). In this context IC approaches seem to be of prime importance for institutions of higher education and research since knowledge is their main input and output.

During the last two decades, some attempts have been done to apply IC models in universities and research centers especially in European Countries (Leitner et al., 2014; Ramirez and Gordillo, 2014; Wu et al., 2012; Veltri et al., 2012; Nava and Mercado, 2011; Secundo et al., 2010; Ramírez, 2010; Bratianu, 2009; Sanchez et al., 2009; Ramirez, et al., 2007; Leitner, 2005; Observatory of the European University, 2006; Sanchez and Elena, 2006; Leitner, 2004; Leitner and Warden, 2004). Despite the proliferation of IC models - mainly designed by individual institutions and implemented on voluntary basis (Sanchez et al., 2009) - only Austria universities use a homogeneous model and are obliged by Law to publish an IC Report.

Framed in the above premises, our concern is focused on the design of an IC model suitable for affording the trade-off between the comparability aims and the efforts to capture the institution's uniqueness. Our analysis points out that the pathways for adoption of IC management and reporting strongly depend on the characteristics of the university, its previous experience with management tools and its managerial orientation. Thus, in our view, what is needed is a more general, flexible and comprehensive model that could be used by universities with different profiles and development stages as higher education organisations, regardless of its voluntary or obligatory nature. Framed in the above premises, the purpose of our paper is to propose an "*IC Maturity Model*" for *Universities (ICMM)* which aims to be a flexible framework for defining and implementing IC approaches within universities. The ICMM provides a theoretical continuum along which the process of maturity of the University that allow to be developed incrementally from one level to the next one moving from: Data collection, IC

Awareness, Adjustments, Measurement, Reporting, Interpretation and Decision making, and Strategy and Planning. Thus, the ICMM proposes a staged framework to initiate a step-by-step change within a University based upon its current level of IC management maturity. Moreover, the different steps of maturity might be an answer to cope with the huge diversity of European universities, some of which have strong managerial orientation, while others follow collegial form of governance.

The paper is structured as follow. Section 2 provides the rationale to understand why IC is relevant in the context of higher education and research institutions. Section 3 presents the research approach and methodology. Section 4 proposes the maturity model for universities, its components, the different stages and the full cycle of IC management. Finally, Section 5, the discussion and conclusion, emphasises the added value and advantages of the model proposed and also its limitations and ways of improvement and moving forward.

2 Rationale for IC approaches in universities

Intangible assets and Intellectual Capital (IC) are seen as elements essential to value creation in companies (Moustaghfir and Schiuma, 2013) and for nations' economic wealth (Martín-de-Castro et al., 2011; Lev, 2001; Cañibano et al. 2000). Although the IC concept was first developed as a framework to analyze the contributions of intellectual resources in for-profit enterprises, it was soon extended to public and non-profit organizations due to its importance (Mouritsen et al., 2004; Kong and Prior, 2008). This section briefly describes the general background to understand what IC is in the context of universities and the rationale for proposing IC approaches for these institutions.

2.1 *What Intellectual Capital means in the context of universities?*

In practical terms, IC strategic management focuses on the ways to visualize and make use of individual and organizational resources and capacities in a holistic manner, with a focus on intangible assets, and on how to develop in a sustainable manner such resources and activities. From an organizational point of view, the term 'Intellectual Capital' refers to the resources on which the organization relies in the broadest sense, including not only human capital resources, but those of the organization itself (structural capital) and its relations with its external stakeholders and its general environment (relational capital) (MERITUM, 2002). IC has been also defined as the combination of intangible resources

and activities that “allows an organization to transform a bundle of material, financial and human resources in a system capable of creating stakeholder value and organizational innovation (European Commission, 2006, p. 4). Moreover, it could be described as intellectual material that has been formalized, captured and leveraged to produce a higher valued asset (Schiuma, 2009). Without doubt, the tripartite classification is the one that has the widest recognition in the specialized literature, structuring IC in three blocks: Human Capital (HC), Structural capital or Organisational Capital (SC) and Relational Capital (RC).

In the context of universities, the tripartite classification is as follows:

- *Human Capital (HC)* refers to the intangible value that resides in the individual competencies; this includes the expertise, knowledge and experiences of researchers, professors, technical staff, PhD students and administrative staff.
- *Structural Capital (SC)* comprises the intangibles resources that are found in the organisation itself, i.e. what remains when academic staff and students leaves. This includes, among others, the databases, the intellectual property, the research projects, the research infrastructure, the research and education processes and routines, the university culture and the governance principles.
- *Relational capital (RC)* is related to the intangible resources and capabilities able of generating value linked to the university’s internal and external relations. This includes its relations with public and private partners, position and image in networks, its academic prestigious, its brand, partnerships with the business sector and regional governments, its links with non-profit organisation and civil society in general, collaborations with national and international research centres, networks and alliances, attractiveness as a place to study and to work, etc.

As with private organisations, the weigh, role and internal meaning of each of the components of the IC concept differs depending of the university’s profile, mission and vision.

Accordingly, those Universities defined as *research-intensive* will emphasise the critical role of consolidated researchers (HC), publication records of the research personnel (SC), and networks with prestigious universities (SC); while *entrepreneurial universities* will focus on personnel with an entrepreneurial mind-set and involved in business oriented activities (HC), creation of spin-off (SC) and partnership agreements with the private sector (RC); and *teaching universities* will concentrate its attention in

attracting the best professors and students (HC), develop competitive graduate and post-graduate programme (SC) and partnerships agreements with prestigious university for student mobility (RC).

Beyond the different types of universities, each university (even being classified under the same typology) has a different managerial approach and maturity level in terms of management of intangibles and IC depending on the national law and regulations procedures where the University is located. A series of researches have dealt with the development of methods to measure IC and to support IC management and reporting in Universities (Silvestri and Veltri, 2011; Siboni et al., 2013). These initiatives have been developed or promoted by the European Union (Cañibano et al., 2000; European Commission, 2006), by national governments (e.g. Danish Trade Industry Development Council (DMSTI), 2003; Federal Ministry of Economics and Labour (FMEL), 2004; Austrian Research Centers (ARC), 2005), and by groups of experts (Observatory of the European University (OEU), 2006). In the wide range of public organisations several studies have highlighted a lack of research with reference to state universities (Hellstrom and Husted, 2004; Sanchez and Elena, 2006; Bezhani, 2010), and several calls for research have been published to improve the managing of IC in those organisations (e.g. Castellanos and Rodriguez, 2004; Leitner, 2004; Sanchez et al., 2009; Secundo et al, 2010).

Probably the most comprehensive effort done so far to provide a comprehensive and homogenous IC Model for managing and reporting IC in universities (the so-called ICU Report) was developed by the Observatory of the European University (2006). As proposed by the ICU Report (OEU, 2006; Sanchez et al., 2009), a proper IC management and reporting tool has to take into consideration three elements: (a) the vision of the institution, which includes the main general objectives, the strategy and the key drivers to reach them, (b) the intangible resources and activities that the institution can mobilize and the different activities undertaken or planned to improve them, and (c) the system of indicators defined to allow the internal and external bodies to assess the performance and estimate the future of the institution correctly.

Despite the efforts for developing a comprehensive framework for IC management and disclosure, the attempts to make the ICU Report a reality show several shortcomings in the implementation process mainly related to internal characteristics of the institutions, such as the definition of the university's boundaries and profile; the level of involvement

of managers and their experience with similar tool or the exiting of conflicting objectives within the institution (Sanchez et al., 2009). In other words, IC management approaches were not able to provide a solution for the huge diversity of universities in Europe. Sanchez et al. (2009, p.320) argued that some of these shortcomings have led to the idea that “it would be better to build specific models for each organisation, which could only be done with voluntary initiatives”.

Other advanced models (Chiucchi, 2004) adopted the evolved notion of IC as a dynamic system on intangibles resources based on knowledge (Veltri et al, 2012). In these kinds of model, that overcome the limitation of the pioneering IC measurement models, attention is focused on the interactions between the IC components and on intangible activities which are essential in the production, maintenance and development of intangible resources (Silvestri and Veltri, 2011). The assumption behind these models is that measurement of IC is necessary for the management of knowledge, and their main aim is to identify the paths of an organization’s value creation based on knowledge (Veltri et al, 2012). Some features are considered relevant when analysing and defining an integrated IC management and reporting model: *the potential value of IC and its dynamic* and the *organization-specific nature*. Understanding these factors in the context of Universities means that as regard the first feature, in order to create value, IC components have to interact with each other and with tangible factors. Furthermore, the dynamic nature of IC implies that it is a concept in evolution, which undergoes changes over time and which must be constantly understood and interpreted (Kianto, 2007). The implications for researchers and practitioners are that an exhaustive list of IC components does not exist, due to these constant changes of classification (Grojer, 2001). The organization-specific nature of IC also implies that IC indicators are specific for each single organization, sector, industry, typology, size of organization, etc. Even the more accredited guidelines for drawing up an IC report do not propose an exhaustive list but include only some organisations specific examples.

2.2 Why intellectual capital approaches are relevant for universities?

The need for universities to have a greater involvement with their wider community and the general concern to ensure comparisons and benchmarking among them makes advisable to manage and disclose information on IC (Ramirez Corcoles et al, 2011). General methods for identifying, evaluating, managing and reporting on intangibles

within universities finds its justification on the one hand in the political and managerial challenges that universities are facing (Harayama, 2007; Johnes et al., 2009; Parker, 2011; Veltri et. al., 2012), and, on the other hand, in the fact that their most valuable resources are its researchers, students and their relations and organisational routine, and their most important output is knowledge, that is basically intangibles (Siboni et al., 2013; Canibano and Sanchez, 2009, Leitner, 2004).

In general terms, the benefits of implementing an IC management model fall into two categories (Marr and Chatzkel, 2004, European Commission, 2006): (a) Its potential to function as a management tool to help develop and allocate resources, create strategy, monitor the development of the organisation's results, and facilitate decision making and (b) Its potential to function as a communication and reporting tool linking the institution to the stakeholders and as a way to attract resources – financial, human and technological.

In the context of HE institutions, the challenge is to combine flexibility and adaptation to the fast-changing environment which necessarily implies the introduction of management tools. Additionally other reasons why IC management tools are of great potential for universities (Elena and Warden, 2011) are as follows:

- Universities are being provided with more autonomy to manage their own affairs, not only academic but also financial, to redefine their own internal structures, which necessarily requires new management and reporting systems.
- Universities have to be more transparent and, thus, to disseminate more information to stakeholders (researchers and teaching, students, funding bodies, governmental agencies, labour market, and society as a whole).
- The increasing cooperation between universities and firms has resulted in the demand for similar processes of evaluation for both players. Accordingly, universities would have to implement new management and reporting systems, which necessarily incorporate intangibles.
- IC management can help to shift strategic focus of universities towards intellectual resources and enhance their capability to adapt to the challenges posed by the non-profit environment they are operating in.
- Finally, IC should play a key role in human resource management (HRM) within organisations, thereby also addressing the organisational factors (structural capital) that are important that employees and students can enfold their creativity.

Despite the benefits and potential of IC approaches, in the realm of practice, universities face serious difficulties when trying to implement a “business” thinking to steer the organization towards a successful future. They are complex organizations dealing with a multi-mission approach, task complexity, professionalism and administrative values (Sporn, 1999). Furthermore, the governing modes of European universities, often based on collegial models, hinder the implementation of new managerial decision making processes and tools (Elena and Warden, 2011). There are also important external constraints, such as the changing role of the state, public budget pressures and new societal demands.

Framed in the above premises and based on the idea that “one solution does not fit all”, the research aims of this article is to conjugate the IC measurement and management perspectives within Universities, by developing a flexible framework able to adapt to individual characteristics of different institutions and different stages of managerial development. This provides an opportunity for IC approaches to reinvent itself and to facilitate a more balanced approach among management, measurement and reporting.

3 Research approach

The research approach followed is based on what has been called the “third stage” of IC research (Marzo, 2014), which focused on the praxis of IC approaches and models rather than on its theoretical conceptualisation. When dealing with IC in non-for profit organisations, as it is the case of universities, the gap between theory and practice is very broad. The benefits of IC approaches advocated by the specialised literature and policy recommendations are clear but crash with the daily life and the reality of these organisations. Hence, our research approach was practice-oriented and has been produced in the frame of the Project “Quality Assurance in Higher Education through Habilitation and Auditing”¹ run by the Executive Agency for Higher Education and Research Funding of Romania (EUFISCDI) and co-funded by the European Social Funds (Sectoral Operation Programme Human Resources Development 2007-2013).

As argued by Dumay (2009; 2012) neither practitioners nor the academic community support the universal implementation of any of the proposed frameworks because none

¹ Project co-funded by UEFISDI and European Social Funds (Sectoral Operation Programme Human Resources Development 2007-2013).

of them seems to offer a robust solution to visualise, manage and report the IC. For the case of universities is even more clear since the wide range of individuals experiences of managing and reporting on IC have been, in most cases, one stand-alone practice and there is no continuity over time.

To this purpose and with the aim to cover the highlighted research gap, three Mutual Learning Workshops (MLWs) were organised as a mean to bring together international experts and practitioners to share their views and experience on IC Reporting and setting up task forces to draft the Blueprints for IC Reporting for universities. The MLW took place in Bucharest (Romania) from October 2012 to May 2013 involving 15 experts from across Europe.

The mutual learning methodology is a valid tool to provide a common space, a “platform”, for experts, practitioners, managers and policy-makers to reflect upon, share, consolidate and transfer experiences and lessons. This methodology has been proved to be highly effective in other areas of high relevance and policy impact such as the definition and implementation of Smart Specialisation Strategies (S3)¹.

The expert team conducted the work along four stages:

- Stage 1. Mutual learning from the IC management in European Universities. In this phase the existing approaches and lessons with IC management at universities across Europe have been discussed and synthesised. Analysis included experience from Spain, Austria, Greece, Italy, Romania, Lithuania, Poland and Latvia.
- Stage 2. Identification of the main shortcomings of the existing models and instruments for IC reporting and management. A common discussion and analysis of existing approaches allowed to define the requirements for a new model to be developed.
- Stage 3. Development of the model. The IC model was defined taking into account the features of universities and the operational requirements to draft a model which can be applied for very different universities concerning their management development and organisational culture.

¹ For more information see the Smart Specialisation Platform peer reviews activities based on the principles of mutual learning workshops: <http://s3platform.jrc.ec.europa.eu/peer-review>

- Stage 4. First validation of the Model with experts in IC management and colleagues of the project, team which in parallel developed a model for IC management in Regions

The lessons learnt can be organised around the following four key issues: (i) critical review of functions and purposes of IC management and reporting models from the university perspective; (ii) IC models and frameworks should be reoriented and adapted to individual institutions; (iii) the definition of indicators should consider the trade-off between comparability purposes and usefulness for managers, and (iv) shortcomings of the implementation process.

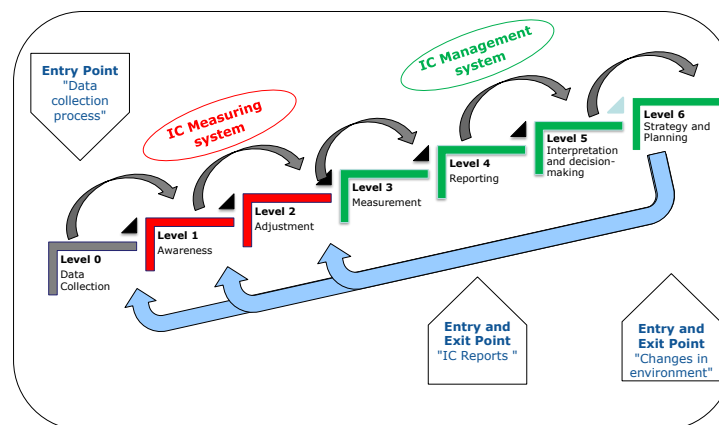
The final result of the Project is a set of guidelines for IC management implementation in European universities (Leitner et al., 2014).

4 Towards an IC Maturity Model for Universities

As mentioned in previous sections, European HE landscape is very diverse in terms of missions, forms of governance, level of autonomy, capacities and existing processes for management of tangible and intangible assets. This suggests that there are no ‘one-size-fits-all’ solutions and thus the adoption of IC management systems should be flexible and tailored to individual needs and capabilities. To this end we suggest an approach for IC management based on the concept of maturity models.

Maturity models were initially developed in computer programming with the view of ensuring systematic development of software and ensuring inter-operability of programmes (Van Looy et al., 2010). Subsequently such models were applied to monitor and manage the introduction of a broad range of organisational innovations: from new product developments to e-learning or open source. Maturity models provide a flexible framework for the introduction and management of innovations along a continuum of maturity levels: from *ad hoc* activities carried out by ‘heroic individuals’ to systematic implementation and subsequent continuous improvements. Depending on capabilities and individual characteristics, organisations typically start at different levels and proceed to the next stages at varying speed. Hence, maturity models serve several functions: a) initial appraisal of *status quo* (i.e. identification of maturity level before introduction of innovations); b) step-by-step roadmaps on how to proceed; c) instruments for monitoring the progress.

The proposed *IC Maturity Model (ICMM) for Universities* and has been constructed in line with three guiding principles (see Figure 1). First, IC management system should be introduced considering the mission, objectives and unique features of the university. Hence, there are multiple ‘entry points’. In other words, universities are likely to start the definition and implementation of an IC management approach from different levels (e.g for the data collection process or from the reporting of IC information or even just from a change in the environment). Second, fully functioning IC management system is an iterative rather than a linear process. IC measurements should be systematically integrated into decision-making processes and periodically reviewed in line with shifting strategic and operational objectives. Third, IC management is not ‘yet another management tool’: a fully mature system should be at the heart of strategic and operational decisions taken by university.



Source: Own elaboration

Figure 1. ICMM for Universities: paths for IC definition and implementation

As Figure 1 illustrates the full cycle of maturity model includes seven levels, so provides targets on improving maturity, three “entry points” (data collection process, IC reports and Strategy and Planning) and two “exit points” (IC reports and Changes environment). As mentioned above, the “entry point” implies that the institution can start with the model at different levels, and not necessarily from level 0, given the different degrees of its management maturity. Those universities not familiar with the IC approach and still with a need to homogenise data bases and gather further data will most likely start from level 0, while for instance universities already reporting on IC (such as could be the case of Austrian universities) can start from Level 4. On the contrary, “exit points”

means that the institution could stop the process and not finalise the full maturity cycle for different reasons. It could be the case than the institution would like to stop the process when the target of reporting has been accomplished or when changes in the environment impose reorientation of managerial priorities.

The seven levels of maturity are as follows:

- **Level 0: Data collection.** All European universities collect, to greater or lesser degree, some data for accounting, management and/or external accountability purposes (e.g. number of students, degrees awarded, number of research projects, number of staff, etc.). Some of these indicators could be related to intellectual capital, but are neither conceptualised as such, nor used in the management process. Such data collection process (either for management or reporting purposes) represents a typical ‘entry point’ for of IC measurement and management.
- **Level 1: Awareness of IC.** Universities are producing knowledge, but a rather small proportion of them can clearly identify unique intangibles that differentiate them from other universities or alike institutions. Hence the first level of implementation of IC management systems involves the definition of key intellectual assets unique to a University. This process is typically guided by strategic objectives and the available information on current strengths and weaknesses. Awareness of IC may be the result of long-term strategic orientation and, over time, could lead to the next level: adjustment of data collection and monitoring system.
- **Level 2: Adjustment of monitoring systems.** Once the objectives and scope of IC monitoring is defined, indicators and routines for data collection are reviewed so as to explicitly incorporate relevant dimensions of organisational IC. This includes systemic review of all the data collected by university, relinquishing of irrelevant indicators and introduction of new ones to reflect the strengths and weaknesses of IC of a university. While consensus building on unique IC dimensions (awareness level) is likely to involve broad participation from academic community, optimisation of monitoring systems is usually performed by the management.
- **Level 3: Measurement of IC.** Measurement involves systemic collection of data in line with *ex ante* defined indicators. This process involves considerable costs

to university administrators and academic community who have to provide additional information. Well-functioning measurement systems are based on a limited set of indicators and a shared vision regarding the rationale behind data collection. If levels 1 (awareness) and 2 (optimisation) are immature, measurement process is likely to be problematic. On the one hand, if there is lack of consensus on the objectives of IC management, academic community may decline to provide additional information. On the other hand, definition of the right indicators and measurement process can create incentives for academic community to align their individual agendas with that of the university.

- **Level 4: Reporting of IC.** Publication of IC reports could be an indication that university has reached the fourth level of the ICMM. Importantly, the reports should serve two functions: a) accountability of external stakeholders as well as tax-payers at large and b) provide vital information for managerial decisions (EQU, 2006). All too often information on IC is used only for external accountability purposes. This stage could also represent an 'exit' point, i.e. IC measurement system is not used as an integral part of IC management.
- **Level 5: Interpretation and decision-making.** The sixth maturity level involves use of information on IC in everyday decision making. It should constitute an integral part of human resource policies, investment decisions as well as set the framework for deliberations on curriculum and research agenda.
- **Level 6: Strategy and planning.** Fully functioning IC management system involves periodic reassessment and reinvention of universities' unique strengths, long- and short-term objectives and means to achieve them. Hence, the last maturity level involves use of information on intellectual assets to review universities' internal processes, redefine mission, values, objectives and strategic plan. These decisions should be reflected in the next planning cycle: what are the core assets, how they should be monitored and managed to improve mission and performance?

Strategy and planning phase could also reflect an 'entry point' to IC management. Radical shifts in strategic orientation of university (typically caused by factors such as economic crisis, change in regulatory framework or appointment of new Rector) could create a need to introduce IC management as an instrument to flesh-out universities' mission or reallocate resources.

5 Discussion, Conclusions and ways forward

Universities are moving from a traditional academic organization to new forms of Entrepreneurial Universities where the processes of education, research and innovation are strictly integrated to support cooperative activities and relationships with external stakeholders and funders (Hunt, 2003; Gibb and Hannon, 2006). The increasing emphasis on integration – such as university-industry-government cooperation – calls for new forms of academic and administrative management (Weber, 2006). At this purpose Universities need to take into account new IC management strategies for identifying, measuring and valuing intangibles as part of an overall management perspective.

“At present, the numerous initiatives on IC reporting provide many interesting and challenging ideas, but arguably have little prospect of widespread adoption. Perhaps, the lack of agreement among academics and practitioners on most aspects of IC reporting including what to report (or what is IC) and how to report, can be blamed for the current moribund status of IC reporting” (Abhayawansa, 2014, p. 119). Nevertheless, the situation is likely to change, because the increasing autonomy and competition among universities and research organizations will oblige universities to position themselves strategically, raise new financial resources and find new ways of accounting for their investments and expenditures. In response to these challenges, universities and research organizations are already implementing new management and reporting systems, which must incorporate intangibles.

However, the design of an IC model suitable for affording the trade-off between the comparability aims and the efforts to capture the institution’s uniqueness when designing an IC model or framework is still open. With the aim to cover this gap, our analysis pointed out that the pathways for adoption of IC management and reporting strongly depend on the characteristics of the university, its previous experience with management tools and its managerial orientation. An *“IC Maturity Model” for Universities (ICMM)* has been presented as a flexible framework for defining and implementing IC approaches within universities. The ICMM provides a theoretical continuum along which the process of maturity of the University allows to be developed incrementally from one level to the next one.

Transitions from lower to higher maturity levels are neither predetermined, nor effortless. Climbing the ‘maturity ladder’ requires at least three preconditions. First, strategic leadership is essential to tackle at least three challenges: a) inertia in decision-

making routines and managerial practices; b) countering a rather widespread belief that knowledge creation is not susceptible to management, but rather relies on individual efforts of ‘super-star academics’ and autonomy from managerial or bureaucratic ‘red-tape’; c) taking tough decisions in reallocating resources in line with the strategic and operational objectives that emerge from interpretations of IC measurement system. Second, transition between maturity levels requires continuous efforts from academic community. Hence, it relies on broad consensus on the benefits of exercise to justify the costs. Lastly, transitions to higher levels are to necessitate introduction of additional analytical, managerial and similar systems. For instance, measurement requires definition of indicators, careful analysis of the costs and benefits of collecting each additional data point, review of other monitoring systems to facilitate benchmarking, etc. Development and maintenance of these systems will consume scarce human and financial resources. Hence, as Cohen, March and Olsen (1972) argued, it is likely that organisational innovations are likely to emerge in universities with large institutional ‘slack’, i.e. availability of additional resources that are not essential for other vital organisational functions. This suggest that universities continuously operating under large financial stress are not likely to introduce (or increase the maturity of) IC management systems.

Maturity models seem to be useful because they allow organizations to self- assess the maturity of various aspects of their processes against benchmarks. Specification of a University’s IC maturity helps in determining the current attitude towards intangible assets, the state-of-knowledge in the University about the IC and finally the University’s-specific strategy for implementing IC related activities in order to improve performance.

The ICMM also provides a staged framework to initiate a step-by-step change within an University based upon its current level of IC management maturity. The application of the model would be a healthy exercise in transparency for these institutions to facilitate access for their stakeholders to a variety of information which is relevant to their decision making. So, the ICMM could facilitate universities on the path to presenting information useful to their stakeholders, contributing to a greater transparency and comparability in the higher education sector, to help decision-making processes, improve the articulation of public policies and increase transparency in the whole system. The originality of the ICMM Model lies in its adaptation to cope with the huge diversity of European universities, some of which have strong managerial orientation, while others follow collegial form of governance.

Future research will include the identification and validation of IC indicators according the features of the University where to apply the model. To this end, a questionnaire will be sent to members of the governing board of a set of identified Universities to identify their opinion on the necessity of disclosing these IC indicators; analysis of the different perceptions of each group of stakeholders regarding the importance of disclosing information about IC.

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A literature review on Knowledge Management in SMEs

Emilio Esposito *, Maria Rosaria Spadaro

Department of Industrial Engineering
University of Naples Federico II
Piazzale Tecchio 80, I-80125 Naples (Italy)

** Corresponding author*

Structured Abstract

Purpose – The aim of this paper is to provide a comprehensive research review on knowledge management in small and medium enterprises in order to identify gaps in the body of literature. By connecting these gaps to business future trends we identify several future research avenues for each research area.

Design/methodology/approach – The main objective of this literature review is to analyse the state-of-the-art of knowledge management in small and medium sized firms from the management perspective in order to identify relevant research gaps. The review has been carried out using Scopus and Web of Science Academic databases, and it has been conducted using the keyword “knowledge management” in combination with “SMEs” or “small firms” or “small business”. Seventy papers in total were selected and studied in detail; they are all relevant scientific papers covering the topic of KM in SMEs from 2003 to 2013.

Originality/value – This methodology puts in evidence the current situation in knowledge management in SMEs’ research field.

Practical implications – The outcomes of the application provide a valuable understanding of both knowledge management’s best researched topic, which concerns the factors affecting knowledge management in SMEs and the knowledge management topics which are poorly investigated which concern KMSs adoption in SMEs, the barriers hindering their dissemination and the impact of KM on firm performance. From a practical perspective, the review concludes that the barriers connecting to KMSs implementation seem to belong more to cultural area rather than technological one and need to be exploited more in depth.

Keywords – knowledge management, enabler factors, barriers, SMEs.

Paper type – Academic Research Paper

1 Introduction

A vast literature underlines that in modern industrial environment SMEs are playing a crucial role for large companies competitiveness (Al-Mutawah et al., 2009; Dyer, Hatch, 2006; Esper et al. 2010; Esposito, Passaro 1997; Esposito, Raffa, 1994; Esposito, Raffa, 2007; Gunasekaran, Ngai, 2007; Lakshman, Parente, 2008; Lee et al, 2010; Samuel, 2011; Iandoli et al. 2012). Nevertheless, although there is an abundance of studies describing how large companies are successfully practising KM, the reasons why small firms show poor usage of KM tools are still unclear and benefits of KM adoption are not fully exploited by these firms (Alavi, Dorothy, 2001; Durst, Edvardsson, 2012; Marra, Ho, Edwards, 2012; Thorpe et al., 2005). Several researches highlight that the issues relating to KM in SMEs are different from large firm. In KM practices issues faced by small businesses cannot simply be a scaled-down replica of large-company experiences (Pillania, 2006, 2008a; 2008b; Sparrow, 2001). As asserted by Frey (2001), although major corporations have led the way in introducing and implementing KM, for SMEs is increasingly important manage their collective intellectual assets. In line with this perspective, Desouza and Awazu (2006) identify five key peculiarities that differentiate practices of knowledge management in SMEs than large companies: the dominance of socialization in the knowledge creating cycle; common knowledge, that is knowledge known to all members of the organization; the way to avoid lost of knowledge (the close social ties among members of the SME act as a deterrence against employees leaving the business and avoid pitfalls of knowledge loss); exploitation of external sources of knowledge; people centred knowledge management (technology is never used as a means to manage knowledge). Similarly, McAdam and Reid (2001) using a modified version of Demarest's Socially Constructed model for the KM that in turn is an adaptation of Clark and Staunton's model describes the key dimensions of KM process (knowledge construction, knowledge embodiment, knowledge dissemination and knowledge use/benefits) and for each dimension conducts a comparison between large firms and SMEs. Sparrow (2001) identified four components of KM in small firms: the appreciation of personal and shared understanding; knowledge bases and knowledge systems; the integrated and contextualized action needed for knowledge projects in SMEs; the knowledge and organizational learning processes in SMEs. Egbu et al. (2005) highlight

that knowledge generated in SMEs is tacit in nature due to various reasons. In the context of SMEs some elements of KM are practiced but in an 'ad hoc' fashion. Indeed, any technological infrastructure that is put in place to support KM must be adapted to the organisation's needs and not the other way round. Wong (2005) underlines that most of research concerning factors that may influence the success of KM implementation is heavily focused on large companies as early adopters and superior performers of KM were large and multinational corporations. As such, existing factors are mainly large companies oriented, thereby reflecting their situations and needs. Directly applying these factors into the SMEs environment may not be sufficient without an understanding of their very own and specific conditions. In this context, Wong (2005) and Wong and Aspinwall (2005), proposed a more comprehensive model for implementing KM in SMEs based on eleven critical success factors: management leadership and support, culture, information technology, strategy and purpose, measurement, organisational infrastructure, processes and activities, motivational aids, resources, training and education and human resources management.

From the other point of view there are several works which stressed how firm's performance can be enhanced by knowledge management processes Daud (2011); Bagnoli (2012).

The above literature highlights that there are profound differences in the process of KM between SMEs and large companies. Directly or indirectly these differences turn around the following aspects:

- In SMEs the nature of knowledge is mainly human embedded;
- In SMEs there is a sort of common knowledge, that is a knowledge known to all members of the organization;
- The scarcity of resources pushes SMEs towards the exploitation of external resources of knowledge.

Although these aspects seem reasonable, the Information and Communication Technologies (ICTs) are more and more reducing their weight by offering new tools for KM that are (Antonelli, et al., 2000; Esposito, Mastroianni, 2001; Garrigos-Simon, et al., 2012; Matlay, Westhead, 2005):

- *Low cost*. This means that new KMSs do not require relevant financial resources and are compatible with budget of SMEs;

- *Ease to use* (friendly). That is, ICTs are offering KMSs that to be used do not need high skills;
- *More effective*. Compared with traditional tools, new ones are able to support the processes of socialization among members of a group.

In synthesis, new technologies are reducing the human and financial barriers that hinder the adoption of KMSs, are facilitating the process of socialization of the knowledge that is crucial for SMES, and are offering new opportunities and new benefits that push SMEs toward practices of KM.

The reality is constantly changing and although the number of papers is increasing in the last few years, the body of knowledge regarding knowledge management in SMEs is still limited (Durst, Edvardsson, 2011).

Assuming that SMEs are the drivers of most nations all over the world, this situation is to be improved.

According to the literature review written by Durst (2012), there are three areas of KM, which seem to be relatively well researched in SMEs.

These are KM implementation, KM perception and knowledge transfer while the body of knowledge regarding the topics of knowledge identification, knowledge storage/retention and knowledge utilisation is rather poor.

Therefore in order to meet both market changing in IT field and taking inspiration from some evidences retrieved in literature, the aim of this paper is to review research on KM within smaller firms in order to identify gaps in the literature which justify further research avenues as well as to clarify what are the well researched areas.

The paper is organized into three sections. Following this introduction, the second section describes the methodology used to carry out a systematic literature review on KM in small firms and provides the main results achieved. Conclusions and implications are outlined in the third section.

2 Methodology

The review has been carried out using Scopus and Web of Science Academic databases, which ensure a comprehensive coverage of scientific output as they contain more than 8,000 scientific journals, including the most important high-ranking journals. Adapting the approach suggested by Kolbe and Burnett (1991) and Li and Cavusgil

(1995), the systematic study of existing body of knowledge on the above topic has been done through the three following main phases: 1) sampling, 2) classification and 3) analysis.

2.1 Sampling

The sampling phase is aimed at identifying all relevant papers that covers the topic of knowledge management in SMEs.

The search was conducted using the combination of the following keywords: “knowledge management”, “SMEs”, “small business”, “small firms”, “small enterprises”.

Journal articles, which appeared in the period from 2003 to 2013, were collected. These articles were sourced from ISI Web of Knowledge and Scopus database.

This allows us to identify 269 documents from Scopus database and 74 documents from Web of Science Academic database. It is important to stress that about the 90% of the latter are included in the former database.

The further step in this phase was to achieve a high level of rigorousness of scientific products retrieved and control over quality of the search process. This was achieved by limiting the search to peer-reviewed journals (including papers already presented in international conference proceedings and published on peer-reviewed journals after the conference). As a result, prefaces, editorial notes, review and other editorial materials, in addition to any articles from magazines or industry publications, were excluded. We adopted the selection criteria of title, abstracts, keywords and making reference only to the subject areas of social sciences the final sample obtained at the end of this stage consists in 70 journal articles.

2.2 Classification

For the retained 70 articles we conducted a descriptive analysis before studying their contents in more depth.

The descriptive analysis covers the articles distribution over time (Fig. 1) and journal research area (Table 1).

Concerning the 70 retained articles distribution over time, it mirrors the timing trend of the all 269 articles which have been yielded in Scopus database.

To classify the articles identified in the previous phase the functionalities, provided by the Web of Science Academic database, have been used. These allow to identify the

distribution of 70 articles retrieved by 19 subject areas of the database. The subject areas have been grouped into the following four macro areas (Table 1): a) Engineering (7 article), b) Information systems and computer science (7 articles), c) Operations research and management science (46 articles) and, d) Multidisciplinary (10).

The articles were obtained from the e-journal search engines available in the University of Napoli Federico II electronic library. These include access to journals published by several publishers such as Elsevier, Taylor & Francis and others.

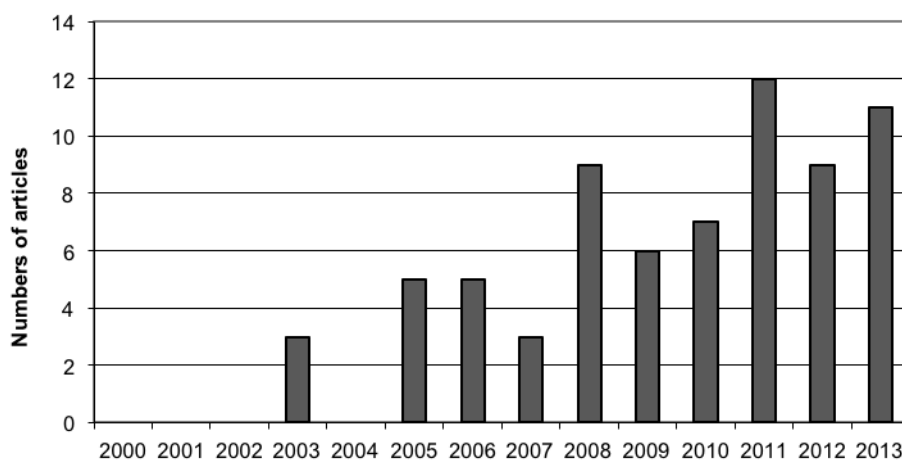


Fig. 1 - Articles distribution over time

Table 1 - Sample articles by macro areas

Macro areas	Papers
Operations Research & Business Science	46
Engineering	7
Computer Science & Information Systems	7
Multidisciplinary	10
Total	70

Full bibliographic details of the 70 articles selected for the analysis are shown in the reference section in order to make our research processes transparent.

The 70 articles were studied in detail and the results of the analysis are described in the following section.

2.3 Content analysis: characterisation of research areas

Content analysis of the 70 articles gives us a detailed overview of the aspects covered by research on knowledge management in SMEs; the articles have been clustered according to macro topic areas which in turn have been split, as possible, in classes of influence or otherwise in subgroups in order to get a fully overview of the problem.

2.3.1 The first macro topic area: factors affecting the knowledge management in small and medium enterprises

The articles belonging to this topic deal with the factors that can influence the success of KM implementation; taking inspiration from Wong (2005)'s study, at first, three classes of influences can be proposed to classify these factors: managerial, resource and environmental influences.

The managerial area involves four main aspects: coordination, control, measurement and leadership; resource area consists of knowledge, human, material and financial resources with human resources in turn involves human capital: education, experience, social skills and motivation (Jones, 2010), whereas environmental influences includes: competition, markets, time pressure, governmental and economic climates.

At the end, another important class of influence to KM implementation can be identified, it is the firm's infrastructure (Lee, 2011), which involves: technology, organizational structure and organizational culture.

According to the first class of influence there are several studies in literature (Wong, 2005; Valmohammadi, 2010) which argue that top management behaviour and its full support is able to motivate employees to take part in successful implementation of knowledge management, so it is a point to stress.

Concerning human resource area, training and education is another important field for successful KM, in fact if employees are trained and educated in using the KM system and other technological tools for managing knowledge they can utilise the full potential and capabilities offered by these tools as argued by Wong (2005).

From the other side the motivation of employees is another critical human factors to take into account and to support because if individuals are not motivated to practise KM, no amount of investment, infrastructure and technological intervention will make it effective.

Concerning firm's infrastructure influence it involves at first organizational structure which makes reference to the degree of centralization and formalization (Ghoulipour, 2010), a too formalized structure can inhibit dynamic interaction that is critical to knowledge creation.

Another factor that belong to infrastructure dimension is the firm' culture. Concerning the cultural issue, Wong (2005) argues that culture is a wide concept, which comprises many aspects. One cultural aspect, which is crucial for Knowledge Management, is collaboration. In fact a collaborative culture requires individuals to keep in touch each other, to exchange ideas therefore it is an important enabler for both knowledge transfer and knowledge creation. Trust is also another fundamental aspect of a knowledge friendly culture (Wong, 2005). In fact the building of a trust atmosphere between individuals and groups inside the firm is able to get down the knowledge barriers about intellectual property and the fear of exploitation and therefore can improve the knowledge sharing process.

So the culture is an important point to stress because if it has not been fully exploited it can become the largest obstacle faced by organisations in creating a successful knowledge-based enterprise as the survey, conducted by Chase (1997) and reported by Wong (2005), suggests.

Another factor which belongs to infrastructure is information technology (Lee, 2011), it is an indisputable key enabler for implementing KM in SMEs (Wong, 2005) but its development and utilisation have to meet the particular firm's need with reference to the knowledge content, organizational structure, suitability to users' needs in order to develop systems which evolve from merely being a static archive of information to being connector of a human to information and of one human to another (Wong, 2005).

The identified classes of influence can be clustered into two macro-areas: internal factors area and contingency factors area.

1. Internal factors cluster. The first cluster involves the articles belonging to managerial, resources and infrastructure classes of influence, these classes have a peculiarity in common, in fact they deal with factors inside the firm, which affect knowledge management and which are directly controllable by an organization (Valmohammadi, 2010); the most part of articles retrieved in literature belongs to this area.

2. *Contingency factors cluster*. This sub-topic research area covers only 6 articles. The articles belonging to this area deal with both factors outside the firm, affecting the enrichment of company's own knowledge base such as environmental influences, as earlier explained, and contextual factors (organizational size and age firm). In literature many questions have been arisen concerning the relation between KM and organizational size (Moffett and McAdam, 2006), and in particular whether KM programmes can be applied across all organizations equally. Concerning this topic we have to also make reference to background variables like: location, turnover, gender, and age of managers (Edvardsson, 2009).

The explored factors can influence the success of KM implementation whether they are well employed and combined otherwise they become barriers to knowledge management.

In fact as Nunes (2006) argues, there are several issues related to KM implementation.

The first is associated with the already discussed syndrome that "long term investments" are always lower priority than "short term investment" Nunes (2006). The second reason is related with the difficulties in obtaining a "believable Return on Investment case" (Nunes, 2006).

These issues make reference to organizational cultural influences and top management behaviour, which have been earlier explored.

Others barriers connecting to knowledge spread are intellectual property and, sometimes, organizational structure (Milosz, 2010).

As shown in the survey conducted by Wong and Aspinwall (2005), in SMEs sector in UK, there are several reasons for not practising knowledge management.

These reasons point to the lack of a sound conceptual foundation in KM and in its potential benefits. This is consistent with the findings of other studies related to SMEs (McAdam and Reid, 2001).

However only 4 articles adopt this viewpoint to face knowledge management topic.

The classification of articles, belonging to the first topic area, can be summed up as shown in Fig. 2.

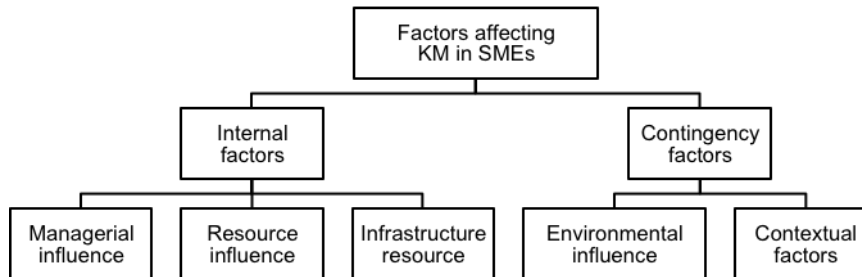


Fig. 2. The articles' topic areas

2.3.2 The second research topic: KM in small and medium enterprises and firm performance

Concerning the second topic it deals with the relationship between Knowledge management process implementation and improvement of firm performance.

There are various perspectives in literature to evaluate KM performance; adapting Chen and Chen (2006)' approach we can identify the following categories: quantitative analysis and qualitative analysis.

Concerning the quantitative analysis it makes references both to financial measures (profit, return on assets, payback periods, Tobin'q indicator, sales growth, shareholder equity) and to non financial measures.

About non financial measures, they involve market performance indicators (increasing market share, increasing level of customer satisfaction, market flexibility, competitiveness) and operational and technical performance measures (decreasing operation costs, decreasing product cycle time, increasing productivity, flexibility in resources utilization and process efficiency, quality).

About qualitative analysis it concerns measures, which involve human resource management perspective (improving employees' skills, developing customer and suppliers relationships, work relationship, creativity and staff performance, employee retention), strategy perspective (improving quality strategy, improving core business processes) and technological perspective (innovation).

Gholami (2013) deals with the relationship between Knowledge management process, which involves knowledge acquisition, knowledge storage, knowledge creation, knowledge sharing and the improvement of organizational performance, which includes

critical components such as productivity, financial performance, staff performance, innovation, work relationships, and customer satisfaction.

Bagnoli (2012) evaluates the relationship between SMEs innovation and organizational performance through a quantitative analysis carried out on a sample of 60 manufacturing SMEs in northeast Italy.

Salojärvi (2005) shedlights the positive relationship among the employment of knowledge management practices, policies in small and medium-sized enterprises and sustainable sales growth of those enterprises through a survey of 108 Finnish SMEs.

Delen (2013)'s research findings instead reveal that knowledge utilization appears to be the most important factor of KM in terms of its effects on both financial and non-financial firm performance. It is due to the fact that knowledge is valuable if only it is utilized. Hence, one of the most challenging dimensions of KM is how to leverage and utilize knowledge in accordance with organizational objectives and convert it into a valuable form in order to gain a competitive advantage.

Durst (2012) stresses the need for the SMEs' succession planning to develop control mechanisms of knowledge retention and therefore to implement measures to face the problem of undocumented knowledge and the dominance of tacit knowledge in order to avoid the danger of knowledge attrition caused by organizational turnover or large term absenteeism of critical staff members.

Soon and Zaino (2011) argue how knowledge enablers like learning, IT support can affect organizational creativity as "the creation of a valuable, useful new product, service, idea, procedure, or process by individuals working together in a complex social systems" and thus organizational performance.

All this seems to shedlighth that KM contributes to an overall growth of SMEs by enhancing simultaneously both quantitative and qualitative performance indicators but it is required in literature to develop a further empirical evidence which stresses the relationship between performance's elements and their importance.

The variables influencing knowledge management performance analysis can be summed up as reported in Fig. 3.

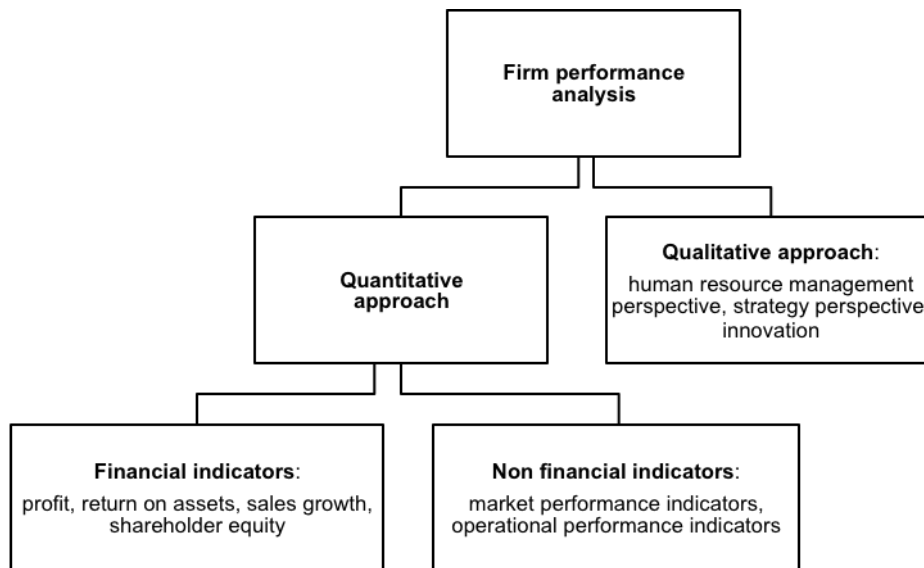


Fig. 3. Firm performance' analysis

2.3.3 The third research topic: KM practices

This topic covers 25 articles, which can be addressed to two subtopics according to the classification suggested by Turner et al. (2010):

1. *human oriented practices*, including such methods as communities of practice, job rotation, coaching, mentoring, after action review, storytelling, status meeting.
2. *technology oriented practices*, including collaboration platforms, document management, yellow pages, skills inventories, expert systems, blogs, information portals and wikis.

Concerning the first category as Desouza (2006) argues SMEs manage knowledge mainly by humanistic way, these include the use of face-to-face meetings, observations, apprenticeship training methods; and technology is not fully understood as a means to manage knowledge; it was due to the fact that several times SMEs do not exploit the potential benefits of IT for KM (Egbu, 2005).

According to the survey conducted by Edvardsson (2009), the Icelandic SMEs which funded in ICT adopted Internet and Intranet, data warehousing and groupware, but few got advanced KM technology like document management systems and decision support.

Boden (2012) carries out two case studies to show how knowledge exchange is performed by analyzing four knowledge sharing practices: status meetings and

maintaining awareness, the collaborative use of shared artefacts and repositories, and human ‘bridges’ that mediate between people and cultures.

In respect to the human oriented knowledge practices a great importance in literature is given to communities of practice.

As duPlessis (2008) argues, the communities of practice are groups of people, which work together to achieve objectives and start building relationships.

Each of the members in the community of practice brings a unique skills set to the community of practice, which is then shared to create a greater body of knowledge and skills among the members of the community. This assists in innovation and knowledge creation across boundaries in the organisation.

According to Wenger et al. (2002), communities of practice vary from work groups and other work entities. Communities of practice share an area of competence and are willing to share the experience of their practice in that particular area. It differs from a work team or project team, however, as it has no specific time bound work objective but exists indefinitely for the issues based on which the community of practice was formed.

Many times these practices replace informal processes as: discussion groups, mentoring program, brainstorming, compiling knowledge directories, firm visit (Hutchinson, 2008).

These practises can support one or more knowledge management processes as shown in Fink (2009)’ study however the practices retrieved in literature are developed to support particularly the area of knowledge creation/acquisition and transfer (Spraggon, 2007; Pillania, 2008; Yao, 2011) while the area of knowledge identification and storage are less supported by ad hoc practices. It is in accordance with Durst review’s findings.

Concerning the technologies oriented practices, mainly adopted by SMEs, a great attention in literature is given to wikis.

According to Leuf and Cunningham (2001) wiki is a freely expandable collection of interlinked webpages, a hypertext system for modifying and storing information database, where each page is easily editable by users. It is a collaborative space due to its total freedom, ease of use and access, simple and uniform navigational conventions and is also a way to organize and cross-linked knowledge.

Grace (2009) in his case studies also finds that some benefits which move the small and medium enterprises towards the usage of wikis include “its ease of use, ability to track and edit, its influence on the building of a trusting culture and as a central repository

of information, one significant and tangible benefit from the use of wikis is its ability to save time and therefore, money”.

From the other point of view Razmerita (2011) argues that “social media tools like wikis, blogs or social networks are the new way to knowledge sharing for SMEs because they are open source and free of charge and therefore can be adopted by companies without high costs”.

The use of information technology, especially Web sites, is recognized as a critical success factor for knowledge management initiatives in the SME sector also by Wong & Aspinwall (2005). Wong (2005) sees information technologies as a key enabler for the implementation of knowledge management, and considers in the development of a knowledge management system factors such as the simplicity of technology, ease of use, suitability of users’ needs, relevancy of knowledge content, and standardization of a knowledge structure as key factors for knowledge diffusion.

However there are few articles focus on technology oriented practices (tools) in SMEs and the barriers connecting to their adoption, while the most literature work focuses on practices, which are human oriented or more generally speaking on knowledge management processes.

The distribution of articles by macro-topic areas has been reported more in details in Tables 2 and 3.

Table 2. Sample articles by macro-topic areas

Macro Topic Area	Papers
Factors affecting KM in SMEs	33
KM and performance	12
KM practices	25
Total	70

3 Conclusions

According to our classification we can identify some gaps in the literature.

The articles belonging to the first cluster focus particularly on the enabler factors which influence the knowledge diffusion in SMEs it is in accordance with Durst’ viewpoint who argued that knowledge transfer and, in a roundabout way its enablers, is a well researched topic in literature.

Otherwise very little attention has given to the barriers connecting to knowledge management systems implementation; these barriers however seem to belong more to cultural area rather than technological one and need to be exploited more in depth.

From the other side very little attention is given to the importance of knowledge spread across SME's networks in fact only an article (Cappellin, 2003) stresses this topic.

As Cappellin argues, the evolution of knowledge in SMEs is the result of interactive learning processes, which involve not only individuals inside the firm but also the SMEs' networks stakeholders.

Therefore there is the need to exploit the knowledge flow between SMEs rather than to limit the research to only a single SME' boundaries.

The articles belonging to the second cluster deal with the improvement for SMEs owing to the adoption of KM, in terms of different elements as competitiveness, organizational performance, sales growth but a further empirical work which classify the variety of firm' performance and evaluate its elements' interaction is needed.

From the other point of view only one article deals with the need for succession planning in SMEs to storage knowledge, it is in accordance with Durst' outcomes who argued that the topic of knowledge retention seems to be avoided in the field of KM in SMEs so the topics of knowledge retention and techniques to measure the level of gained knowledge in SMEs need to a better investigation.

Table 3. Articles' topic areas

Factors affecting KM in SMEs	KM and performance	KM practices
Contextual Davenport (2005) Hsu et al. (2007) Moffett and McAdam (2006)	Alegre et al. (2011) Bagnoli and Vedovato (2012) Daud and Yusoff (2011) Delen et al. (2013) Egbu et al.(2005)	Technology oriented practices Beylier et al. (2009) Choudhary (2013) Dotsika (2013) Grace (2009)
External Cappellin (2003) Edwards (2007) Roy and Therin (2008)	Filippini et al. (2012) Gholami et al. (2013) Liu and Abdalla (2013) Salojärvi et al. (2004) Soon and Zaino (2011)	Gresty (2013) Lopez-Nicolas, Soto-A. (2010) Razmerita and Kirchner (2011) Rosu et al. (2009)
Internal Bocquet and Mothe (2010) Boden et al. (2012) Cantù et al (2009) Chen et al. (2012)	Talebi and Tajeddin (2011) Wei et al. (2011)	KM processes and human oriented practices Ambrosini and Bowman (2008) Corso et al. (2003) Desouza and Awazu (2006)

Chen et al. (2013) Costa and Jimenez (2009) De Saa-Perez (2012) Deng (2008) Eze (2013) Gholipour et al. (2010) Hussain et al. (2011) Jones et al. (2010) Lee and Lan (2011) Migdadi (2008) Montequin et al (2006) Patalas-Maliszewska and Hochmeister (2011) Pillania (2008 b) Tan and Hung. (2006) Tseng et al. (2012) Valmohammadi (2010) Wee (2013) Wong (2005) Wong and Aspinwall (2005)		Du Pessis (2008) Durst (2011) Durst (2012 b) Edvardsson (2009) Fink and Ploder (2009) Hutchinson and Quintas (2008) Levy et al. (2003) Lin (2012) Massa and Testa (2011) Navarro et al. (2010) Pillania (2008 a) Spraggon and Bodolica (2007) Whyte (2012) Yao et al. (2011)
Barrier hindering KMS adoption Anand (2013) Joshi (2012) Milosz (2010) Nunes et al (2006)		

The articles belonging to the third cluster deal with the knowledge management practices, these are based mostly on direct or mediated communication between people, that are human oriented practices and less on the adoption of ICT tools, that are technology oriented practices.

It is in accordance with Durst literature review, which shows how the knowledge identification area, which involves the utilisation of KM tools and practices to acquire existing knowledge, is still poor.

Nowadays firms have to face globalization, mature markets, high levels of customer service and a continuous need for cost reduction, so there is the need for enterprises of integration and knowledge sharing with the other business partner by technology infrastructure so the attention towards the development of KM tools grows up.

Nevertheless as shown in literature review there is a poor and not methodical usage of km tools in SMEs, although the relative importance is stressed and the IT tools' price is getting down, a strong cultural barrier concerning their adoption goes on.

From the other side ICT adoption should rather be analysed in the frame of the wider Knowledge Management Systems that also includes organizational tools and management practices.

In fact in many occasions organisations have made the mistake of introducing high quality technology before employees were sensitised and motivated for the use of the new system's capabilities; so it would be preferable to start with the human oriented approach because it represents a precondition for taking a system oriented approach and it is more promising in achieving short-term success in KM (Turner, 2010).

The research directions should moves towards to fill the above mentioned gaps and in particular towards the study concerning the development of technology oriented practices which are suitable for the particular needs of the enterprise according to an integrative approach, that is the most important challenge for SMEs.

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Knowledge Sharing Mechanisms in Business Networks of SMEs: Findings from an Empirical Study

Manish Unhale, Paolo Taticchi *

Royal Docks Business School,
University of East London
University Way, London E16 2RD

** Corresponding author*

Structured Abstract

Purpose – Network collaborations continue to be a central focus in a firm’s success and businesses are regularly striving to harness the collective capabilities of the networks to which they belong through the use of effective collaborative strategies. It is therefore vital for the firms to ensure sound and effective knowledge sharing strategies in their network practices. Previous literature has extensively investigated the impact of these network strategies on the performance of firms, but little empirical research has been conducted to examine the process of knowledge sharing through network collaborations. Moreover, the context of small and medium-sized enterprises (SMEs) is substantially unexplored in reference to these problems. Hence, the main purpose of this article is to examine the mechanisms at the base of knowledge sharing in SME business networks.

Design/methodology/approach – Data were collected from SMEs through an extensive survey covering 116 SMEs based in the UK that manifested different modes of collaboration with their business partners and different knowledge sharing mechanisms. Empirical data was used to determine the factors that contribute to knowledge creation and important hurdles in sharing the knowledge between various network partners. A chi-square test, ANOVA test, a post-hoc analysis and a factorial analysis were conducted to analyse the dataset and verify robustness of findings.

Originality/value – Key findings of this research include understanding of formal and informal mechanisms used by SMEs to share knowledge in business networks, as well as key barriers associated to implementation. Moreover, results are discussed on the light of theory and in reference to different industries.

Practical implications – The paper contributes to the literature by providing empirical evidence on different mechanisms of knowledge sharing in SME business networks. Findings are relevant to academics for further development of theory and to practitioners for the formalisation of knowledge sharing strategies in a SME environment.

Keywords – Small and Medium Enterprises (SMEs), Business Networks, Knowledge Sharing, Empirical Research.

Paper type – Empirical Research

1 Introduction

Small and medium-sized enterprises (SMEs) play an important and vital role in a country's growth by providing employment, promoting innovation, inciting competition, and building economic wealth. Governments have realised that the SME sector can support in generating more employment, and help to indigenise technology in order to create a competitive advantage and foster growth (Quayle, 2003; Vaaland T and Heide M, 2007). Generally, SMEs have a comparative disadvantage in terms of management practices: organisational resources such as manpower, finance, marketing, R&D and IT, dynamic and informal strategies; and business volume (Bhagwat and Sharma 2006).

In today business environment, competitiveness is not only driven by the performance of single companies or industry, but it is dependent on the combined performance of networks of agents that collaborate together to co-create value (Gadde *et al.*, 2003). In a business network, different sorts of collaboration can be established between the different actors (Poler *et al.*, 2008) so as to create an environment of interconnected business relationships. Horvath (2001) has contributed to characterize the benefits correlated to cooperation between companies. Taticchi *et al.* (2012) in a recent work have reviewed the possible configurations of business networks and investigated the managerial issues that arise in in the context of SMEs. In fact, networking of companies causes new organizational problems, such as the decentralization of decision-making, the horizontal coordination between different business functions Ghoshal (1990) as well as the problem of knowledge management (Taticchi *et al.*, 2009). Both theoretical literature and empirical research supports the belief that Knowledge Management (KM) can play a key role in managing businesses effectively and drive success (Maier, 2007; Patriotta, 2004).

In this paper we focus our attention on knowledge sharing mechanisms activated in business networks of SMEs in the UK, with the goal of contributing to the body of knowledge by providing relevant findings from empirical research. Moreover we considered that supply chain collaboration and various collaborative strategies such as joint ventures, co-design, co-development, co-logistics, co-manufacturing, aggregated purchasing, joint problem solving, shared resources and collaborative planning, forecasting and replenishment are important in sharing the knowledge in business network. This paper primarily focuses on these collaborative strategies as knowledge sharing mechanism in the SMEs. This works limits to present partial findings of a larger study the authors are developing in reference to several countries and industries.

This paper is organised as follows: section 2 introduces relevant literature, the research methodology is explained in section 3; the analysis and results are explained in section 4 followed by discussion and conclusion in section 5.

2 Review of Relevant Literature

Today, it is possible to assert that the ability to learn, acquire, foster and integrate relevant knowledge within an organization and its extended environment is one of the most vital competences to achieve strategic success and competitive advantage (Collison and Parcell, 2001). Buckler (1998) argues that the poor performance of companies, often, is partly due to a poor and fragmented understanding of organizational learning processes, that are critical for the enablement of business excellence and innovation.

Van Baalen (2005) claims that knowledge transfer within and between organisations is not a one-way activity, but a process of trial and error, feedback, and mutual adjustment of both the source and the recipient of knowledge and that for this reason the terms “knowledge sharing” better reflects the social processes that are involved. In agreement with this definition, we have used this term in our work.

In KM literature, the implementation of knowledge sharing practices in business networks has been defined with different terms based on the approach used. Brown and Doguid (2000) have introduced the popular terms of “Networks of Practice” where knowledge is shared between different actors in an indirect way (e.g. with the use of reports, newsletters, shared portals); and “Communities of Practice” where different actors work together collaboratively with the purpose of sharing knowledge, processes and practice. In recognition of this evidence, in our work we identified supply chains as a starting point for our analysis and identified companies presenting explicit and proactive mechanisms of knowledge sharing fitting therefore in the definition of “Communities of Practice”.

In literature there is evidence that different mechanisms can be activated inside business networks with the purpose of knowledge sharing. A popular category of mechanisms concerns the use of ICT-based Knowledge Management Systems (KMSs) that are enabling technologies to effectively support knowledge management aspects and related learning processes (Maier, 2002). Early ICT-based KMSs have substantially failed to address the KM needs of companies, and this has encouraged the application of KM

soft approaches that are focused on learning through direct social communication and interaction at different levels (Senge, 1990). A number of empirical works demonstrate that a combined approach based on ICT and soft KM sharing mechanisms proves well in terms of facilitating organizational activities, promoting continuous knowledge creation and improvement, and supporting growth through innovation (Magnusson, 2004).

In the peculiar context of manufacturing SMEs, knowledge sharing mechanisms have proved successful to help companies in continuous improvement and total quality management initiatives (Bessant, 1995), in the diffusion of wide variety of technologies, and in increasing the knowledge base and business capabilities (Fuller-Love and Thomas, 2004).

3 Research Methodology

3.1 The Survey Approach

A survey research approach was adopted for investigating the knowledge sharing practices employed by SMEs located in the UK (the definition of SME provided by the UK HM Revenue & Customs was considered: Turnover \leq €100 million and \leq 250 employees). The survey method gave access to a larger number of respondent SMEs which in turn increased the scope of the study. It offered a holistic view of the issues under investigation by providing detailed insight into the knowledge sharing practices. The use of a survey approach is advocated by researchers such as Flynn 1990, Forza 2002 and Bryman and Bell 2007. Specifically, the use of a survey study is appropriate given that the study involved an exploratory investigation of the current knowledge sharing environment in the SMEs.

3.2 The Sample

An ideal sample for this work would have been drawn from the total population of the SMEs in the UK. Drawing such a random sample from the sampling frame was not easy and feasible. We used 'manufacturing' and 'number of employees' as the criteria to identify the SMEs in the UK. Additionally, we employed 'contact details' of the SMEs including name, position, email addresses and telephone numbers of higher level persons (managerial level and above) as the inclusion criteria. This level was chosen because of the extensive knowledge of their organisations, network structures and knowledge sharing strategies. This way it was ensured that the research questionnaire was responded by the

key persons in the company. On the basis of these criteria, a sample frame consisting of 720 SMEs was derived.

3.3 Data Collection

The survey questionnaire was used for collecting the primary data. It was used to effectively gather information on the relevant variables covered in the study. The survey relied on the total design method of Dilman (1978) for design and administration of the questionnaire. As the respondents were higher-level staff in the companies, Dilman's suggestions such as the covering letter, return envelope in the questionnaire pack, follow-ups were implemented. This resulted into more responses from the sample.

3.4 Respondents

The survey covered as many manufacturing companies to be included therefore respondents were selected from a wide range of industries such as: pharmaceutical, food, construction, furniture, electrical components, construction, heavy manufacturing, auto components, plastic, engineering, paper, garments and general products. A sample profile is provided in Figure 3.1.

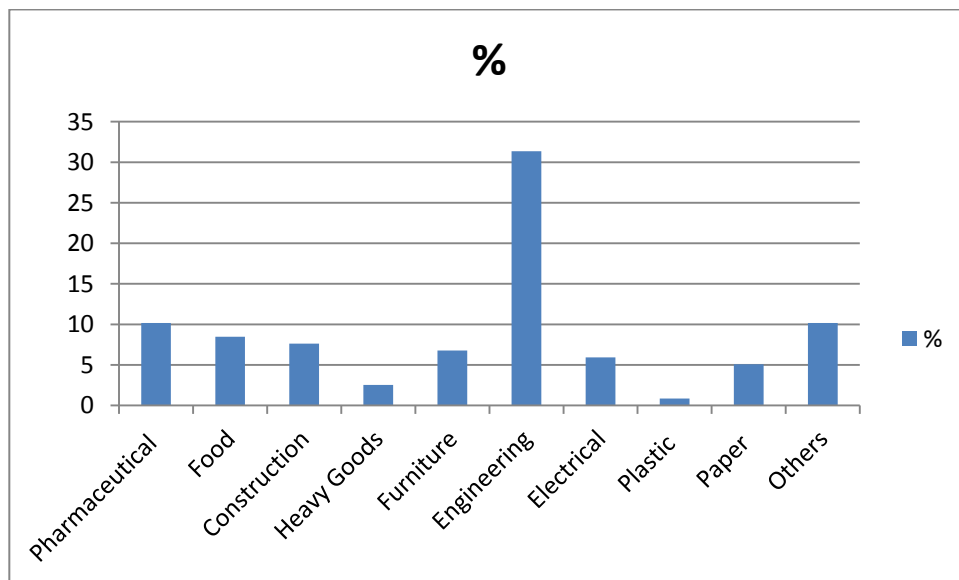


Figure 3.1. Sample Profile: Number of respondents

The questionnaire pack was sent to nearly 50 (360) percent of the sampling frame. 142 packs of questionnaires were returned undelivered, 65 packs were returned because the respondents were not interested in the survey and 27 packs were returned because of the company's policy not to participate in any survey. Out of 126 completed and returned responses (35.5 % response rate) 10 responses were eliminated for two reasons: completed by lower-level staff and missing information in the responses. This resulted in 116 valid responses with a usable response rate of 32.7 percent.

4 Analysis and Results

4.1 External collaboration and knowledge sharing in SMEs

The respondents were asked to respond to the question: Does your organisation share knowledge with other network partners? The results indicate that network collaboration and sharing of knowledge are very common in SMEs and more than 73% of SMEs do have some form of network collaborations with external organisations. Table 4.1 provides more details.

External collaboration and knowledge sharing	Yes (%)	No (%)
	73.7	26.3

Figure 4.1: External collaboration and knowledge sharing

The external collaborations and knowledge sharing were analyzed by considering a range of independent variables such as type of ownership and network structure. On the basis of ownership type, it was found that 75.4% of local SMEs collaborate externally with other companies 74.1 % of foreign SMEs and 33.3 % of joint venture SMEs collaborate with other external organisations. The test for association between ownership and external collaboration was conducted and it was found that these two variables are associated (chi square value $\chi: 9.74, p = 0.03$). Table 4.2 shows the details pertaining to type of ownership and the external collaboration in the SMEs.

Table 4.2: Ownership and Collaboration

Ownership and External Collaboration	%
Local SMEs	75.4
Foreign SMEs	74.1
Joint Venture SMEs	33.3

On the basis of network structure, it was found that 100 percent of SMEs with S-M-W-R structures collaborated externally, around 80 percent of the SMEs with S-M-D-R and S-M-W-D-R structures collaborated externally. Chi square value ($\chi: 14.03, p = 0.01$) suggested that there is an association between Network structure and external collaboration. Table 4.3 shows more details of network structure and external collaboration.

Table 4.3: Network Structure and external collaboration

Network structure and external collaboration	%
S-M-R	68.3
S-M-W-R	100
S-M-D-R	80.0
S-M-W-D-R	80.8

4.3 Knowledge Sharing Strategies in SMEs

The result of different forms of knowledge strategies employed by the SMEs considering independent variable such as ownership type and network structures are provided in Tables 4.4 and 4.5. A chi-square test was conducted to find out any association between different the knowledge sharing initiatives and the independent variables. On the basis of the chi-square values, it can be established that almost all collaborative initiatives are associated with the respective independent variables.

4.3.1 Knowledge Sharing Strategies and Ownership

Based on the chi-square values, it was found that 27 knowledge sharing strategies were associated and 18 knowledge sharing strategies were not found to be associated with the ownership type. The major ones were: joint ventures with supplier and customer; co-manufacturing with supplier, customer and competitors; co-logistics with supplier, customer and other organisation. The results in table 4.4 show that knowledge sharing strategies are popular in each of the three ownership types.

Local SMEs are more focussed towards joint problem solving, CPFR, co-design and aggregated purchasing initiatives, whereas co-manufacturing, joint ventures and co-developments are also popular knowledge sharing strategies, however, co-logistics and

shared resources are the knowledge sharing strategies which were found to be difficult and less common knowledge sharing initiatives in the local SMEs.

Foreign SMEs, on the other hand, were more focussed towards joint ventures, co-developments and co-designs., However, such SMEs were less inclined towards co-manufacturing, aggregated purchasing and shared resources for knowledge sharing with their network partners.

Local-foreign SMEs were found to be more focused on joint-ventures, joint problem solving, CPFR, aggregated purchasing and co-design strategies. These SMEs were also found to be involved in co-manufacturing, co-logistics and shared resources with their network partners.

Table 4.4: Knowledge Sharing initiatives and ownership

Knowledge Sharing Initiatives		Local	Foreign	Joint Venture	Chi-square Test
		%	%	%	
Joint Ventures	Supplier	20.0	26.3	12.3	3.57, $p = .068$
	Customer	14.3	17.5	8.8	1.91, $p = .384$
	Competitor	6.4	7.0	1.8	2.09, $p = .364$
	Others	44.3	52.6	89.5	34.02, $p = .000$
Co-development	Supplier	19.3	31.6	12.3	6.78, $p = .034$
	Customer	25.7	15.8	10.5	6.65, $p = .036$
	Competitor	4.3	5.3	3.5	0.21, $p = .899$
	Other	14.3	17.5	29.8	6.53, $p = .038$
Co-design	Supplier	20.0	29.8	8.8	8.00, $p = .018$
	Customer	30.0	22.8	8.8	10.14, $p = .006$
	Competitor	3.6	1.8	5.3	1.09, $p = .596$
	Other	16.4	5.3	36.8	19.72, $p = .000$
Co-manufacturing	Supplier	20.7	15.8	19.3	0.63, $p = .729$
	Customer	4.3	8.8	5.3	1.57, $p = .455$
	Competitor	8.6	1.8	5.3	3.32, $p = .190$
	Other	27.9	3.5	35.1	18.09, $p = .000$
Aggregated	Supplier	12.1	10.5	12.3	1.17, $p = .934$
	Customer	7.1	8.8	7.0	0.17, $p = .951$
	Competitor	22.9	5.3	26.3	9.97, $p = .007$
	Other	27.9	7.0	38.6	15.76, $p = .000$
Co-logistics	Supplier	16.4	26.3	14.0	3.49, $p = .174$
	Customer	13.6	22.8	15.8	2.55, $p = .278$
	Competitor	8.6	1.8	14.0	5.70, $p = .050$
	Other	12.9	5.3	14.0	2.86, $p = .246$
Joint Problem	Supplier	42.9	29.8	38.6	2.89, $p = .235$
	Customer	35.7	24.6	28.1	2.73, $p = .255$
	Competitor	15.0	1.8	10.5	7.26, $p = .026$
	Other	27.1	1.8	57.9	44.47, $p = .000$

Shared Resources	Supplier	12.1	8.8	10.5	0.48, $p = .748$
	Customer	11.4	15.8	0.0	8.89, $p = .012$
	Competitor	5.7	3.5	3.5	0.69, $p = .712$
	Other	23.6	8.8	38.6	14.05, $p = .001$
CPFR	Supplier	49.3	19.3	68.4	28.36, $p = .000$
	Customer	45.0	28.1	63.2	14.17, $p = .001$
	Competitor	2.1	0.0	0.0	2.47, $p = .291$
	Other	2.9	3.5	0.0	1.86, $p = .396$

4.3.2 Knowledge sharing Strategies and Network Structure

A chi-square test was conducted in order to establish association between different knowledge sharing strategies and it was found that only 14 knowledge sharing strategies were associated with the type of network structure as shown in the table 4.5.

Table 4.5: Knowledge sharing initiatives and network structure

Knowledge sharing Initiatives		S-M-R	S-M-W-	S-M-D-R	S-M-W-D-R	Chi-square Test
		%	%	%	%	
Joint Ventures	Supplier	18.9	24.0	15.3	20.0	5.96, $p = .223$
	Customer	17.6	12.0	11.1	10.9	8.90, $p = .049$
	Competitor	5.4	0.0	5.6	9.1	8.71, $p = .050$
	Other	20.3	38.0	29.2	49.1	14.43, $p = .006$
Co-development	Supplier	25.7	10.0	16.7	25.5	10.01, $p = .040$
	Customer	27.0	12.0	18.1	20.0	4.77, $p = .311$
	Competitor	4.1	0.0	4.2	7.3	9.52, $p = .043$
	Other	18.9	24.0	12.5	20.0	3.25, $p = .517$
Co-design	Supplier	25.7	12.0	25.0	9.1	12.92, $p = .012$
	Customer	28.4	16.0	22.2	25.5	2.87, $p = .579$
	Competitor	2.7	2.0	1.4	7.3	11.50, $p = .021$
	Other	17.6	18.0	19.4	18.2	0.53, $p = .970$
Co-manufacturing	Supplier	25.7	14.0	22.2	10.9	6.09, $p = .192$
	Customer	5.4	6.0	4.2	5.5	4.73, $p = .316$
	Competitor	4.1	8.0	5.6	7.3	4.74, $p = .314$
	Other	14.9	28.0	27.8	27.3	4.85, $p = .303$
Aggregated	Supplier	17.6	2.0	8.3	14.5	16.87, $p = .002$
	Customer	10.8	4.0	4.2	9.1	6.30, $p = .177$
	Competitor	16.2	24.0	19.4	20.0	1.51, $p = .825$
	Other	10.8	34.0	29.2	32.7	12.39, $p = .015$
Co-logistics	Supplier	18.9	10.0	12.5	25.5	11.13, $p = .025$
	Customer	17.6	12.0	12.5	21.8	3.41, $p = .491$
	Competitor	4.1	14.0	8.3	7.3	6.45, $p = .168$
	Other	5.4	24.0	9.7	9.1	12.39, $p = .015$
Joint Problem	Supplier	41.9	28.0	47.2	34.5	5.36, $p = .253$
	Customer	29.7	34.0	27.8	36.4	1.32, $p = .858$
	Competitor	10.8	18.0	9.7	5.5	5.87, $p = .209$
	Other	21.6	42.0	22.2	32.7	8.12, $p = .057$
Shared Resources	Supplier	13.5	8.0	8.3	12.7	3.15, $p = .533$

	Customer	10.8	10.0	6.9	10.9	2.69, $p = .610$
	Competitor	8.1	4.0	2.8	1.8	9.03, $p = .045$
	Other	20.3	24.0	25.0	25.5	0.80, $p = .938$
CPFR	Supplier	39.2	52.0	43.1	56.4	5.16, $p = .271$
	Customer	36.5	58.0	38.9	52.7	8.85, $p = .063$
	Competitor	0.0	0.0	0.0	3.6	31.75, $p = .000$
	Other	4.1	2.0	0.0	1.8	15.23, $p = .004$

4.3.3 Knowledge Sharing Strategies and ANOVA and Post Hoc Test

For further analysis, one-way between groups analysis of variance (ANOVA) and a post-hoc test were conducted to explore the impact of ownership type and supply chain structure on different knowledge sharing strategies. Based on the results, it was found that there were statistical differences at the $p < 0.05$ level in the different knowledge sharing initiatives for the groups of respondents. Eta squared values were also used to determine the effect size of the results. Eta squared is calculated as: sum of squares between groups divided by the total sum of squares. Statisticians classify 0.01 as a small effect, 0.06 as a medium effect and 0.14 as a large effect. With respect to ownership, responses were divided into three groups: local, foreign and local-foreign joint venture and in terms of supply chain structure the responses were grouped into four as S-M-R, S-M-W-R, S-M-D-R and S-M-W-D-R. The results indicated significant differences between the different supply chain strategies in terms of ownership. However, supply chain strategies were not found statistically different in terms of supply chain structure.

5. Discussion and Conclusion

This work has analysed knowledge sharing mechanisms of manufacturing SMEs operating in business network environments through a large survey carried out in the UK. Findings show that SMEs operate in “communities of practice” as defined Brown and Doguid (2000) where formal mechanisms for knowledge sharing are activated. In fact, our results confirm that formal network and knowledge sharing initiatives are very common in SMEs. Joint problem solving emerged as the most popular knowledge sharing initiative, while CPFR, joint ventures, co-design and aggregated purchasing are also popular initiatives that include knowledge sharing goals. However, initiatives such as co-logistics and shared resources were found to be difficult strategies for the knowledge sharing goals. The results suggest that SMEs understand the need and importance of network collaborations and actively seek opportunities to collaborate with strategically

important partners for specific knowledge sharing initiatives, whenever it is required. These findings are in line with the views of other researchers (Barratt, 2004; Mentzer et al., 2000). This study did not include and examine other important factors such as length of network relations, outcome of these relations on the knowledge sharing strategies and other relevant experience/s with individual network partners. This could be further area of research work in the future and will to be included in our future work

The results also indicated that knowledge sharing strategies are not restricted to only vertical relations with suppliers and customers but also extend to horizontal supply chain relations. SMEs are actively collaborating with their competitors and other organisations in joint ventures, co-manufacturing, aggregated purchasing and shared resources. This suggests that competitors and other organisations are important partners in these knowledge sharing initiatives compared to their direct supply chain partners (suppliers and customers). The results also identified that SMEs are more active in collaborating with vertical supply chain partners for co-development, co-design, co-logistics, joint problem solving and CPFR initiatives.

The study identified two major limitations, one the sample consisted of 116 SMEs from the UK While the basic nature of manufacturing and operations may not differ in the SMEs but other aspects of manufacturing and operations may differ across different industries in the UK, therefore covering and including more industries will improve the generalising of the findings of this study. Another limitation was cross sectional analysis using only ownership and network structure as independent variables, future works can include age size and nature of SMEs, and other variables to further examine the robustness of our findings. The authors already expanded the research by looking at the practices of Indian SMEs for a cross-country comparative study and are currently in the process of analysing the findings.

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Knowledge management in the international marketing channel – the case of two SMEs

Olavi Uusitalo *

Department of Industrial Management
Tampere University of Technology
PO Box. 547
33101 Tampere, Finland

Structured Abstract

Purpose – It is widely agreed that the know-ledge management (KM) lay beyond the success of companies. In case of small and medium sized enterprises (SMEs) the value of KM is indisputable; some research has even shown that the majority of SMEs' competitive advantages refer to knowledge management and intangible assets. However, KM has been studied extensively especially in large organisations, but not in SMEs. The purpose of this study is to find out the utilization of KM in brand creation and R&D within an international marketing channel (marketing channel replaces supply chain, because of the marketing nature of the case) of SMEs.

Design/methodology/approach – We propose an approach of a case study methodology as our aim is at theory building rather than theory testing. Case studies may be used as illustration in the context of making a conceptual contribution and to sharpen existing theory. The focus is on KM in international marketing channel between two SMEs. The case companies, one in Finland and the other one in the United States, are analysed during their first seven years of cooperation (1959-1965).

Originality/value –This methodology puts in evidence that KM utilization within an international marketing channel of two SMEs can include brand creation and R&D. Successful operation requires knowledge sharing, trust, commitment and learning.

Practical implications – The outcomes of the application suggest for managers knowledge sharing, commitment and trust for successful cooperation in marketing channel. on the one hand the Finnish manufacturer recognised the potential of its U.S. partner and granted the right to its brand, but on the other hand the partner realized a tremendous opportunity, together with a major responsibility, in creating a strong brand. This reflects consortium in licensing models.

Keywords – knowledge management, marketing channel, SMEs, brand, R&D

Paper type – Academic Research Paper

1 Introduction

Human resources can be argued to be the most important asset of companies. This is true especially in the case of small and medium-sized enterprises (SMEs), where the success of the company is based on the proficiency and motivation of the personnel (VTT, 2000). Both practitioners and researchers have widely agreed that knowledge management (KM) and other elements of the intellectual capital lay beyond the success of companies (see e.g. Edvinsson and Malone, 1997; Kujansivu and Lönnqvist, 2007; Sveiby, 1997). Most particularly human capital, which Edvinsson and Malone (1997) defined as the individual's knowledge, experiences, capabilities, skills, creativity and innovativeness, has long been argued to be a critical resource in most firms (Pfeffer, 1994).

Knowledge management has been studied extensively especially in large organisations, but not in SMEs (Durst and Edvardsson, 2012; Marra et al., 2012; Wong and Aspinwall, 2004). Durst and Edvardsson's (2012) literature review of KM within SMEs revealed that the body of knowledge regarding of KM, although it is highly important for SMEs, is limited. According Edvardsson and Oskarsson (2011) there is lack of understanding of how firms create knowledge and of how this is translated into competitive advantage and enhanced customer relations. Moreover, studies in corporate branding dedicated to SMEs are almost nonexistent (Ahonen, 2008; Inskip, 2004). Trust, shared values, commitment and participation positively relates with learning capacity for combined knowledge strategy (Cheng et al., 2009) and for building a learning chain between two companies (Maqsood et al., 2007). Choi et al. (2004) described five models of licensing relationships in supply chain to extract value from intellectual capital assets. This research answers partly the quest posed by Marra et al. (2012) who regard the knowledge accumulation process, within the supply chain, as an interesting topic to understand more deeply and ask for research with new insights in improving supply chain performance.

The aim of this paper is to find out the utilization of knowledge management in brand creation and R&D within an international marketing channel or marketing channel of two SMEs. We study a Finnish lure manufacture, Rapala and its partner in America, Normark. This research is limited to small and medium sized enterprises (SMEs, employees less

than 250 and turnover less than 50 million euros, European Commission, 2005). SMEs constitute a large group of firms within the Finnish economy (In 2013 99,8 per cent of all Finnish enterprises were SMEs; Statistics Finland, 2013).

The remaining part of the paper is organized in the following way. First, we explain the pertinent literature underlying our research. Second, we describe the research methodology. Third, we report the start of the co-operation of Rapala and Normark within their marketing channel in the early 1960s. Finally, we analyze our marketing channel case to KM and its impact on positioning and new product development (NPD), draw conclusions and discuss implications.

2 Literature

2.1 Knowledge management in SMEs

Knowledge management studies have focus mainly large organisations (Durst and Edvardsson, 2012; Marra et al., 2012; Wong and Aspinwall, 2004). “Durst and Edvardsson (2012) showed in their literature review that amongst other KM areas, particularly the issues of knowledge utilisation, or knowledge outcome, respectively, represent a neglected field of study, at least in the context of small and medium-sized enterprises (SME).” (Edvardsson and Durst, 2013:52).

Durst and Edvardsson (2012:899) divided in their literature review empirical studies of KM in SMEs in eight areas: KM perception & KM implementation, knowledge identification, knowledge creation, knowledge retention/storage, knowledge transfer, knowledge utilisation, scope & context of KM research, and perspective used in research. KM perception & KM implementation, knowledge transfer and scope & context of KM research have received attention while knowledge identification, knowledge retention/storage and knowledge utilization are under-researched areas. There seemed not to be any studies of a marketing channel / supply chain of SMEs.

External knowledge is of prime importance to SMEs (Chen et al. 2006) and knowledge sharing is important for internationalising SMEs (Flecher and Prashatham, 2011).

2.2 Knowledge management in international marketing channel

Marra et al. (2012) divide the literature in the continuum from knowledge exploitation to knowledge sharing or transferring. Cheng et al.'s (2008) suggested that shared values,

participation, communication and learning capacity are positively related with trust and knowledge sharing. Next these concepts are looked in more detail. Shared values are important for the development of interorganizational relationships and they create trust between channel members, since they enable one member to understand other's behaviors and objectives better (Anderson and Weitz, 1989; Dwyer et al., 1987; Sahay, 2003). Participation refers to the level to which a shared commercial goal to be accomplished is included in decision making of including the idea generation, participating in decisions, and goals setting (Dwyer and Oh, 1988). A shared decision making process would improve the performance of marketing channels (Kim and Oh, 2005). Both informal and formal co-operation enables sharing of relevant and timely information (Anderson and Narus, 1990; Håkansson and Johanson, 1988). Maqsood et al. (2007) emphasised the building of a learning chain for handling the complexity of markets and organizations. The learning chains could be created through a culture of knowledge sharing across the marketing channel.

Trust can reduce the uncertainty embedded in decision-making, because the trusting channel member has confidence that the trustworthy party can be relied on (Morgan and Hunt, 1994). As such, the success of specific relationships lies in the presence of relationship commitment and trust, not coercive power and the ability to condition others (Morgan and Hunt, 1994). Establishment and development of an international relationship is a result of bilateral or even multilateral interaction. Thus development of in a foreign market is a complex, uncertain and time-consuming process requiring considerable commitment (Johanson and Vahlne, 2003). Trust and power between partners in a relationship are interlinked and they co-evolve over time, in which the existence of trust may make the need for using power useless in certain activities (Inkpen and Currall, 2004). The significance of close, mutual and lasting relationship between autonomous partners and the control their co-operation has that way reduces the importance of power coming from ownership control (Johanson and Vahlne, 2003). Trust refers to a company's belief to have confidence in its partner's reliability and integrity that will lead to positive outcomes (Anderson and Narus, 1990; Morgan and Hunt, 1994). In the context of supply chains as well as marketing channels, trust is a phenomenon, which increases to the strength of interorganizational relationships (Sahay, 2003; Wu et al., 2004). Trust is an important precondition in marketing channel management (Halldorsson et al., 2007) and information sharing is a prerequisite for trust in marketing channels (Henriott, 1999;

Kwon and Suh, 2005). As such trust facilitates interorganizational knowledge sharing (Mentzer et al., 2000).

When companies do business abroad and learn they get something which may be of value in the future. By doing business in foreign the company creates market specific assets, but the value of these assets is connected to and dependent on specific context. At the same time the company increase its commitment to these markets, as well (Johanson and Vahlne, 2003).

2.3 Brand creation in SMEs

Branding is usually considered the province of big business operating in consumer market (Merrilees, 2007; Mudambi, 2002; Webster and Keller, 2004). Strong consumer brands are built to differentiate one seller from another (Aaker, 1996; Kapferer, 1997). According to Kapferer (1997) branding is more than just giving a brand name to a product or products: “brands are a direct consequence of the strategy of market segmentation and product differentiation. Thus the role of branding and brand management is primarily to create differentiation and preference in the minds of customers. According to Webster and Keller (2004) the fundamentals of a brand strategy are market segmentation, targeting and positioning. The development of product brands has been built around the core role maintaining differentiation in a certain market (Knox and Bickerton, 2003). There is little brand research within SMEs (Abimbola et al., 2007; Berthon et al., 2008; Merrilees et al., 2011).

Differentiation from competitors is one of the major benefits of branding. Criteria for choosing brand elements can be divided in two groups: to build the brand and to defend the brand from competitors. The brand building criteria are memorability (how easily the brand is remembered), meaning (what product qualities the brand suggests), and likeability (how it appeals to the customer). The brand defending criteria transferability (how easily the brand can expand e.g. to new markets), adaptability (how easily it can be updated) and protectability (e.g. is it legally protected from competitors). Kotler and Keller (2009). Corporate branding builds on the product branding, seeking to create differentiation and preference. However, corporate branding is conducted at the level of the firm instead of the product or service, and it targets not only customers but stakeholders such as employees, customers, investors, suppliers, partners, media, authorities etc. (Hatch and Schultz, 2001).

2.3 Knowledge management in international marketing channel or SMEs

Based on branding literature customers should be segmented into segments which have different type of customers in each of them but similar within each segment (see also Uusitalo, forthcoming). More over segments should be large enough and to be communicated with different ways. Products should be differentiated from those of competitors. Based on the company resources best segment(s) and best product(s) are selected. This is market/product fit or targeting. Positioning follows after this selection. This framework for differentiation, segmentation, targeting and positioning is illustrated in Figure 1.

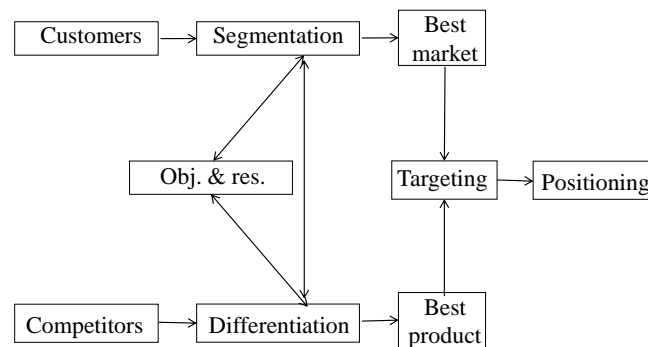


Figure 1. Segmentation, differentiation, targeting and positioning based on branding literature

Based on knowledge management literature within SMEs and supply change and KM has been integrated in the framework. The most important features in international supply chain or marketing channel from KM's point of view are shared values, participation, commitment, communication and learning, the good shape which of which increase trust and enhance knowledge sharing. The research base of two individual SMEs forming an international marketing channel can be increased by well managed KM. KM brings synergy to the channel; the sum of 1+1 is more than 2. In Figure 2 this is the enlarge objectives and resources (the dotted line). Enlarge resources provided by KM also has impact on both segmentation (via market and institutional experience; Johanson and Vahlne, 2003) and differentiation and thus also on targeting and positioning, that is the whole framework. KM management also I particularly look the impact of KM on branding and NPD.

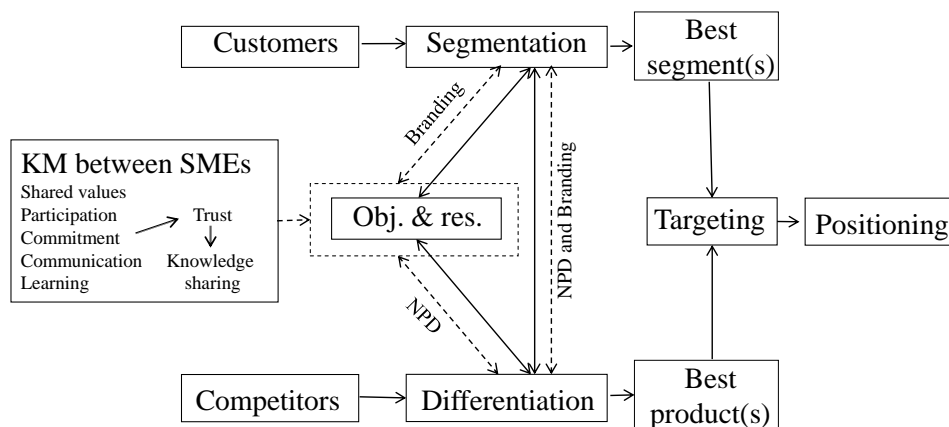


Figure 2. Knowledge management in an international marketing channel of two SMEs

3 Research methodology

The new status of the combination of brand creation and R&D within an international marketing channel of two SMEs as well as my aim at theory building rather than theory testing requires a qualitative, longitudinal and historical case study (Yin, 2009). According to Siggelkow (2007) case studies may be used as illustration in the context of making a conceptual contribution and to sharpen existing theory by pointing to gaps and starting to fill them.

Abductive (with induction and deduction) research process assumes that the gained theoretical insights during the research can modify data collection and theoretical framework, and the matters rising up from the data can lead to new questions and theoretical views (Eisenhardt, 1989; Dubois and Gadde 2002). Triangulation (Jick, 1979; Pettigrew, 1990) was applied with data sources which include interviews, histories of the companies, datasheets, promotion material, articles in magazines, trade journals, newspapers and Internet pages.

This study focused specifically on brand factors unique to a manufacturing SME on global industrial markets. The case of the company Rapala was randomly selected. The company has been studied for a decade. In 2002 a case study with analysis was written (Uusitalo, 2003). The findings of the later research are reported in conference papers (Uusitalo, 2013; Uusitalo and Grønhaug, 2013). Detailed histories have been written on Rapala (Hahl-Harjakorpi, 1986; Mitchell, 2005; Olkkonen and Sirpa Glad-Staf, 2013;

Rapala-yhtiöt,1990; Rapala, 2003) and its U.S. Partner (Dupont, 1998). The case study is based on a thorough analysis based on in-depth interviews with both closed and open-ended questions and an extensive research on archives.

4 International marketing channel of SMEs

In the 1930s Finland had an economic depression when Lauri Rapala earned a living for his family by working as a lumberjack in the winter and a fisherman in the summer. He designed his own lure to get better fish. He already knew that in schools of minnows, the wounded ones, those which wobbled when they swam, were the most attractive for larger fish. In the 1950s, the Rapala lures found their way to North America by participants of the 1952 Helsinki Summer Olympic games, Finnish immigrants and visitors (Hahl-Harjakorpi, 1986, Dupont, 1998 and Mitchell, 2005). In 1953 Lauri Rapala installed a testing tank in his workshop. In 1948 and 1954, Lauri won prizes for his craftsmanship at local agricultural fairs. In 20 years (1936–1955) Rapala, a family company, made about 51,500 lures. Lauri Rapala's four sons helped in production while his wife took care of packaging and accounting. In 1955 Rapala exported the first lures to Sweden and in 1959 it had 17 employees.

Ron Weber started as a tyre sales engineer. However, his love for fishing made him switch to the fishing tackle distributorship. In 1958 he formed his own fishing tackle sales company in Minneapolis close to the premier fishing areas in the US. (Dupont, 1998 and Mitchell, 2005). In a trip in August 1959 Weber learned about Rapala lures and saw them catching fish after fish. Soon he bought them and tested them for two weeks. The more Weber thought about the Rapala lure, the more convinced he became that the product could revolutionise fishing in America. (Dupont, 1998, Mitchell, 2005 and Sivonen, 1986). Weber told about the Rapala lures to his friend Ray Ostrom, who had a store called Ostrom's Marine and Sporting Goods. Also Ostrom found them excellent.

In September 1959 they wrote a letter to Rapala and ordered first 3000 lures in the early 1960. Rapala granted exclusive right for Weber and Ostrom to sales in North America. Normark was founded. In January 1961, it received Lauri Rapala's written permission to register Rapala as a trademark in the US. Weber and Ostrom realised the value of developing a strong brand (Dupont, 1998 and Mitchell, 2005). The timing for Rapala plugs was perfect (Dupont, 1998). The industry needed lighter lures. The double price of the Rapala lures compared to established American plugs was not a big

challenge. In 1960 Rapala sales was 3,040 lures and in 1961 sales soared to 31,135 lures. In the same years sales to Scandinavia and Finland were 25,000 and 17,500 lures, respectively (Mitchell, 2005:74)

Early on, Ostrom understood the importance of media in the marketing and sales. He had solid connections with local radio and TV stations, newspapers and magazines. Ostrom regularly appeared on local TV fishing programmes. Long time he had organised fishing trips and tournaments for stakeholders. Ostrom switched from promoting his own business to that of Rapala. Since then Ostrom used Normark's boat called the Lord of Rapala for social functions to entertain stakeholders. In 1961, a reporter from Life magazine visited Minneapolis. Ostrom was invited to dine with the reporter. Ostrom brought Rapala lures to the dinner and told the story of Lauri Rapala. The reporter sent the lures with a short report to his boss. In spring 1962, the boss caught fish well with the Rapala lures and decided to write a story. A Life reporter interviewed Lauri Rapala in Finland. The Rapala story appeared named as "A Lure Fish Can't Pass Up" on the August issue. In August Marilyn Monroe, the U.S. number one actress, died. The very Life Magazine issue had her picture on the front cover and the life story in its pages. This issue surpassed all circulation records. Millions of people bought the magazine. This was Rapala's and Normark's greatest exposure. Normark received three million orders, of which it could fill only a fraction. The demand was further fuelled by enterprising resort owners and tackle stores that limited the sale of lures. In the black market the price was \$25 or even more. Some resorts rented Rapala lures at a daily rate of \$5, with a \$20 deposit (Durant, 1998:11). Now Weber and Ostrom made a full-time commitment to the Rapala business. They sold their earlier businesses and formed a company in Canada (Mitchell, 2005)

In July 1962, during Weber's first visit to Finland, a contract was signed between Rapala and Normark to establish a long-term relationship. Normark agreed to purchase Rapala's production up to 300,000 pieces in the next year. The lures were paid in advance. If Normark purchased 100,000 lures each year, it had sole rights in North America until 1970. Normark would finance the new factory. Weber also explained to Lauri Rapala the need to expand the range of lures. The Original lure was of high quality, but it was too light to cast in the wind. Lauri understood the need. In 1961 the Jigging Minnow was design and over 7,500 jigging lures were exported to the US that year. In 1964-1965 the Countdown (7, 9 and 11 cm models) lure was developed on a trial-and-

error basis. An 18-cm version of the Original lure was introduced, as well. (Mitchell, 2005:77).

By the mid-1960s, America had over 40 copies of the Rapala lures. Rapala refused to lower its standards to increase production. Rapala tank-tested each lure to ensure their better quality than the lower-priced copies. The number of available lures in 1964 grew from 6 to 13 in 1965. Moreover, each lure was available in three colours, making a total range of 39 lures. Rapala grew steadily and quickly. Its staff and sales statistics in the 1960s are shown in Table 1 (Mitchell, 2005:93).

Table 1. Rapala's staff and sales figures in the 1960s (Mitchell, 2005:93).

Year	Staff	Sales of lures to US	Total sales of lures
1963	18	225,348	272,482
1964	46	783,582	934,009
1965	77	1,334,916	1,579,556
1966	84	1,531,042	1,713,083

By the mid-1960s, Normark won Importer of the Year award and Rapala lure was named twice "The Hottest Selling Lure in the Country". At that time, Normark started importing the Finnish Martini knives to the US to enlarge the Rapala brand to "Rapala Fish'n and Fillet". In 1970-1982 the joint R&D brought several lures on the market. (in 1970 the Magnum for saltwater predators; in 1972 the Deep Diver and all-metal lure, Vertical Jigging Pilkki; in 1974 the jointed lure with attractive vibrations for cold or cloudy waters; in 1982 the very successful Shad Rap). (Mitchell, 2005).

In 1974, Weber and Ostrom were awarded by the Finnish Central Chamber of Commerce to commemorate Normark's contribution to Finnish international trade. They in turn praised Lauri Rapala's immense contribution to their success. In 1984 Ostrom sold his part of Normark to Weber while in 1990 Weber sold Normark (the U.S., Canadian, the UK firms and the brand) to Rapala. That time Rapala's turnover was €75 million and it had 650 employees (Rapala-yhtiöt, 1990). Next year Rapala bought Normark Scandinavia (from Mats Olofsson, Weber and Ostrom) and the French Ragot. In 1991 Rapala owned 30 companies in 12 countries and manufactured its 150 millionth lure. (Mitchell, 2005).

5 Conclusions

In Appendix 1 there are shown the KM and marketing channel aspect of both companies. According to Marra et al. (2012) areas where knowledge management has been used in supply chain are outsourcing (the most common), the construction industry, decision support, NPD, risk management, build to order, procurement and organizational performance. In this study outsourcing from the U.S partner point of view was important as well as NPD. One new item not listed in the Marra et al.'s list is brand building. This case demonstrates how knowledge management created first trust, which enabled the good relationship, exclusive sales agreement, granting the right to the Rapala brand and committed brand building within the marketing channel.

For managers this paper suggests knowledge sharing, commitment and trust for successful cooperation in marketing channel. Thus, Rapala recognized the potential of Normark and granted the right to the Rapala brand. Normark saw a tremendous opportunity, together with a major responsibility, in creating a strong brand. This reflects consortium in Choi et al.'s (2004) licensing model.

According to Maqsood et al. (2007) for an organisation to maintain its competitive edge and continually innovate it has to facilitate learning throughout the whole marketing channel to become a learning chain. Trust and commitment are pre-requisite to achieve the aim of learning chain. In the case above this was what took place. In the early phases trust was created between Lauri Rapala and Ron Weber and between Lauri Rapala and Ray Ostrom. All of them were committed to the mutual business and shared information. Rapala granted exclusive right, gave the brand and made production commitment. Weber and Ostrom tested the product, did brand building effectively, financed the new plant, gave market information for new products. Since the beginning the hand shake was the guarantee for the commitment.

The relationship between Lauri Rapala with Weber and Ostrom was unique as Ostrom's quote tells: "Every time Ron and I met Lauri he had tears in his eyes, and every time we said goodbye to him he had tears in his eyes. Lauri took us to his family. We were not just business associates, we were almost like adopted sons. If the relationship had not developed this way our business would not have been a success." (Mitchel, 2005:107)

Within this case, we have demonstrated the concrete customer value (the lure caught fish far better than its competitors did) created for the marketing channel and consumers.

The trust between the business partners was immense. When the co-operation started, both parties respected each other. Ostrom and Weber used Ostrom's Marine and Sporting Goods company letterhead to make the letter to Rapala more official. Trust was maintained between Weber and Ostrom and the Rapala family across three generations, which paid off when Weber wanted to withdraw from the business. He was willing to wait until Rapala had arranged financing for the acquisition by loans and funds from the sales of the consumer durable businesses. Weber also accepted part of the purchase price in the form of Rapala stocks. For some reasons, these family firms had realised the importance of trust, as Rotter (1967:651) puts it:

“One of the most salient factors in the effectiveness of our present complex social organization is the willingness of one or more individuals in a social unit to trust [each] other. The efficiency, adjustment, and even survival of any social group depend upon the presence or absence of such trust.”

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Appendix 1. Illustration of KM and international marketing channel aspects

	Rapala	Normark
<i>KM between SMEs</i>		
Shared values	<i>love for fishing value to fisherman (ability to catch fish) good quality</i>	<i>love for fishing value to fisherman (long tests) (ability to catch fish) good quality</i>
Participation	<i>joint NPD a new plant</i>	<i>joint NPD financing of the new plant</i>
Commitment	<i>exclusive distribution gave Rapala trademark new plant on loan</i>	<i>love for fishing letter to Finland visit to Finland financing the plant advance payment</i>
Communication	<i>trip to the U.S. in 1967</i>	<i>letter to Rapala trip to Finland in 1962 learn to the family</i>
Learning	<i>as a result of the above</i>	<i>as a result of the above</i>
Trust	<i>handshake four sons involved</i>	<i>handshake increased sales learn to the family</i>
Marketing		
Branding	<i>value for fisherman high price, high quality Lauri Rapala story simple brand name</i>	<i>value for fisherman high price, high quality commitment to brand creation good relations to media Life article Lord of Rapala enlarge the brand Awards</i>
NPD	<i>joint design</i>	<i>joint design</i>
Segmentation, differentiation & positioning	<i>price brand</i>	<i>price brand</i>

In The Riptide Of Changing Objectives: Reciprocity In Consultant-Client Interaction

Jukka Mattila *

Department of Management and International Business
Aalto University School of Business
P.O. Box 21250, 00076 AALTO, FINLAND

Ewa Kicinska

Finpro, Operations and Network
Finland Trade Center, ul Fr. Chopina 4/8
00-559 Warsaw, POLAND

Sampo Tukiainen

Department of Management and International Business
Aalto University School of Economics
P.O. Box 21250, 00076 AALTO, FINLAND

** Corresponding author*

Structured Abstract

Purpose – The purpose of this paper is to increase understanding of the reciprocal nature of the client-consultant relationship in management consulting. Although different aspects of the client-consultant relationship have been addressed – including interaction between client and consultant (Fincham, 1999; Pellegrinelli, 2002; Werr and Styhre, 2002), the multitude of roles of both the client and the consultant during the consulting process (Hislop, 2002; Kaarst-Brown, 1999; Schein, 1987; Williams, 2001) and the knowledge transfer or creation during a consultancy process. (Todorova, 2004, Handley et al., 2007; Ko et al., 2005) – the research still lacks proper descriptions of the process of interaction in management consulting projects. In this paper we show with the aid of case study analysis how the client affects the final outcomes of a management consultancy process and how external processes and events have an impact on the outcome of the consultation process. The study describes a changing event path, during which an IT outsourcing project was affected by decisions by the client company's management, its board, and the suggestions from an external consultant. In addition, the paper discusses the consulting project success criteria.

Design/methodology/approach – In this paper we build on a single case study of an internationalizing Finnish SME technology company. The case provides a design enabling us to examine longitudinally and in rich detail the changing goals and directions of a consulting project, affected both by the consultant's and the client's input in knowledge creation. In the case study we relied on multiple sources of data: of in-house

memos, emails, interviews, project reports, meeting notes, consulting evaluations, and field observations. The collected data in this study was analyzed according to case study protocol (Yin, 1989) with a connection to the explorative and grounded theory approaches, in which data collection, analysis, and theory stand in reciprocal relationship with each other. (Straus & Corbin 1990, p. 23)

Originality/value –This paper adds to the existing research by showing how the client and the consultant interact and how the external unexpected and not-controllable factors affect the whole consulting project. Secondly, the case shows that the client problem can change during the project and the consultant has to adapt to the changing client's problem and criteria. Thirdly, the case shows how different types of clients in the consulting projects actually have different goals and unclear or hidden agendas. This widens the view on client-consultant relationship in existing theory on knowledge intensive client work (cf. Sturdy et al., 2009; Ciampi, 2007; Todorova, 2004; Pellegrinelli, 2002; Bitner et al., 1997) and especially in the reciprocal client-consultant processes. (cf. Nikolova & Devinney, 2012)

Practical implications – The proposed results of the analysis provides a framework, which allows the clients of management consultants better design, brief and guide the consultancy processes. From the consultant's perspective, the results of this study contribute to a view which encourages to design facilitation methods, which strengthen the need for understanding the multiplicity of client's goals.

Keywords – Management consulting, knowledge creation, innovation, internationalization, client-consultant relationship.

1 Introduction

The special dimensions of consulting services are intangibility, uniqueness of the service provided to each client's needs and the inseparability derived from the relational exchange between buyer and seller during the main stages of the process (Bennett & Smith 2004, p. 438). The client-consultant relationship is based on bilateral communication, in which the development in the client organization is a result of both the client's and the consultant's efforts. (Kakabadse et al., 2006; Mohe & Seidl, 2011; Werr & Styhre, 2002) Different aspects of the client-consultant relationship have been addressed; these include the interaction between client and consultant (Fincham, 1999; Pellegrinelli, 2002; Werr and Styhre, 2002), the multitude of roles of both the client and the consultant during the consulting process (Hislop, 2002; Kaarst-Brown, 1999; Schein, 1987; Williams, 2001) and the knowledge transfer or creation during a consultancy process. (Todorova, 2004, Handley et al., 2007; Ko et al., 2005). As Fincham (1999, p. 349) noted, an improved interpretation of the relationship between the consultant and the client would be such, which conceives the relation as open-ended and structurally symmetrical. Hence, management consultancy is a collaborative and processual interaction, where

relationships, roles, knowledge processes, and political and other outcomes are co-produced. (Sturdy et al. 2009, p. 249)

The knowledge created during a consultancy project is part of the delivered service, and thus, "the active managing of the process of consultancy can impact on the content of such interactions, that is, the production of management knowledge and associated organizational changes." (Sturdy & Wright, 2011, p. 490) In this process of co-production, the quality of service is dependent on the nature of the interaction between the consultant and client. (Den Hertog, 2000)

Pemer & Werr (2005) have shown how consultants and clients form their relationship and how consultants are utilized dependent on the managers' perceptions of their role as purchasers and users of consultancy services. Schwarz and Clark investigated how clients respond to consultant's activity, "managing" the relationship and ultimately affecting also the outcome of the consultancy process. (Schwarz & Clark, 2009) Schein (2000) noted that the consultant's role shifts over time along the relationship with the client. However, as Alvesson et al. (2009) noted, the positioning of both the consultant and the client is a complex procedure, which affects many dimensions of the consulting process. The position and role the consultant takes or is given (Alvesson et al., 2009) influences among others the content and relevance of the consulting process (Nikolova et al., 2009) and perceiving who is "the client". (Schein, 1987) These in turn are in connection to what is or will be the outcome of the consultancy process.

Knowledge inflow from consultant to client is influenced by the consultant's openness to knowledge flow from the client, both of which ultimately influence the creation of useful knowledge. (Todorova, 2004) Management consulting is knowledge intensive action, in which the customer has a central role in generating knowledge. The client's output is used as an intermediate input in the production processes of the consulting firms. (Nachum, 1999 The transferring of knowledge to the individual, group, or organization "...is expected to affect attitudes, subsequent individual behavior and finally the performance of organization." (Kubr 1985, p. 18)

However, this is only an ideal model, omitting a lot of challenges visible in the real life. The majority of previous research has discussed the consultancy process solely from an unidirectional perspective, stressing the consultant's effect on the client. Despite of the growing interest towards client-consulting reciprocity (Cf. Schwarz & Clark, 2009; Nikolova & Devinney, 2012; Pozzebon & Pinsonneault, 2012), there is still a lack of

proper understanding of client's role in the two-way relationship and how it affects the advancement of consulting projects by reconfiguring the client's expectations for wished outcomes. In this paper we contribute to this need by describing empirically by a case study specific event paths, during which the client affected the consultant, by resteeering the started consulting project and driving it to emergent directions and alternative solutions.

The purpose of this study is to increase understanding of client influence on management consulting processes as a reciprocal interplay between the client and the consultant. The research goal has been formulated as two important a research questions: (1) Alongside of the consultant having an influence on the client, how does the client influence the consultant? (2) How does this affect the evaluation of the success of the consulting project in question? This builds of wider views on management consulting evaluations, as the dominant view on the impact of management consulting argues that consulting has a direct impact on the client.

In the rest of this paper, with the aid of case study analysis, we show how the client activity influences the consultant during the consulting process. Then, in the conclusion sector, we summarize based on the first part's findings and existing literature, in order to understand the findings of the case study.

2 Implementation of the Study

This research has adopted the case study design. A case study examines and interprets the reasons for the occurrence and significance of a phenomenon. The material is taken as a whole, it is thought to shed some light on "singularly understood structure of an internal logic". (Alasuutari, 1995, p. 28-29) Case study is a research strategy, which is concentrated on understanding the dynamism within single, even unique settings. (Eisenhardt, 1989, p. 534). A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used (Yin, 1989, p. 22).

The analysis utilizes the principles of historical inquiry is a cyclical process of inference and tracing evidence from the past. Multiple and even complex pieces of evidence – newspapers, stories, interim reports, market analysis, legends - can serve as

sources in order to draw credible inferences and claims about events in the past. The sources provide useful information after thorough critical and systematic consideration. The outcome of the analysis is a construction of credible claims about what happened. Events, incidents and phenomena have many explanations. The historical researcher constructs a path of development, adds a bulk of causes and creates order in it, and arranges the explaining causes in some ranking order. (Carr 1963, p. 94-95)

The collected data in this study was analyzed according to case study protocol (Yin, 1989) with a connection to the explorative and grounded theory approaches, in which data collection, analysis, and theory stand in reciprocal relationship with each other. (Straus & Corbin 1990, p. 23) We began with an chronological event case, and the expanded it by identifying challenges and turning points in the management consulting project. This was followed by a categorization of the main events, during which the consulting was affected by the client.

The goal of this research is to explain a phenomenon, to increase understanding about it. Thus, this research is committed in creating substantive theory – "the formulation of concepts and their interrelation into a set of hypotheses for a given substantive area". (Glaser and Strauss, 1965) This paper relates to a management consultancy assignment and experiences acquired by the consultant, the Finnish Trade Commission which is an independent revenue based business consultancy agency. The Client Company is a Finnish internationalizing SME technology company from the field of IT services and outsourcing.

There are several reasons for selecting the company as a study case; first of all the consultancy assignment consisted of three consecutive and directly interrelated client cases which were completed. This provides an opportunity to study consultancy work in retrospect, including the case flow, the phase transitions, and team interaction. The total case value translated into a considerable but not exceptionally large case and one of the authors of this paper acted as the primary project manager. The named consulting project spanned one year and progressed in terms of pragmatic responsibilities. In other words, client-consultant cooperation was fairly typical, occasionally intensive and the level of interactivity was high.

The chosen case study is a revealing case because the client-consultant relationship was intensive and lasted for a comparatively long time. The case therefore provides a design enabling us to examine longitudinally and in rich detail the reciprocity in the

consultant-client relationship in securing the needed knowledge for internationalization efforts. In this longitudinal case study we relied on multiple sources of data: of in-house memos, emails, interviews, project reports meeting notes, consulting evaluations, and field observations.

We use a pseudonym of the case company, as well as of the actors involved, due to confidentiality of the consulting assignment.

3 The Case

The Client Company in this research was an IT service provider, operating in Finland and Sweden. The Client Company had more than 45 years of experience in the development of IT services. The company offered wide variety of different services, including electronic invoicing and printing, consultancy and solution deliveries. One of the Client Company's focus areas was outsourcing services for mid-size companies. The Client Company defined its client segment as companies with 200 to 2000 IT-users. In this customer segment the Client Company is among the leading service providers in Finland with more than 200 clients. The Client Company's core services include continuous services: Service desk and user support, Application management, Workstation management, Server management, Data communication. The Company employed approximately 700 IT experts and its annual turnover was over €140 million.

The Client Company growth was determined by acquisitions. According to Client Company figures, in 2010 approximately 25% of turnover came from international operations. Internationalization provided the Client Company with the opportunity for stronger growth. The company had three strategic objectives: (1) Excellent profitability requiring improved efficiency of processes and outsourcing of tasks with a lower processing value to the Eastern European countries and India, (2) Well-considered expansion in the Baltic region, (3) Utilizing Superior Nordic expertise by allocating its personnel resources to demanding expert tasks and subcontracting a significant part of services to the countries with lower cost levels.

3.1 The Beginning

In the beginning of October 2010, Finpro consultant learned from a Finpro business developer that the Client Company was interested in Poland. The business developer was the one that had the initial face-to-face meetings with the Client, whereas consultant received the quotation for the approval. The Board of the Client Company planned to expand to new markets in the Baltic region and the management was given the task to study the Polish IT-market as a source of lower cost IT-expertise and as a target market for the company's expansion. The Client Company wanted to present the report to the Board already before Christmas 2010, as became evident during a telephone discussions with the Finpro business developer and his quotation.

The Client Company was in need of general business environment information about Poland in comparison to the Central and East European Region, information about the foreign direct investments in Poland as well as information about Polish IT sector (locations, workforce, salaries, education etc.). The general view on the Client Company's business potential should have been drafted based on this information. The quotation was prepared by Finpro business developer, Finpro sales person and Finpro Project manager. A draft of the Client's problem with the Finpro solution proposal were based on face-to-face discussions between business developer and Client Company Director.

The first solution offered to the Client by Finpro business developer was a market analysis. The project scope was broken down into three phases with regards to required information type and ways of collecting it. The first phase was basic data collection and tailoring it to the Client Company's needs was identified during a workshop. The second phase comprised of specified data collection and interviewing local players. The third phase consisted of field visits in order to get first impressions on market. In fact, the market analysis phase was not typical for Finpro and not in line with Finpro service offering templates and tools. The quotation was adapted to Client's needs and time schedule, which was considered as tight.

3.2. The visits to Poland

In the beginning of October the Finpro consultant started to work on market analysis, and also Finpro's business developer worked on some parts of the report. Simultaneously the consultant prepared a program for the visits to Poland for Client Company's Director. He visited Poland on November 23 and had a few meetings in Warsaw during his stay.

Finpro Consultant accompanied him and this was the beginning of deeper direct discussions between the two. So far Finpro had worked directly with the Client via other persons. It became clear, that the Client Company's Director wanted to grow the IT services business of his company through an acquisition of a Polish company. In order to achieve the goal he had to convince the Client Company Board that Poland was a good, potential market and that there existed an interesting company for acquisition, a company which provided helpdesk services and was focused on IT outsourcing.

The first phase of the consulting project, the market analysis, was aimed to provide general information about Poland including a comparison of the market with the Central and Eastern European region. The consultant collected data on Poland and Polish IT sector, whereas Finpro Project Manager collected data on other countries located in the region. Simultaneously to data collection and report writing, the consultant was organizing several visits of Client Director to Warsaw. The aim of the visits was to provide him with impressions about the market, its maturity, companies' perception of services outsourcing in Poland. The consultant was also assisting the client during the meetings in Poland.

From the very beginning, from the first meeting, the Client Director took a leading role during the visits to the Polish companies. He was asking questions and leading conversations when the consultant was making notes and rising additional issues if appeared. During the visits the consultant was learning from the Client what kind of topics were of his interest and how to ask difficult questions, for example how to check in a polite and delicate way whether the company is for sale. On the other hand, the consultant was explaining to the Client how the Polish business culture and hierarchy in Polish organisations looked like.

When searching for acquisition targets the characteristics of companies was changing according to the Client Director ideas and suggestions. First, the consultant was searching for big companies (in terms of employment) which offered offering IT outsourcing, helpdesk and network administration services. Next, when the companies appeared too big the consultant focused on searching for medium-size companies and, also, for data centres, which initially were not taken into account as primary targets.

The Client Company Director had a lot of information needs and open questions like: was there any demand for Client Company -type of services in Poland? Who could be their clients, were they public or private companies, big or small companies? Was

outsourcing in general preferred in Poland? What was the approach to IT outsourcing in companies? What is the maturity of the Polish market in buying outsourced services? What IT activities companies outsource in Poland? The Client Director needed to learn and understand the Polish customers, their needs and behaviour.

The normal procedure would have continued after the general analysis of the Polish IT market with the planning of market entry that would have included an Entry Mode analysis and market entry strategy development. However, the Client had already an established idea of how to enter the market through a merger and acquisition type of transaction. When the consultant discussed the acquisition with the Client Director, she mentioned that the alternative would be the establishing an own company in Poland, in case of not finding an appropriate acquisition target. The Client did not take this alternative into consideration as he remained in the belief that an acquisition of a Polish company enabled a faster market entry and provided immediate customer base for the operations.

The Client Director had already an idea what kind of company he was searching for. He specified the range of services the potential acquisition target should provide, as well as the size and location of the acquisition target. Firstly, the target company under search should have been a provider of helpdesk and network administration services with focus on IT outsourcing. Secondly it should have employed 50-100 people, and thirdly, it should have had an office in a large city and production sites in low-cost area.

3.3. The First Iteration

As a result of discussions between the Client and the consultant as well as the lack of market entry planning option the consultant drafted the following objectives for the next consulting project: (1) To increase understanding of the outsourcing market development in Poland, (2) To develop further understanding of customer behaviour in Poland, (3) To create a long list of acquisition targets. These objectives were the basis for potential next quotation for the Client Company. The decision concerning further interest in the Polish market and further co-operation with Finpro depended on the results of the market analysis and on the decisions of the Client Company's Board.

During his first visit the Client Director met a few Polish IT companies, potential acquisition targets. It appeared that the term "IT outsourcing" had different meanings in Polish companies and the consultant was unaware of the variety of services were offered under this title. The consultant gained detailed information what kind of companies the

Client Company looked for and thanks thus it was easier to search for the acquisition targets during the second phase of the project. At this phase the consultant was creating the list of potential acquisition targets with short descriptions of the companies, and later profiles of the companies selected by the Client Director. The list was continuously updated and reviewed by the Client. Profiles of candidates were based on telephone and face-to-face interviews. The main challenge was the necessity to adapt to the changing criteria of acquisition targets. That is why the list was constantly changing, some companies were deleted and some new included.

The whole project was focused on information gathering (through desk study, face-to-face and telephone interviews), analysing it and considering what the most relevant findings for the Client were. Throughout the whole project the Client was counselled on his ideas and questions that were appearing. The consultant and the Client exchanged opinions about each meeting and each company, considered different criteria for acquisition targets, and reassessed approaches to establishing business in Poland.

The market analysis was finalized in the beginning of December 2010. The Client Director presented the general market analysis on Poland to the Company's Board. Both the Board and Director agreed that Poland seemed to be an interesting market. As the result of this conclusion the next quotation was prepared by Finpro Project Manager. Before that the consultant sent him the objectives drafted during Client Director's visit to Poland. During teleconference the consultant and project manager agreed a proposal for a solution to the Client. The project scope was broken down into four phases: 1) Definitions for the study and pre-work, 2) Acquisition target identification, 3) Demand side analysis and 4) Competition analysis. The criteria for acquisition targets were drafted in the quotation. The Client influenced the size criterion (preferably company with EUR 5-10 million turnover, at least over EUR 2 million turnover, employing more than 50 employees) and location criterion (company with office in large city but with production in low-cost areas). The acquisition target identification was scoped by the consultant and project manager according to standard Finpro process. For the demand side analysis and competition analysis the project manager suggested interviews as method of information gathering.

The quotation was scoped according to issues discussed earlier with the Client Company's Director. The project was aimed at helping the Client to understand Polish customers and find candidate companies for acquisition. The order was signed and the

consultant started to work on the new project for the Client Company on December 21, 2010. During the execution phase it appeared to be difficult to find a company that would meet client expectations in terms of size and service scope. The screened acquisition targets were either too small or too big in terms of employment and structure.

Simultaneously, next three visits of the Client Director were organized. Together the Client and the consultant we were meeting Scandinavian companies located in Poland in order to learn their perception on Polish market and outsourcing of services, as well as potential acquisition targets in order to learn their business, size and approach to Merger & Acquisition type of transaction. Polish IT companies were met to learn their opinion about the Polish IT market, its development and maturity.

It is worth mentioning here, that Client's and consultant's perception of the size of the acquisition target company was different. For the consultant, the company employing 40 people was of medium size, for the Client – small size. In general, the market appeared to be full of companies employing 5-10-people, and on the other side, companies around 200 people. The consultant suggested a purchase of a medium-sized company (small according to The Client Company's Director) and to develop and grow it in line with the market growth. The Client was interested in bigger companies as he believed that only with volume the Client Company could reach a better profitability. He was thinking about targets employing around 100 people.

In the meantime the Client Company's Director met a new Finpro project manager and raised a number of issues. Poland was an interesting market but there was not enough understanding how to approach it. The challenge was that there were no active players on the market and there was not enough similar offering to the Client Company's offering on the market and the clients were not experienced in and used to buy this kind of services. A short list of acquisition targets was seen good but maybe there were still some other companies on the market that were not identified.

Regarding acquisition targets the consulting company project manager suggested a few alternatives. The Client Company could purchase a bigger company with different businesses and sell out those which were not interesting. They could purchase an optimal company in terms of employment and client base that had a different service offering and could change the company focus. An option would also be to purchase a company that fit the needs but was too small at the moment. So it must have been grown into a larger size.

3.4. The Second Iteration and the End

It was obvious from the exchange of ideas and opinions between the Client and the consultant that the Client was not happy with the acquisition targets listed by the consultant. None of the companies was meeting his initial criteria. The option of obtaining a business unit from a big company appeared during consultant's meeting with one company, which focused on hardware but also had a helpdesk services unit. During the meeting the Board Member of the company was considering to sell off all non-core business.

Additionally, The Client Company's Director was wondering how the companies' valuation process looked like in Poland and what were the motives behind companies' sale. Since the consultant knew at least two owners of the companies that had been sold in Poland and could arrange meetings with them, she suggested a new project that could provide understanding of mergers & acquisition transactions in Poland, as well as a list of additional acquisition targets.

In June 2011 a new quotation was prepared by Finpro project manager. It had two major objectives: to identify additional potential acquisition targets including business units from large companies and to provide initial understanding of the merger and acquisition transactions valuation in Poland. The proposed solution was tailor-made and did not remind any standard Finpro solution. The proposed solution had four phases: Phase 1: Identifying alternative acquisition targets in Poland, Phase 2: Screening the old and newly listed companies, Phase 3: Identifying deals and interviewing specialists and entrepreneurs that had sold their businesses, and finally Phase 4: Meeting the most prospective candidates.

Again, The Client Company's Director signed the order and the co-operation with the Client could continue as planned. All three subsequent consulting projects mentioned above were signed by the same Client Director. However, all phases of the project and all offers were to be accepted by the Board, which remained at this stage as an underlying client. The consultant did not have any chance to meet them or talk with them. Thus, the whole consulting process was affected heavily the Client Director.

In August 2011 Finpro project manager and consultant received suddenly the information that The Client Company had changed plans. Due to on-going investment projects at the Client Company and economic slowdown, the Client Company did not have a possibility to proceed as fast as planned in the Polis investment case. The company

was still positive about investing in Poland, but not at that particular moment. At this point the decision was not to open any discussions with the owners of potential acquisition targets in Poland. However, the consultant was expected to continue the project and prepare a “final” short list, even though she knew that the Client Company would not undertake any concrete actions in the nearest future. In practice, the project was paused at that moment, there was no reason to interview the companies or organise any meetings.

Next, the consultant and the project manager learned that the Client Company’s Director had to leave the company and he was not working any more in the Client Company. As a result, the consultant and project manager had one more meeting with the Client Company in autumn 2011 and the consultant’s live engagement with the Client Company ended. During this meeting the consultant met the Senior Vice President of the Client Company, who was not involved in the consulting engagement, but he was influencing her work indirectly by assessing the performance of the Client Director. He was one of the Board members that had influence on contract termination with the Client Company’s Director. During the meeting with consultant, he mentioned that the Board had not wanted to acquire a big company in Poland. Finally, there was one manager less in the company and the final decision of not entering Poland had been taken.

4 Conclusions and Discussion

The consulting project started normally as an incremental step-by step advancement true navigation gates in a planned and established service route. The Client’s involvement increased in every step. However, contrary to the standards, the client kept his own mind during the course of events and acted against the consultant’s suggestions. The small deviations made the consultant’s service delivery closer to tailored services. The consultant had an open and good relationship with the representative of the Client, the Client Director. Consequently the consultant based her aspirations about the final outcomes of the project on the guidance of the Client Director, considering him to present the Company’s vision about the investment in Poland. The aim was both in securing high quality service delivery and also a continuity in the Client relationship.

During the project, all previous Client’s decisions showed that the project was on a good track towards its final target, which meant the establishing of the Client Company operations in Poland. There were no elements or decisions that would have signalled the

opposite. The Client Company's Director was assigned by the Management Board to research the Polish market and he was a professional who was given the complete responsibility for execution of the potential merger & acquisition in Poland. The consultant believed that there had been real commitment from the Management Board to invest in Poland and she was not able to predict sudden change of the Client Company's strategy.

However, external factor that unexpectedly affected the consulting projects stemmed from a change in the strategy, initiated and supervised by the Management Board. The changes in focus related to among other in the decision of not to enter the Polish markets. The consultant did not have any influence on this decision since her recommendation was the opposite.

The table below lists the main events in consultant's relation with the client company with the aim to clarify the flow of the consulting project.

Table 1. Main decisions during the consulting assignment, which had an impact on the direction of the service delivery.

What	Who	Results	Decision	When	Did the decisions bring the project closer to establishing operations in Poland
Meeting in Warsaw, joint visiting companies	Consultant, the Client Director	Beginning of close co-operation		X 2010	
Delivery of the project's phase 1, the market analysis for the Client Company's Director	Consultant			XII 2010	
Presentation of the market analysis to the Board	The Client Director	Poland appeared to be an interesting market for The Client	Board decides to continue in Poland	XII 2010	The decision of the Board shows that the project is on the good track towards the target
Delivery of the project's phase 2, acquisition targets to the Client Company's Director	Consultant	Polish companies did not meet the criteria	The Client Director decides to continue in Poland and search for more candidate companies	IV 2011	Decision of the Client Director brings the project closer to the final outcome

The Client Company changes plans regarding Poland	Board	The Client Director leaves the company	Board decides to cease co-operation with The Client Director	VIII 2011	Both, the change of plans and Board's decision suddenly moves the project away from the target and final outcome
Presentation of the project's phase 3 Meeting with the Board Member of the Client Company	Consultant, Project Manager	Final delivery of the project	Board decides to close the project in Poland	X 2011	

In delivering the consulting project, there were three occasions, in which the client influenced heavily the course of events and the final outcome of the consulting project. The content of the events was related to 1) affecting the consultant's suggestions by widening the scope of possible acquisition targets, 2) continuous interactive learning about the client's expectations with a reciprocal observation-commenting-learning-revisioning loop, 3) redefinition of the terms of reference and the mandate for the consulting assignment.

The client affected the consultant's suggestion by either accepting or disapproving the proposals. In the case, the consultant and client had different views on the size of the acquisition targets, as well as should it be a greenfield investment, a merger, or scaling up and growth of an existing nonrelated business.

The client was involved in modifying the consultant's perceptions about what the client wanted by giving information, showing example, sharing insights, and focusing on certain topics of discussion. The consultant in her turn used this as an input to make her probe suggestions and for learning from the client's feedback and comments. This in turn contributed to the revisioning the content and focus of the consulting assignment.

Lastly, in the final phase of the project, the client terminated the whole cooperation. This meant a large-scale redefinition of the consulting project framework. This underlined the questions about the usability of the knowledge created during the whole project. As the generation of new applicable knowledge is one of the main reasons in purchasing management consulting services, we could ask, what kind of knowledge was created during the consulting project? Naturally, as the end result of the project the Client obtained information about the potential of Polish IT market and Polish companies. During the project the Client Company representative met numerous local IT companies, established contacts with many managers and potential customers. Consultant's

recommendation was to enter Polish market and purchase a medium-size company. This information was used by the Client Company's Board in order to decide whether to enter Polish market and acquire local company.

However, the final result of the whole consulting project was a decision not to enter the Polish market and not to purchase any Polish company. The consultant together with two project managers provided the background information and supported this decision-making process. The consequence of the "not-to-enter" decision was that the real Client, The Client Company's Director left the company. The relations with the Management Board representative remained good.

The question arises whether the consulting project was a success or failure. The answer depends on the point of view and perspective. The Consultant perceived the whole project as a failure. From her point of view the project would have been a success if the Client Company would have followed her recommendation to enter the Polish market and to acquire a company in Poland. If the outcome of the project would have been the establishing of Client Company's new business in Poland it would be a success. Finally, even though the relations with The Client Company's Board and The Client Company's Director remained good, Finpro did not manage to maintain the long-term relations with the Client. As a result, from the consultant's perspective the definition of success in this particular case would have included the following criteria: Firstly the Client follows recommendations; Secondly, the Client establishing successful operations in Poland; Thirdly, creation of growth in the Client's business; and fourthly, establishing long-term relations with a Client company. However, if at the very beginning of the project the consultant would have defined success merely as "a satisfied client" her evaluation of the engagement would be totally different.

Nonetheless, the project can be perceived also as a success. The long-term project for the Client Company has been a good reference case for the consulting company. The Client – here meaning the Board - was satisfied, i.e. it had no contrasting views on the proceeding of the project nor to the quality of the services delivered, and the Client remained in good relations with the consultants. For example, the Client Director – who left the Client Company – continued cooperation with Finpro and the same consultant on another, completely new consulting assignment. The Client Company's Director, most probably, would consider the project as a failure. He did not manage to convince the Board to invest in Poland and lost his job. The Client Company's Board, on the other

hand, might consider the information provided by Finpro as an enabler in their risk-avoiding decision.

The case showed that the client problem can change during the project and the consultant has to adapt to the changing client's problem and criteria, and find the opportunity for on-sell based on this. Finally, the case presented that different types of clients can actually have different goals and unclear or hidden agendas. That is why it is important to meet both the real and the underlying client, learn their needs and build good relation with them.

The Client Company case is an example of how the external (unexpected and not-controllable) factors can affect the whole consulting project and turn it into success or failure. It also shows how differently the project's success/failure can be perceived. As a learning, it is very important to define the project's deliverables, impact and, separately, success at the very beginning of any consulting engagement.

For practitioner, the case shows that it is important it is to establish relations with the underlying clients and understand the wider picture in every consulting assignment. The real or even hidden needs, considerations and plans must be comprehended. In order to establish such relationships, the consultant meeting the clients should always look for a possibility of meeting with the top management. The aim of such a meeting would be learning the needs of the client and evaluating their commitment in the project, but also establishing a communication channel during the whole project. It should be important for consultants to meet the Client company Board members, establish relations with them and involve them into the project or, at least, to correspondence; and encourage them to be assertive and provide their opinion in formal way at the moment they feel it is important.

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The Use of Data Mining on Government Employee 360-Degree Competency Appraisal and the development of Staff Education and Training Plan

Ping-Jung Hsieh*, Yu Syuan Chen

Institute of Human Resources and Knowledge Management
National Kaohsiung Normal University

* *Corresponding author*

Structured Abstract

Purpose - The knowledge and competencies of the individual employees are valuable asset for a knowledge-intensive organization. A continuous education and training system enables an organization to build new knowledge and competencies among its members. To have an efficient and effective education and training plan that not only meet the need of individual employees but also improve organizational competencies is an important task for human resource management. Data mining has been used to discover the hidden patterns of data from a large-scale data warehouse. After further analyses, these data patterns may be transformed into intelligent knowledge as to support various decision makings. By using data mining, this study is aimed to explore the competency gap of the individual employees, and build the training needs predicting models. These models can assist human resource department to have an education and training plan that reduce the competency gap of the individual employees and also raise organizational knowledge asset and competencies as a whole.

Design / Methodology / Approach - The total amount of 638 example collected from Taiwan municipalities government 360-degree competency appraisal were used. These data were analyzed by SPSS to obtain statistic results. Data mining was used to explore the relationship among these data. Based on these results, the training needs predicting models were constructed.

Originality / Value - The results show that (1) the 360-degree competency appraisal model can be used to find out the competency gap and competency status. (2) the results of SPSS and data mining can be used to construct the training needs predicting models with accuracy above 70%. (3) the staff education and training plan can be obtained based on the training needs predicting models.

Practical Implications - The paper provided the reference of using data mining on the knowledge and competency management. The results could also provide the reference for planning the staff education and training plan, in order to achieve the purpose of improving individual and organizational knowledge and competencies.

Keywords: data mining, knowledge and competency management, 360-degree competency appraisal, staff education and training plan

Paper type – Academic Research Paper

1 Introduction

Previous studies have indicated that education training is considered the most efficient way to improve employee competency, training is also a key component in order to develop employee problem solving skills, attitudes and job knowledge. Taiwanese government spends a significant budget in employee training every year; therefore, the training strategy, planning, requirement and performance evaluation have become very important.

Desimone and Harris (1998) claimed that human resource development and training should start from education training evaluation, because it is a strategic planning tool. To plan education training should focus on their demands of different employee level to fit what they need. When making educational training decisions, one should also consider dimensional assessments in addition to employee needs; so that could distinguish the gap between self-evaluation and evaluation from others.

Now, the private corporations and/or government departments have become interest in increasing employee productivity and efficiency. Central government and local governments have relative employee competency execution plans to ensure the development of their employees. Hamidah et al. (2010) considered the data derived from the human resource field can increase employee training knowledge. For instance, applying employee performance records, learning ability and competency data mining to analyze the relative of data and make organizational decision rules.

With the new demand and increased visibility, human resource management seeks a more strategic role by turning to data mining methods(Ranjan,2008).In addition to the aforementioned, other scholars determined data mining technology can be used to build demand classification which will increase organizational education training efficiency.

Thus, developing appropriate competency management is an important strategic issue for HR managers or decision-makers to determine who should be trained, and what training programs should trainees participated. However, most competency management studies have explored the construction of competency models or have involved competency assessments conducted through self-evaluation to present descriptive statistical results. Consequently, competency data are rarely used to obtain accurate or valuable information.

The purposes of this study were to assess the gap for discovering the competencies which employees require training, and develop the training-needs prediction model to

identify crucial trainees by using data mining. This further facilitate in making more accurate and inexpensive decision , plan training activities, and choose appropriate trainees, that leaves little mismatch between training needed and training provided.

2 Literature review

2.1 Competency

Competency is a combination of knowledge, skills, motivation, attitude and personal characteristics which are demonstrated in behavior and influence employee's superior performance. Competency approach focus on how an employee creates value and what is actually accomplished (Spencer & Spencer,1993). The assessment of competency, as well as the development of competency-based management frameworks to support processes such as gap analysis, learning and other key human resource activities. Anitha, Anirudha (2010) believed that the most important aspect of competency evaluation is to identify employee ability gaps, which can be mitigated through training.

This paper used the personnel officer competency model in Taiwan's public sector to do assessment and analysis, as shown in Table 1.

Table 1. The Competency Model of Personnel Officer

	Job level below seven	Job level above eight
Management Competency	1. Communication Ability	1. Goal and Performance Management
	2. Team Motivation	2. Innovation Service and Procedure Management
	3. Emotional Management	3. Problem Tracking and Solving Ability
	4. Crisis Management	4. Knowledge Management
	5. Time and Procedure Management	5. Communication Ability
	6. Conflict Management	6. Emotional Management
	7. Knowledge Management	7. Legal Capacity
Professional Competency		8. Cultural Capacity
		9. Leadership Challenge
	1. Customer Service	1. Customer Service
	2. Personnel Regulation	2. Personnel Regulation
	3. Performance Management	3. Performance Management
	4. Information Technology	4. Information Technology

2.2 360-Degree Competency Assessment

Multiple-source multiple-rater feedback (MSMR) which includes many members to perform the personal assessment. Milliman et al.(1994) believes that 360 degree assessment can stimulate organizational communications and interactions. The group members who participate in the assessment should have full observation opportunities to understand the subject's working performance and personality. The evaluating members could be managers, colleagues, subordinates, customers and/or the individual (Tornow, 1993; Van & Nijhof, 2004) , as shown in Figure 1.

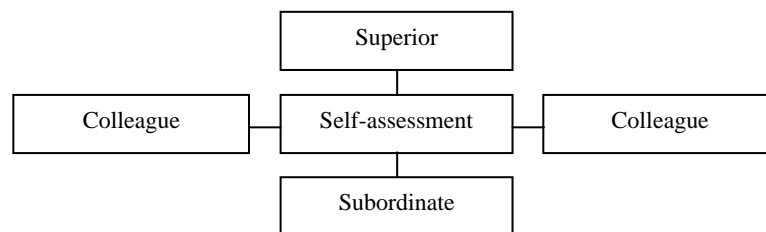


Figure 1. 360-Degree Assessment

Civil Servants Protection and Training Commission (2010) reported that 360-degree competency assessment could obtain the competency status of personal or organizations.(e.g. strong competency, weak competency, self-others consistency) and set the goal to conduct the individual development plan or planning education training.

This paper is using the 360-degree competency assessment model of personnel officer in Taiwan's public sector to do competency gap analysis and determine the order of educational-training demands, as shown in Figure 2.

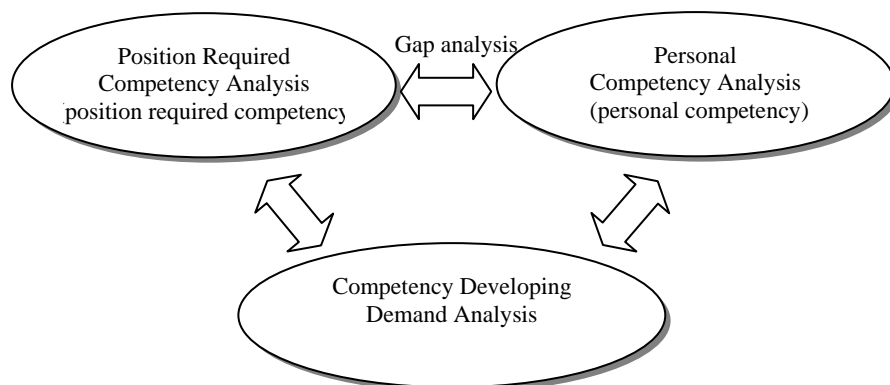


Figure 2. The 360-Degree Competency Assessment Model of Personnel Officer

2.3 Competency Based Training in Public Sector

In recent years, the private corporations and/or government departments have become interest in increasing employee productivity and efficiency. Central government and local governments have relative employee competency execution plans to ensure the development of their employees (Directorate-General of Personnel Administration,2007; Civil Servants Protection and Training Commission,2010; The Examination Yuan,2012; Civil Service Development Institute,2012).

Civil Service Development Institute (2012) collected the competency data of government officer to develop the core competency model, and conducted“Take Off Program for Senior Civil Service(TOP)”to train the competencies for senior officers. Therefore, competency based training has been conducted in public sector, no matter trainees selection, or training programs planning, all focus on the competency-based approach to training.

2.4 Data Mining for Human Resource Management

Presently, data mining is a part of process in knowledge discovery in database, which receives great attention and is recognized as a newly emerging analysis tool. Many areas have conducted data mining techniques, such as in marketing, manufacturing, customer relationship and health care. However, the used of classification techniques in data mining approach does not attract much attention among people in human resource field (Ranjan,2008). Today’s organizations have to struggle effectively in terms of cost, quality. The success of these tasks involves much managerial decisions to decide the right person for the right job at the right time.

Classification and prediction is the common task for knowledge discovery and future plan in data mining. Decision tree is the powerful classification algorithms as stated in some studies, it has many advantages, for example it can produce a model which may represent interpretable rules or logic statement; it is more suitable for analyzing categorical outcomes; easy to interpret; computationally inexpensive; it’s prediction model is explainable to the user. Due to the reasons, this study is aimed to use the C5.0 classification algorithms to handle issue on the competency developing demand of 360-degree competency assessment for building a prediction model.

3 Methodology

In this study, we attempt to assess competency gap and competency status to determine the order of educational-training demands from the 360-degree competency assessment model. Moreover, developing the training-needs prediction model by using data mining to identify appropriate trainees, the research structure of this study as shown in Figure 3.

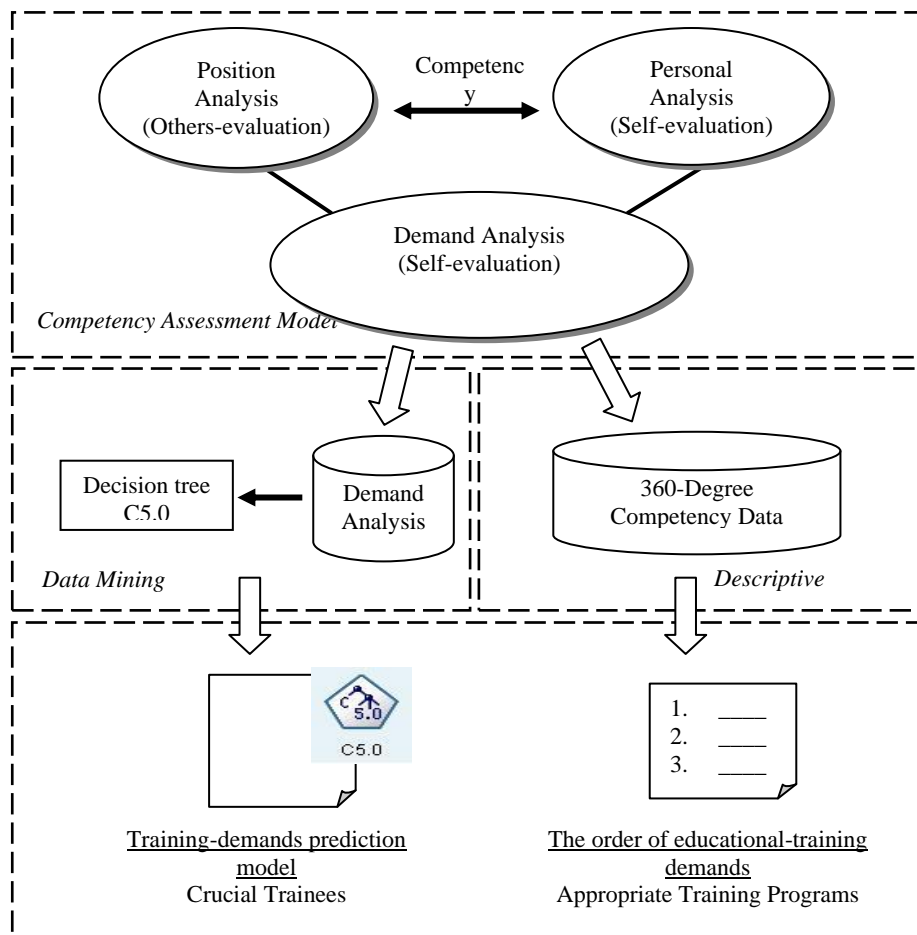


Figure 3. Research Structure

3.1 Data Resource

The data collected from the personnel officer in public sector of Taiwan by using a 360-degree competency assessment, which could be divided into three groups of 360 degree questionnaires. The content can be separated into three parts: basic information,

professional core ability, and management core ability. The questionnaire of professional core ability and management core ability is a five scale evaluation. This paper investigated 664 personnel officers and has a sample of 638 matched samples, each sample collected with its 360-degree evaluating data. The return rate is 96%.

This paper is using the data of 360-degree competency assessment to assess the competency gap and identify the training demands, the following are:

Table 2. Effective Response Sample

		Job level below seven		Job level above eight	Total
		Non supervisor	supervisor		
Self-evaluation	Questionnaire code 【investigated sample】	A 【267】	B2 【203】	B1 【168】	638
	Total of sample	267	203	168	
Third Party-evaluation (360 degree evaluation)	Direct superior Questionnaire code 【investigated sample】	A(c) 【252】	B2(c) 【196】	B1(c) 【167】	1365
	colleague Questionnaire code 【investigated sample】	A(a) 【257】	B2(a) 【189】	B1(a) 【156】	
	Subordinate Questionnaire code 【investigated sample】		B2(b) 【20】	B1(b) 【128】	
	Total of sample	509	405	451	

Total Population:2003

(1) Competency Gap-Consistency

Atwater and Yammarino (1992) mentioned that when distinguishing the consistency between self-evaluation and third-party evaluation, one must collect the grade from self-evaluation and third-party evaluation; and calculate the grade of self-evaluation and grade of third-party evaluation. Through standardization procedure, translate two distribution curves into a Z-score distribution (mean=0 ; standard deviation=1). Z-score can present the individual relative position in a group; therefore, the research uses “grade of self-evaluation(Zs)” and “grade of third-party

evaluation(Z_o)” to analyze the result of consistency between self-evaluation and third-party evaluation.

The consistency results could be divided into three categories (Jihn, 2006) , then calculating the personal proportion of three categories:

A. In agreement: the discrepancy between Z_s and Z_o is less than 0.5

B. Over-estimator: if $Z_s > Z_o + 0.5$

C. Under-estimator: if $Z_s < Z_o - 0.5$

(2) Training demands

The learning demand is an individual’s desire to achieve certain ability, which could be satisfied through education (Scissons,1982). Tom et al.(2011) investigated the competency what employees desire to achieve as the cognitive needs of employees.

Therefore, this paper used the demand of competency developing (self-evaluation) to build the prediction model to reduce the decision costs and identify appropriate trainees.

3.2 Data Analysis

(1) Data pre-processing

Mamdouh (2007) reported data pre-processing is an important step in the data mining process. First, the data do not have main for our research which is deleted, for avoiding that suitable for the analysis of data to being added to the prediction model of data mining. Second, translate the data into the format which can be analyzed. Finally, we will also check the missing data.

(2) Descriptive statistics

This study used the competency data to do descriptive statistics for obtaining the competency status and integrated with the competency gap to determine the order of educational training demands.

(3) Data mining

This study used the C5.0 classification algorithms of data mining to handle the issue on the competency developing demand of 360-degree competency assessment for building a prediction model.

4 Results

4.1 360-Degree Competency Assessment

This study used the competency data to do descriptive statistics, showing the basic population statistic, and integrated three parts (competency self-evaluation, competency

gap and competency developing demands) grade of 360-degree competency assessment model to determine the order of educational training demands.

1. Basic population statistic:

(1) Gender

The gender of employees who responded to the survey are females (n=444, 69.6%), and males (n=194, 30.4%), females are higher than males.

(2) Age

The age of employees who responded to the survey are between 40s and 49s (n=216, 33.9%) takes the most part in effective samples. The age above 56s (n=32, 5%) takes the least part in effective samples.

(3) Job level

The job level of employees who responded to the survey are include job level below level seven (n=470, 73.7%) and job level above level eight (n=168, 26.3%).

(4) Superior rank

The superior rank of employees who responded to the survey are supervisor (n=369, 57.8%) and non-supervisor (n=269, 42.2%).

(5) Work experience

The work experience of employees who responded to the survey are higher than 21s (n=171, 26.7%) and less than 5s (n=170, 26.6%).

2. The order of educational-training demands

This study integrated three parts grade of 360-degree competency assessment model to determine the order of educational-training demands, as following are:

(1) Personal Analysis (self-evaluation)

This study listed the competency grades of personal analysis of two groups for top three and last three. Top three are the strengths, last three are weaknesses. The results could provide useful information for managers give priority to educational training programs, as shown in Table 3.

Table3. Self-Evaluation Competency Grade of Two Groups Statistic Table

	Job level below seven		Job level above eight	
	Competency	Mean	Competency	Mean
Strength	Team Motivation	4.34	Customer Service	4.51
	Customer Service	4.32	Communication Ability	4.38
	Conflict Management	4.23	Knowledge Management	4.37

Weakness	Personnel Regulation	3.90	Performance Management	4.15
	Emotional Management	3.88	Innovation Service and Procedure Management	4.15
	Crisis Management	3.80	Problem Tracking and Solving Ability	4.04

(2) Competency gap (self-other evaluation)

This study used three categories to present the consistency results, in agreement, over-estimator and under-estimator, showing gaps exist between personal (self) and position (third-party) analysis. To calculate the personal proportion of three categories into training demands order.

(3) Demand Analysis

The descriptive analysis of competency demanding development shows the grades of each competency item. The grades present employee's desire or needs to develop the competency.

According to the results of 360-degree competency assessment, this study integrated above three parts to determine training demands order, the results report that the government employee whose job level is lower than level seven should enhance "Personnel Regulation" competency, and whose job level higher than level eight should prove "Leadership Challenge" competency as the first concern. The specific research outcomes are shown in Table 4 and Table 5 .

Table4. The order of training demands-job level below seven

	Personal Analysis		Competency Gap		Demands Analysis		Educational Training Decision	
	Mean	Order	Overestimate Rate	Order	Mean	Order	Total of Orders	Training Demands Order
Customer Service	4.32	10	33 %	2	4.01	2	14	2
Personnel Regulation	3.90	3	35 %	1	4.02	1	5	1
Performance Management	3.94	4	28.5%	10	3.89	6	20	6
Information Technology	4.20	7	32 %	5	3.98	3	15	4
Communication Ability	4.22	8	32 %	5	3.88	7	20	6
Team Motivation	4.34	11	31.5%	7	3.90	5	23	9
Emotional Management	3.88	2	32.5%	3	3.61	11	16	5
Crisis Management	3.80	1	32.5%	3	3.82	10	14	2
Time and Procedure Management	4.12	6	31 %	9	3.87	8	23	9
Conflict Management	4.23	9	28 %	11	3.94	4	24	11

	Personal Analysis		Competency Gap		Demands Analysis		Educational Training Decision	
	Mean	Order	Overestimate Rate	Order	Mean	Order	Total of Orders	Training Demands Order
Knowledge Management	4.09	5	31.5%	7	3.87	9	21	8

Table5. The order of training demands-job level above eight

	Personal Analysis		Competency Gap		Demands Analysis		Educational Training Decision	
	Mean	Order	Overestimate Rate	Order	Mean	Order	Total of Orders	Training Demands Order
Customer Service	4.51	13	36.7%	1	3.56	3	17	4
Personnel Regulation	4.28	7	30 %	12	3.53	4	23	9
Performance Management	4.15	2	31.3%	9	3.48	5	16	2
Information Technology	4.34	10	25 %	13	3.58	1	24	10
Goal and Performance Management	4.18	4	31.7%	7	3.41	10	21	8
Innovation Service and Procedure Management	4.15	2	32.3%	5	3.44	9	16	2
Problem Tracking and Solving Ability	4.04	1	31 %	10	3.47	6	17	4
Knowledge Management	4.37	11	32 %	6	3.46	7	24	10
Communication Ability	4.38	12	33.3%	4	3.36	12	27	12
Emotional Management	4.32	9	32 %	6	3.29	13	27	12
Legal Capacity	4.28	7	34 %	3	3.41	10	20	7
Cultural Capacity	4.19	6	30.7%	11	3.58	1	18	6
Leadership Challenge	4.18	4	34.7%	2	3.46	7	13	1

4.2 Data Mining: Decision Tree

This study used the C5.0 classification algorithms of data mining to handle the issue on the competency developing demand of 360-degree competency assessment for building a prediction model. Therefore, the classification's target is the recommendation for training.

First, this study divided the grades of demand analysis into three groups for predicting, high willingness, medium willingness and low willingness, as shown in Table 6. Second, we used confusion matrix to verify the accuracy of the model. Confusion matrix, also known as a contingency table or an error matrix, is a specific table layout that

allows visualization of the performance of an algorithm (Stehman & Stephen, 1997). Each column of the matrix represents the instances in a predicted class, while each row represents the instances in an actual class. The confusion matrix results are shown in Table7 and Table8 .

Table6. The Grades of Demand to Groups of willingness

The grades of demand analysis	Three groups of willingness
5 points	high willingness
3~4 points	medium willingness
1~2 points	low willingness

Table7. The Confusion Matrix-Job level below seven

Predicted \ Actual	High Willingness	Medium Willingness	Low Willingness
High Willingness	135	34	14
Medium Willingness	26	152	19
Low Willingness	11	32	47
Accuracy	71.06%		

Table8. The Confusion Matrix-Job level above eight

Predicted \ Actual	High Willingness	Medium Willingness	Low Willingness
High Willingness	49	7	4
Medium Willingness	18	36	4
Low Willingness	8	7	32
Accuracy	70.91%		

The classification rules generated from C5.0 classifier is human readable and easy to understand which do not require any domain expert knowledge or parameter setting. This technique can produce both the decision tree and rule-sets and can construct a tree for the purpose of improving the prediction accuracy (Delen, 2005). The C5.0 classifier generated 17 classification rules from 470 training datasets whose job level below seven,

and 10 classification rules from 168 training datasets whose job level above eight. The sample rules that are extracted from the tree are shown in Table 9.

Table9. The Sample of classification rules-job level below seven

Rule No	Classification Rules	Result
1	If (Superior rank=supervisor) And If (work experience > 21s) And If (job level= p06-07) And If (age < 49s)	High Willingness Priority to Train
2	If (Superior rank=non-supervisor) And If (work experience > 5s) And If (job level= p04-05)	Low Willingness
3	If (Superior rank=non-supervisor) And If (job level= p04-05 or p06) And If (gender= male)	High Willingness Priority to Train
4	If (Superior rank=non-supervisor) And If (job level= p04-05 or p06) And If (gender= female)	Medium Willingness
5	If (Superior rank=supervisor) And If (work experience < 5s) And If (gender= male)	High Willingness Priority to Train

5. Discussion

This research attempts to use 360-degree of competency assessment and the application of data mining technology to identify the most appropriate training programs and the most crucial trainees. We used three parts of competency data, personal analysis, position analysis and demand analysis to determine the order of educational training demands. Moreover, this study used the C5.0 classification algorithms of data mining to build a prediction model for training demands.

5.1 Competency Assessment to Educational Training Order

This study integrated three parts grades of 360-degree competency assessment model, personal analysis, position analysis and demand analysis, to determine the order of educational-training demands. In our analysis, “Personnel Regulation” should be enhance first to employees whose job level below seven, and “Leadership Challenge” competency should be improved priority to employees whose job level above eight.

5.2 Prediction Model on Training Demands

This study used the C5.0 classification algorithms of data mining to build a prediction model for training demands. We divided the grades of demand analysis into three groups for predicting, high willingness, medium willingness and low willingness. The

classification's target is the recommendation for training. Using confusion matrix to verify the accuracy of model, the results show both our prediction models were greater than 70%.

5.3 Proactive Educational Training Strategy

Based on our research findings, the 360-degree competency assessment model is effective for identifying the competency gap and competency status, also in determining the order of educational training competency. Moreover, the prediction model we developed for training demands can be used to reduce costs when making human-resource decisions.

We can focus on the weakness competency, the most high demand competency, or the apparent competency gaps to plan the training programs. In particular, the crucial trainees our prediction model found also should be train first, because they have high willingness to learn and train.

6 Conclusion

6.1 Implications

Taiwanese government spends huge budget in employee training every year, therefore, training demand is an important issue, and organizations have to plan the appropriate training programs with crucial trainees at right time. Now, the private corporations and/or government departments have become interest in increasing employee productivity and efficiency. Central government and local governments have relative employee competency execution plans to ensure the development of their employees. However, competency data were used to do the construction of competency model, rarely used to obtain accurate or valuable information.

Tough (1978) mentioned the learning demands of adults is problem-resolved based, because most adults learn to resolve the problems at work. If the training can't fit the demands of employees, the motivation and training effectiveness will decline. Therefore, organizations should consider the personal learning demands when doing educational training decisions. This paper used the competency data and demands to identify and target the appropriate employees for training.

Many organizations establish comprehensive competency-based employee development programs. These programs are staged development initiatives that include: formal in-class learning events; planned work assignments aimed at developing certain

skills and competencies; self-study components; and, formal assessment to evaluate progress in development as well as to accredit or certify that the employee has gained required competencies and knowledge. In some cases, the employee is promoted to a higher level once certain performance standards have been met. Organizations are increasingly moving to this model of employee development to address current or looming shortages of staff and to ensure that there is a continuing supply of qualified staff to meet future organizational needs (John Burke, 1989). This approach also demonstrates to employees that the organization is committed to their development and advancement within the organization.

Overall, competency development and management have become the most important issue and can't be ignored. Our study used the data of competency assessment to determine the order of educational training, and used data mining technology to identify and target the crucial trainees. We believe these results could provide a useful model for facilitating the decision-making of managers and policy makers to reduce much decision costs. In addition, the results provide insights that the government can use in planning related training programs and policies.

6.2 Suggestions

This article has described the significance of the study on the use of data mining classification techniques for employees' training demands prediction. However, there should be more data mining classification techniques applied to the different problem domains in HR field of research to broaden the horizon of academic and practice work on data mining in HR. Besides that, other data mining techniques such as SVM, Fuzzy logic and AIS should also be considered for future work on classification techniques using the same dataset.

In this study, as we can see from result analysis, C5.0 classifier has a great potential for prediction. The generated classification rules can be used to predict the performance of an employee whether he/she has potential to be promoted or not, based on his/her willingness to develop. In conclusion, the ability to continuously change and obtain new understanding of the classification and prediction in HR research has become the major contribution to data mining in HRM.

6.3 Limitations

Our study has some limitations. First, we used the 360-degree as the assessment method. However, the consideration relationship between evaluator and evaluatee is not perfect, because we have little urgent time to collect the data, few evaluators feel not so familiar with their evaluatee. We suggest the researchers could audit carefully the consideration relationship with perfect way and enough time in the related study. Second, Chinese culture emphasize the “renqing”, “mianzi” and power, in this kind of society, to evaluate objective is not a easy thing, the researchers could have competency assessment seminar, make every evaluator and evaluatee have the right concept about competency assessment, then the data of 360-degree competency assessment could be valuable.

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Knowledge-Based Dynamic Modelling of Relation between Corporate Language and Performance

Pavla Slechtova *

Department of Languages
College of Polytechnics Jihlava
Tolsteho 16, 586 01 Jihlava, Czech Republic

Jan Voracek

Department of Electrical Engineering and Computer Science
College of Polytechnics Jihlava
Tolsteho 16, 586 01 Jihlava, Czech Republic

** Corresponding author*

Structured Abstract

Purpose – Globalization enhances traditional managerial models with numerous challenging features. So far isolated companies, focused mainly on local customers, must shortly become valuable units of large multicultural clusters. Beyond the evident business positives, there are also strong appeals, arising especially from unavoidable structural merging. Presented research concentrates on language aspects of globalization, when business units must communicate efficiently both internally (with own employees or internal customers) and externally (market stakeholders). Our goal was to identify and analyse the scope and degree of influence of systematically institutionalized components of organizational language on its performance.

Design/methodology/approach – Balanced scorecard is widely used tool for strategic performance planning and management. According to this approach, enterprise is considered from four perspectives, contributing together to stakeholders' value maximization. In the analytic phase of our research, we selectively identified and quantified the major language-sensitive activities, enhancing companies' learning and growth, customer relations, operations and financial processes. Resultant findings were transferred into system dynamics implementation of BSC in a form of independent but cooperating capacity and human resources development related modules.

Originality/value – There are interesting research results concerning the language management in the sense of its internal production and reception. Other authors study language in organizations from cultural, administrative or technical viewpoints. Consequently, our market oriented approach, projecting language aspects into strategic planning and performance platform is rather new and promising direction in competitiveness research.

Practical implications – Development of soft skills and proper establishment of related processes belong among the key business success factors. Current managers, however, emphasize direct vocational knowledge over general abilities of their staff. This is understandable, because focused professional training influences productivity faster than, e.g., personal behavioural improvements. On the other hand, right systemization and full utilization of official spoken and written language has also evident, although delayed, productive potential. To minimize problem of its quantification, we analyse different ways of language institutionalization by means of interactive management flight simulator. Such tool can be easily adopted and immediately utilized in practical planning and group decision making tasks.

Keywords – Organizational language, strategic planning, performance driver, balanced scorecard, dynamic modelling.

Paper type – Academic Research Paper

1 Introduction

Activities of every company are closely related to and affected by the language used for communication within the company as well as with its external environment. The language functions as one of the determining factors of the company life including interpersonal relationships, cooperation, motivation and managerial processes. Adequate language use promotes competent communication bringing benefit to the company on all levels of its operation, inaccurate language application, on the other hand, may have negative consequences and develop into a barrier impeding business activities and proper functioning of the company. In the modern global business world, issues of language constitute new challenges to multinational companies and their managements where the situation is complicated by diverse language environment. The process of globalization has brought about a widespread creation of multinational corporations. Simultaneously, the role of language as the mediator of effective communication in such companies becomes a pronounced factor possessing the power to influence the corporate business results and achievements and consequently the competitiveness of the enterprise. A number of studies and researches have been published exploring the role of language within multinationals and discussing its influence on their performance and suggesting possible feasible solutions. On the other hand, the discussion and research on the cost effectiveness of such solutions implementation has been rather neglected so far.

2 Language Management and Language Barrier

Both written and spoken language serve as a means of company communication which conveys information internally between managers and employees and also externally facilitating negotiations with partners, contact with customers and company image to the public (Fredriksson et al 2006, Haarmann 1990, Wardhaugh 1992, Welch et al 2005). Language management includes planning, organizing, staffing, leading and controlling of resources related to language (Spolsky 2009). Language used in a proper way might become a powerful tool for building corporate image, act as a connecting factor among the stakeholders leading to better understanding and reducing the possibility of conflict rise. Ignoring the significant role of language in multinational organizations might lead to the loss of resources, impediment of organizational and managerial development due to the lack of communication and knowledge sharing (Lauring, 2007). The managerial approach to the issues of language can be defined as:

- simple – tackles straightforward problems as they occur in communication of individuals (pronunciation, spelling, use of certain words and phrases)
- organized – a more structured approach involving more persons. Language management process in this case is defined, adapted and developed continuously to suit the activities of the organisation, its goals and vision.

Language management is faced with the problems designated as language barrier arising from the increase of communication intensity, language diversity and scale of operations. Unfortunately, the ways to cope with these problems have deserved little attention from the research community so far (Feely and Harzing, 2008). The language barrier can be indirectly monitored in the following areas (Dhir et al. 2002, Enderwick et al. 1994, Guirdham 1990, Henderson 2005):

- Buyer-seller relationship: both groups prefer to communicate in own language,
- Foreign market expansion: language differences make distances ever bigger,
- Joint ventures: companies with international language dominate local partners,
- Headquarter-subsidiary relationship: language barrier cause distrust,
- Staffing policies: in case of single official language, headquarters are usually these foreigners,
- Ineffective inter-unit communication: frequently only one person with fluent knowledge of language acts as an interface, disregarding professional skills,

- Subsidiary role and autonomy: autonomy in own language usually grows with organizational distance from headquarter,
- Social exclusion and power: expats tend to be excluded from local community,
- Staff transfers: realized according to their language abilities rather than expertise,
- Structure, control and coordination: lower teams' cohesion if fundamental knowledge is not available in unified language.

Different authors (Charles et al. 2002, Maclean 2006, Swift 1991) suggest these solutions of language barrier problems and choices of language strategy:

- Lingua Franca, i.e. evolutionary adopted language: strict orientation on a single and too specific language might be dangerous,
- Functional multilingualism: risk of loss or distortion of information,
- Hiring external language resources (translators, interpreters): acquisition of purely language abilities without any domain knowledge can cause mistakes,
- Training: only long term and explicitly evaluated programs are worth,
- Corporate language: slow but efficient and successfully implemented by many global companies,
- Language nodes: predefined standardized communication interfaces inside organizational structure,
- Selective recruitment: straightforward and relatively cheap solution, but difficulty to realize,
- Engage expatriate management: risk of non-locality of management,
- Inpatriation: administratively domesticated staff can be under enormous social and professional pressure,
- Machine translation: rather reactive, short-time solution than a viable strategy. Cannot be used for semantically rich documents like legal or business texts,
- Controlled language: restricted linguistic corpus is helpful for highly formalized,

The basic factors influencing the choice of language strategy might include the language, external environment, the corporation itself, finance and corporate strategy. The language choice will be to a large extent determined by the type of the language, its complexity and commonness. The external factors such as human resources, customers, suppliers and competitors and the languages they use also have an impact on the choice of language strategy for the corporation, which might be influenced by the official language

of the country, language competencies of the managers, common communication style of the customers in relation to marketing and public relations, availability of translation services. The type of corporation, its structure and scope of activities and corporate image constitutes another important factor. Undoubtedly, financing the language integration into the long-term strategy of the corporation requires due consideration. Investments into the language training of employees, testing and maintaining their language skills will on the other hand bring savings owing to information resources sharing, omission of translation services and enhanced possibilities to operate on foreign markets and negotiate with business partners. Corporate strategy representing the ways used by the company to deal with its competitors will benefit from well-chosen language strategy enabling effective addressing of customers.

Although a fundamental research presenting a common base for the solution of language barrier is yet missing, a range of researchers have explored language issues in their case studies of multinationals. Different languages used within one multinational organization might constitute an important barrier slowing down company processes on all levels, increasing costs and thus negatively affecting the company performance. As Thomas (2008) argues it is necessary to consider the language needs of each organization thoughtfully and to develop the language skills of the employees to be able to overcome the communication barrier. Out of the solutions of language barriers named above the concept of a common corporate language is discussed most frequently in the available papers. The discussions address various aspects accompanying the process of common language adoption which the management of multilingual organizations should be aware of and present issues deserving further research. Harzing et al. (2011) suggest in their research a range of solutions to overcome the language barrier including a change of communication patterns, language training and a common corporate language. The effective internal communication often depends on having a shared language as language differences are associated with misunderstanding and conflict.

The most common shared language used in the 21st century is obviously English. Swift and Wallace (2011) focus on a German multinational organization using English as the common corporate language. The vast majority of employees use English for their job but the level of language skills is varying. The authors present a range of provisions to be taken to help the employees to achieve the level of English needed for their jobs. These provisions concern training, job rotation in English-speaking countries but also some

practices to be used in communication within the organization. Ehrenreich (2010) argues that although English has become an indispensable necessity in the business today, it is necessary to realize that it is not English as a native language to be learned but communicative effectiveness in English as a business lingua franca which might include non-native as well as native Englishmen from various cultural backgrounds on different levels of proficiency. An English language policy can be practicable but specific language groups will need promotion and facilitation of language use (de Groot, 2012). Furthermore the implementation of a common corporate language, whether it is English or any other language, presents a number of challenging tasks for the management ranging from translations of necessary documents to staff recruitment and training. As Fredriksson et al. (2006) suggest in their paper, even then the management are faced with the situation when the corporate language may not be as widely shared within a multinational organization due to language diversity, varying language proficiency of its employees and the level of analysis of previous research. According to Welch et al. (2001) adopting a common corporate language may obstruct or alter information flows, knowledge transfer and communication. In their other paper (Marschan-Piekkari, Welch, D. and Welch, L. 1999) the authors explored the impact of language on structure, power and communication in multinationals on a case study of one Finnish multinational. It is argued in their paper that language imposes its own structure on the flow of communication and personal networks. Thus employees with upper levels of language competencies are able to create broad contact networks within the multinational whereas employees with limited language skills rely on personal relationships with language mediators.

Maclean (2006) challenges the assumption that a single corporate language, usually English, is essential for operational efficiency on the basis of its limitations when it is a foreign language to all employees both at headquarters and in subsidiaries in e.g. a bilingual organization. Moreover, Maclean argues that English used as a second language makes the situation even more complex as the difficulties of communicating across cultures are thus contained within a single language, and suggests that more sophisticated, multilingual approaches to resolving language problems will be sought after in future. This is the point where other solutions to language barrier mentioned above or various combinations of them might be considered. For example Crémer et al. (2007) suggest that a manager working as a specialized translator may be used to achieve between-unit

coordination while separate languages are maintained within the organization. Another study carried out by Harzing and Pudelko (2014) proposes that expatriates can facilitate communication between headquarters and subsidiaries.

3 Language and performance

Every forward-looking company strives to establish deterministic, standardized and repeatable strategic planning processes, supporting complex decisions of their managers. Such need is logical consequence of inherent market uncertainty, subjectivity, dynamics and volatility. Furthermore, problematic forecasting of future demand, altogether with blurred consequences of insufficiently justified managerial statements result to internal pressure and loss of motivation, critically threatens the institutional existence. Logically, the main goal of any strategic planning is the maximization of performance. In for-profit companies, performance combines different structural characteristics (e.g. business model) with their implementation and evaluation mechanisms, like strategies, resources and processes. Generally, performance is composed from effectiveness, i.e. measure of success in doing the right things and efficiency, measuring how well we proceed in doing our things. Properly designed performance measurement system must collect adequate amount of data from the both groups. Such temporally and hierarchically distributed definition conveniently predetermines dynamic approach to performance representation, because one-shot time slice can hardly explain complex relations among its leading (resources related) and lagging (output oriented) indicators. Effective, broadly understood structural simplification of performance architecture is yet another prerequisite for correct and prompt establishment of practically applicable, reliable and scalable managerial platform (Davies and Davies, 2011). Consequently, performance management system can be based on the following components:

- Strategy map (Kaplan and Norton, 2004), which is simplified and layered graphical representation of particular business strategy. This diagram acts mainly as systemization and communication tool, helping managers to sort, prioritize and explain their key objectives in single strategic perspectives, including (i) human resources (HR) altogether with their learning and growth policies, (ii) internal operations, (iii) customer relations and (iv) finances. This structure is interpreted in the bottom- up way, meaning that improvement of objectives in HR, learning

and growth perspective leads to better performance of internal processes, which stimulate desired customer-oriented and financial results.

- Balanced scorecard (BSC) - (Kaplan and Norton, 1996) represents refined and restructured version of strategy map, extended with performance drivers and indicators. Originally static document, intended for strategic presentations and discussions, has gradually turned into routinely applicable company-wide executive guideline and also extended to dynamic version by Akkermans and van Oorschot, 2002 or Barnabè, 2011.

4 Tools and techniques

Initial discrete temporal context of BSC is usually captured with Causal loop diagrams (CLD) (Sterman, 2000; Morecroft, 2007), connecting causally coherent internal terms either directly (plus sign) or reciprocally. These edges form complex reinforcing (R) and balancing (B) loops, concurrent contributions of which determine dynamic behavior of the whole system. CLD in figure 1 shows that the proposed problem of language has more reinforcing than balancing loops. Such arrangement says, that there is a growth potential, connected with *Learning and improvement*, *Language quality* and *Active language skills* parameters. Company, indeed, can make money also through proper utilization of its *capacities* and quantitative resources, as well as with responsible management of *customers'* base. On the other hand, *workload* and corresponding loss of *satisfaction* represent the main limiting factor, expressed with the only balancing loop.

Another fundamental tool of BSC dynamization is Stock and flow diagram (SFD). Although it primarily serves as graphical programming language for Systems dynamics modeling, due to the representational clarity SFD can be employed as a computer-independent modeling platform, too. Resources of performance (drivers) are expressed as stocks or tanks, filled and drained by parametrically controlled valves, adjustable with other data, available in system. Corresponding simplified system diagram is system dynamics notation is in figure 2. We can notice that some variables from figure 1 are now expressed with stocks, while others are converted into valves and parameters (invisible in figure 2). Stocks levels, which represent mainly purposely planned and managed quantities, are also called state variables.

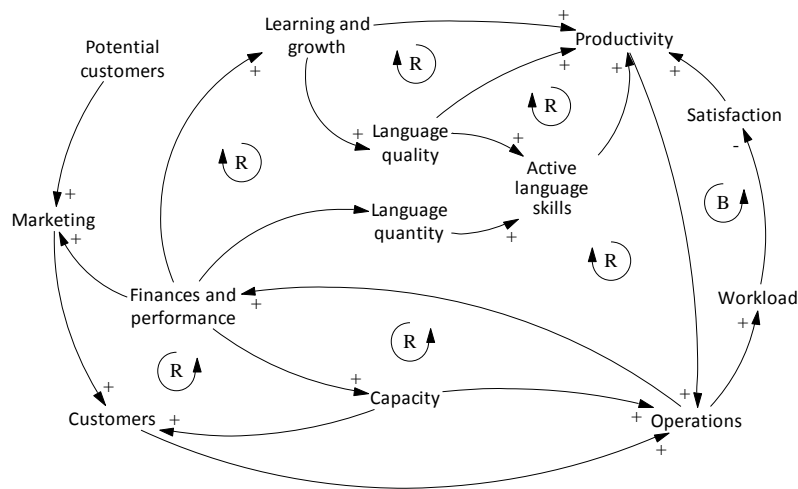


Figure 1 Basic Causal loop diagram of language influence on company performance

Related in- and outflow rates are controlled by generally nonlinear functions of other parameters or stock levels. For example, *Parameter_set_1* can be function of *finances*, (marketing) *staff* and *knowledge* (customer relationship management), *operations* (supply of products and services) and, in our case, also the both *language* stocks. After the model is fully adapted to company processes and external inputs, users can perform sensitivity and scenario analyses or search for viable strategies or policies. All values are constant just between the adjacent computational steps and can be changed whenever afterwards. This nonstationarity option allows adjusting of decision cycles durations based on changing environment.

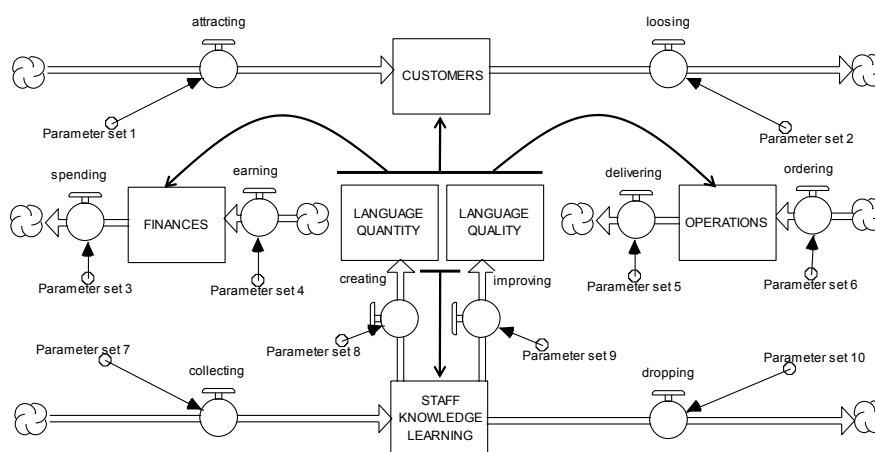


Figure 2 Relation between language and performance, simplified Stock and flow diagram

5 Experiments

We propose the following three ways of projection of the above-discussed language strategies to simulation model:

- a) Installation of language directly to the organizational infrastructure, which is applicable to these strategies:
 - Lingua Franca,
 - Functional multilingualism,
 - Corporate language,
 - Language nodes,
 - Controlled language.

Because the structuring is strategic task, necessary costs become inherent part of primary planning and do not need to be analyzed separately. The set of institutionalized language features thus contributes immediately to basic dynamic behavior. Sample design of such case is discussed in section 5.1.

- b) Development of general language capabilities represented with instantly available and publicly visible quantities, addressing especially the front-end stakeholders, such as prospective customers, suppliers or employees. This can be achieved via:
 - Hiring external language resources,
 - Purely linguistic, professionally unfocused training,
 - Machine translation.

Experiment, analyzing this possibility, is described in section 5.2.

- c) Concentration on development of efficiency enhancing and productivity stimulating HR skills and knowledge (quality of language), which can be realized through the following activities:
 - Active vocational training, delivered in foreign language,
 - Fully utilized positives of selective recruitment, expatriation and inpatriation - for example sharing knowledge in distributed international teams.

Related experiment is shown in section 5.3.

For simplicity, we associated performance with profitability and compare net profits of single alternatives, i.e. differences between sales revenue and total costs. This viewpoint naturally assumes certain level of internal maturity and market stability. In

cases of identical profitability, the number of acquired loyal customers is used as auxiliary performance metrics, because the temporally shifted relation between customers and profitability is evident. Exact structuring of company costs represents a complex problem, influenced with numerous internal factors. Disregarding the accounting details, part of earned money can be reinvested to capacities of structural and human resources (tangible cost drivers). The rest can partially come to the learning and growth sector, where develops human and organizational capital, i.e. individual skills and knowledge, as well as teamwork, management or alignment (intangible cost drivers). Qualitative effort implies continuously improving organizational culture, supports organizational learning and introduces knowledge management practices, which makes company highly efficient and competitive. The both types of cost drivers, utilized in internal operational (core), supportive and managerial processes, yields performance via their effectiveness and efficiency components. Because this research is theoretic, we concentrated on fundamental relational and behavioral aspects rather than on explicit numbers. Let's assume that the costs, associated with company language (C_{TOT}^L) are fixed and make up units of percent of its total costs C . They are split into capability (C_{CAP}^L) and HR development (C_{HR}^L) parts, i.e. $C_{TOT}^L = C_{CAP}^L + C_{HR}^L$. In study of pure capability, we assume that $C_{TOT}^L = C_{CAP}^L$ and search for a reasonable ratio $C : C_{TOT}^L$. The subsequent qualitative analysis uses the previously fixed C_{TOT}^L and strives to find feasible $C_{CAP}^L : C_{HR}^L$ ratio.

5.1 Structural adjustments

Let's suppose that company needs to increase performance through overall extension and intensification of existing infrastructure. This practically means, that managers must find a reasonable balance between quality and quantity supporting investments, resulting in non-decreasing profit during the next two years. Under simplifying assumption of linearity, we gradually adjusted the total additional capacity, then picked its most convenient value and applied the same procedure on HR development sector. Graphical results of the both experiments are in figures 3 and 4.

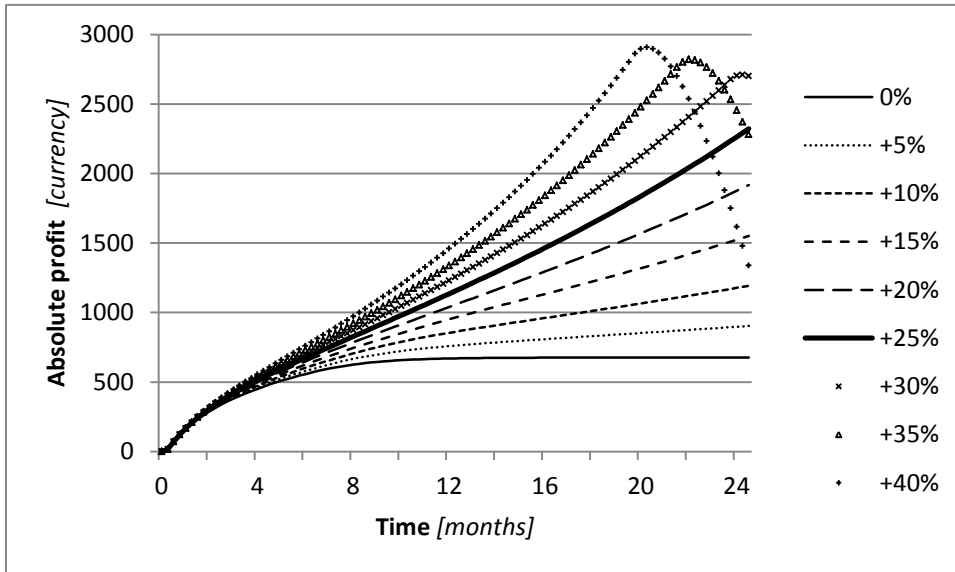


Figure 3 Analysis of profitability with respect to total extension of structural capacity

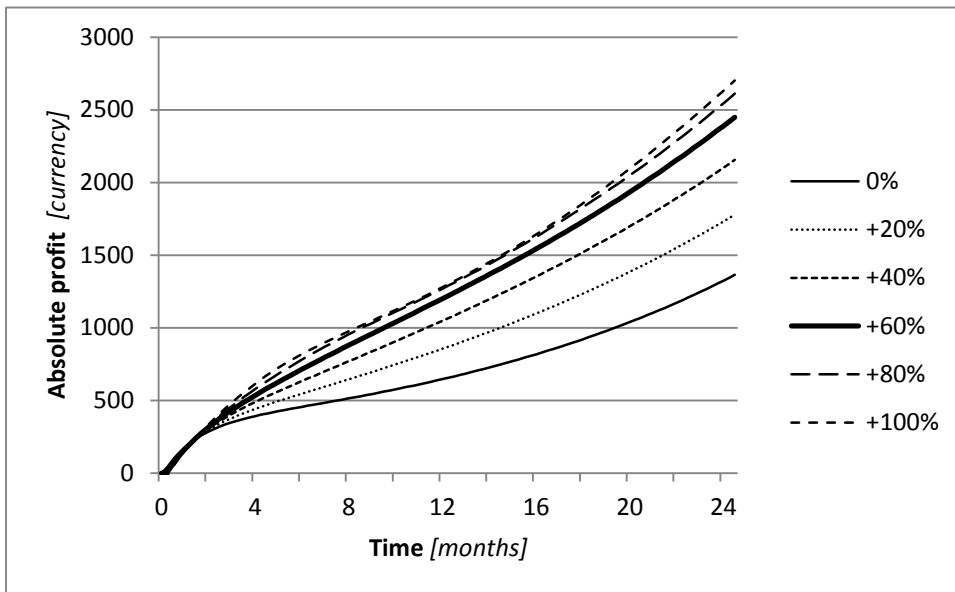


Figure 4 Analysis of profitability with respect to extension of overall HR development

Without any changes, profit initially grows as a result of past investments, until a steady state from month twelve on is reached. Since then and under assumptions of internal and market stability, company serves existing customers and generates constant profit. Firms with such passive strategy have no reason to address new customers or spread own businesses, not to say include language extensions. Set of curves in figure 3 shows that any structural, i.e. tangible investments have positive effect on profitability. One can also notice that spending larger than 25% is potentially risky, because it originates peaks on profit curves due to high incurred costs (salaries, maintenance, overhead), unbalanced with income. There are two ways how to handle such situation - either to accept the level of maximal monotonously growing output or to shorten the decision making cycle. From the inflection point on basic (0%) profitability curve we can estimate its time constant on five months, which is significantly less than currently applied two years. For the second adjustment, we chose the first option and applied the variation of HR development money on 25% capacity growth course. Results on figure 4 justify effectiveness of such change. Two times higher profitability improvement indicates, that our sample company runs a value-intensive business, like job-shop or provision of very specific eventually knowledge-oriented services. Noticeable is also nonlinearly varying density of curves for larger HR investments, showing existence of zone of ineffective knowledge excess. That's why we used only 50% of available HR development financing and left the rest as strategic reserve. Resultant suboptimal profitability curve, used in all following cases as a base run, thus incorporates, among others, also fully institutionalized structural aspects of language.

5.2 Extension of language capabilities

Instantly available and flexibly allocable language-based performance drivers should appear mainly on customer side. Marketing, sales or supportive services are straightforward examples of activities, where prompt availability of language helps immediately. On the other hand, fragmented language elements, spread non-systematically inside company, can hardly contribute to its productivity. More likely they can cause unwanted communication and administrative overhead. Sensitivity analysis in figure 5 shows the relation between language capability and total amount of customers. As expected, this amount always grows, but there is a central bottleneck, caused by momentarily insufficient productivity of operations. Customers, initially

attracted by multilingual environment, are served slowly, which lead to disappointment and move to competitors. Then the partially released and recovered resources are able to serve the remaining customers more efficiently, which is impulse for their return. From the managerial viewpoint, such instability is undesirable and must be minimized either with carefully designed campaigns or, rather, the capability enlargement phase must be preceded with HR skills and knowledge development. Because the absolute amounts, spent for language capability development are relatively small and heavily interrelated with other costs, they can be hardly seen in the total profitability, as it is shown in figure 6.

5.3 Focus on active development of personal language skills

This experiment evaluates the efficiency part of proposed language institutionalization framework. We expect that focused training and wide sharing of knowledge can increase productivity via minimization of necessary inputs. Active language proficiency, for example, helps operators to serve international customers faster and closer to their expectations, master complex devices and technologies faster and more precisely, consult problems and exchange knowledge with worldwide colleagues or freely migrate inside global company.

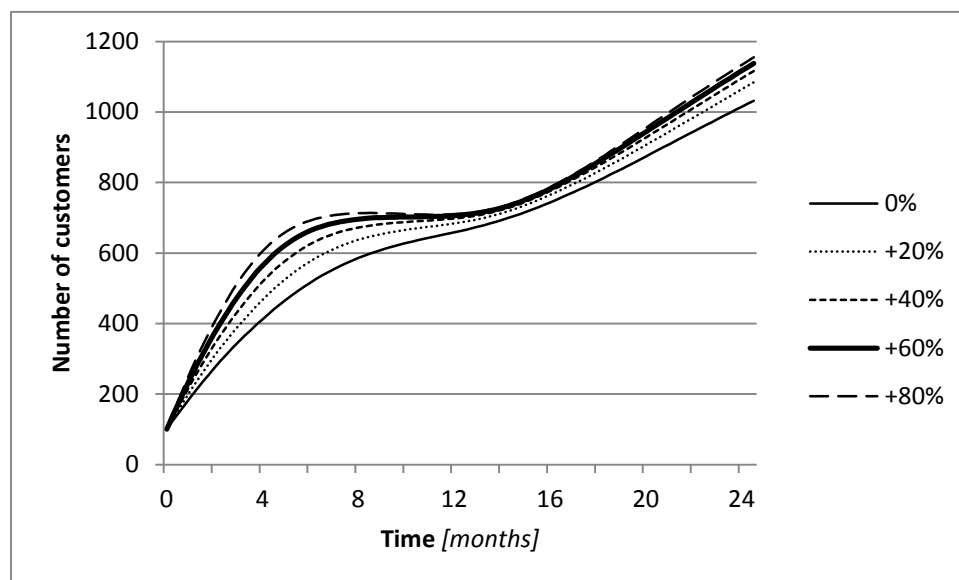


Figure 5 Relation between language capability and amount of customers

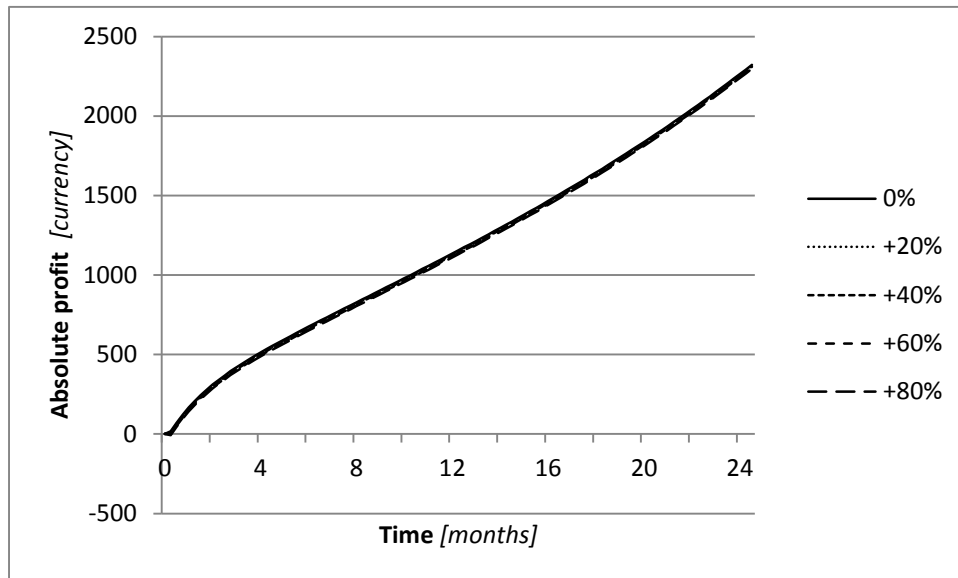


Figure 6 Analysis of profitability with respect to language capability spending

Figure 4 shows possible excess in HR development. This phenomenon alerts to limited effectiveness of any overdimensioned HR development strategy. Instead of mechanic provision of unnecessary training, we propose to save this money and use them later for introduction of higher, value generating quality. Consequently, we identified several viable language-related performance drivers and incorporated them to BSC model. All of them are located in the learning and growth sector and determined by particular levels of internationalization, leadership, teamwork or motivation. Dynamic model takes into account also amount, size and age structure of single teams, as well as degree of process orientation. Personal skills, enhanced with language features influence mainly the quality and speed of operations. These improvements drop operational costs, stabilize existing customers and through quality address the new ones. Analysis of sample HR-development focused parametric setting is in figure 7. Mandatory initial language investments are shortly compensated with higher and smoothly growing performance. To avoid aforementioned excess of quality and keep the acquisition of new customers on reasonable level, we recommend $C_{CAP}^L : C_{HR}^L = 2/3$. Behavior of such alternative is shown in figure 8.

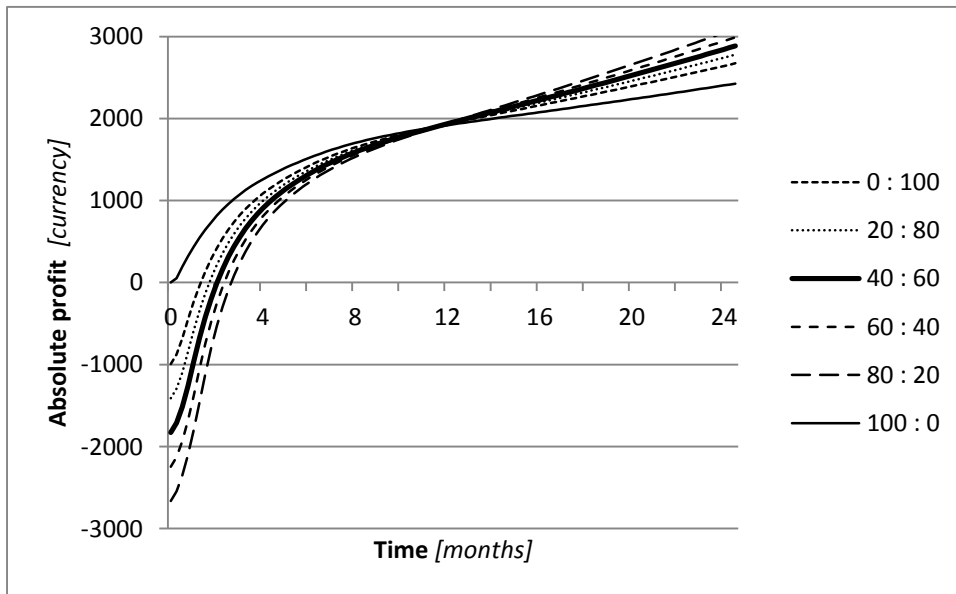


Figure 7 Analysis of profitability with respect to language-focused extension of HR development, represented with particular $C_{CAP}^L : C_{HR}^L$ ratio

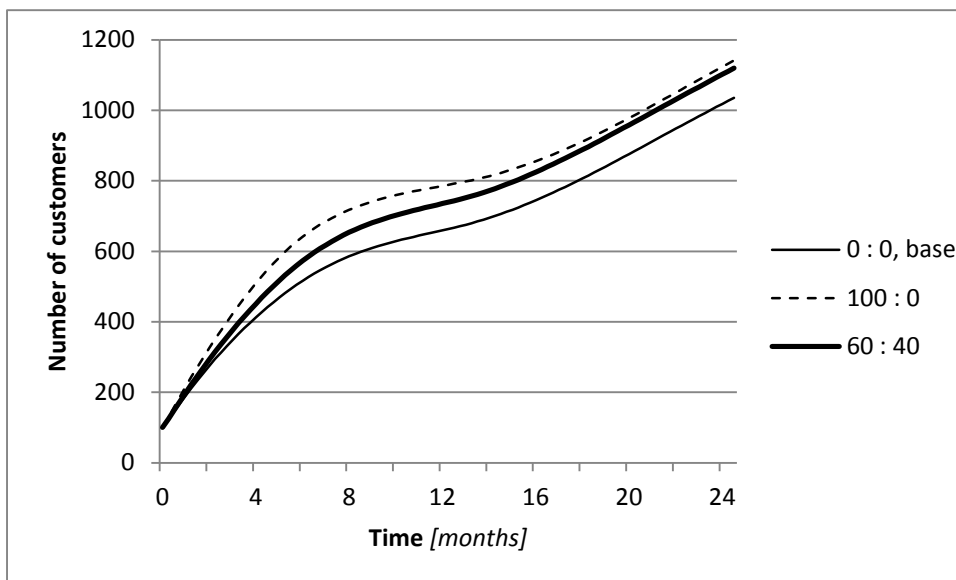


Figure 8 Relation between language language-focused extension of HR development and amount of customers for recommended $C_{CAP}^L : C_{HR}^L$ ratio

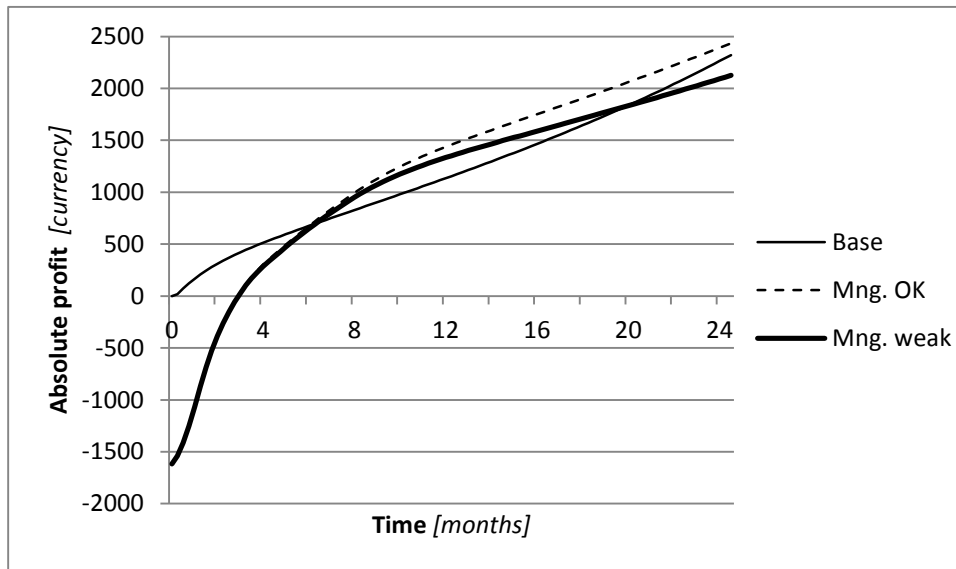


Figure 9 Example of lost opportunity due to weak managerial practices

From the managerial point of view, it is important to mention that inclusion of multiple aspects of people and teams-related dynamics makes the system more parametrically sensitive and, thus, requiring smooth and frequent interactions. In the opposite case, explicit language features can be merged with other HR development activities and finally become indistinguishable. Such poor management downgrades value of initial investment to language quality and embarrasses its exact evaluation. This situation is seen in figure 9. Due to non-systematic implementation, the marked language quality graph loses its initial potential and finally even turns into undesirable overhead.

6 Conclusions

We analyzed influence of different aspects of language institutionalization on profitability and amount of customers. Related experiments were executed in system dynamics version of balanced scorecard. Such solution is internally transparent, scalable and intuitively interactive. Consequently, involved planning officers and managers are capable and willing not only to adopt modeled suggestions, but also actively search for own alternatives and improvements.

After extensive experiments we propose the following strategic recommendations for those, who want to systematically introduce language artefacts to their firms:

- Total language costs should vary in units of percent of the total costs. Moreover, this area can be easily overinvested!
- Language can be developed in the following two directions:
 - Capacity, i.e. engagement of mostly quantitative, publicly visible features. Building of capacity/capability addresses mostly prospective customers and extends business potential of a firm. Profitability, however, remains unchanged. According to our experimental findings, capacity is supporting worthwhile up to 40% of total language budget.
 - Quality, i.e. direct employment of language in operations, which are thus more efficient and productive. Although this orientation requires additional one-shot investment and initially negatively affects the amount of attracted customers, later it always turns into a profitable and viable strategy. There is, however, a risk losing the identity of quality oriented language training over time, which must be mitigated by careful management.

Presented experiments confirmed our research hypothesis on positive influence of explicitly structured and controlled language on organizational performance. Our next research strives to refine the both suggested language directions and identify convenient development scenarios for different types of companies.

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The role of the Technological Districts (TDs) as engines for an effective implementation of innovation policies and strategies – The experience of the Italian National Energy Technological District (DiTNE) on the Green Energy Sources and Systems (GESSs)

Francesca A. Jacobone

Department of Engineering
University of Roma 3
Via della Vasca Navale 79
00176 Roma (Italy)

Antonio Lerro *

Department of Engineering , University of Roma 3
Via della Vasca Navale 79, 00176 Roma (Italy)
Department of Mathematics, Computer Sciences and Economics
University of Basilicata, Viale dell'Ateneo Lucano
85100 Potenza (Italy)

** Corresponding author*

Structured Abstract

Purpose – In the last years, there is an increasing attention to define and implement effective policies and strategies for support Green Energy Sources and Systems (GESSs) both at sovra-national, national and territorial level. On the base of the general objective and the priorities of the EU Horizon 2020 program and in order to create major attractiveness as a location for defining and implementing GESSs and to effectively link advanced knowledge, research, science and innovation and business, recently different national and regional systems have decided to elaborate and develop a new strategy and different policy interventions based on the creation of specific and right “ecosystems” able to connect world-class science base, advanced knowledge and business in GESSs. Specifically, the design and the creation of Technology Districts (TDs) have been identified as relevant engine for the definition and implementation of policies and strategies for support GESSs in many Countries according to EU general addresses.

The aim of the paper is to examine the state-of-the-art of policies and strategies for Green Energy Sources and Systems (GESSs) in the Italian context. Particular attention is given to the role played by the Technology Districts (TDs) - in particular related to the energy industry – as engines for an effective implementation of GESSs policies and strategies. First, it is briefly analyzed the scenario about the European Union (EU) and Italian strategies and policies and related framework on research and innovation, setting the position and the main challenges that business and policy are facing today. According to the priorities identified by the EU Horizon 2020 program and by the Italian National Energetic Strategy, the industrial and organizational model of the Technology Districts is

then introduced and analyzed as particular engine for an effective implementation of GESSs policies and strategies. Finally, we present the successful experience of the Italian National Energy Technology District (DITNE) as case of excellence in implementing effective GESSs policies and strategies and supporting smart growth dynamics according to EU and national programs.

Design/methodology/approach: To support our arguments we integrate some conceptual frameworks with the analysis of a case study of an Italian Technological District operating in the energy field. We provide the case example of DiTNE which has effectively planned and implemented innovative strategies and policies aimed to activate and support national and regional strategic development. The paper combines then a deductive approach with an inductive one. The main dimensions leading the innovation strategies and policies of European Union and Italy are identified through a review of the academic literature and policy-oriented reports. Then, the conceptual framework is integrated by the analysis of a case study aimed to enrich the proposed conceptual arguments with empirical evidences.

Originality/value: This paper contributes to further develop the understanding the role of the Technological Districts (TDs) as engines for an effective implementation of innovation policies and strategies. The analysis of the case-example shows in particular that Italy has been able to engage new mechanisms of sustainable and smart growth in which the development and the implementation of innovative strategies and policies in the energy sector sources have driven virtuous dynamics of value creation.

Practical implications: The paper provides implications for future research and useful insights for management and policy making. Our empirical work is based on an interpretation of the innovation dimensions levered and developed within the EU and Italian development strategy in the energy sector. Its nature is mainly explorative and intends to provide an interpretive platform for understanding the role and relevance that TDs may act as engines for an effective implementation of innovation policies and strategies. However, one case study can just provide insights for developing other more in-depth empirical studies.

Keywords – Technological Districts; Innovation; Innovation policies and strategies; Energy sector; DiTNE

Paper type – Practical Research Paper

1. Introduction

The global economy is changing at an unprecedented rate: energy sources, sustainability, science, technology, knowledge and innovation are widely recognized at the hearth of these transformations. In particular, future energy development currently faces great challenges. These include an increasing world population, demands for higher standard of living, a need for less pollution, and a possible end of fossil fuels. Without energy, the world's entire industrialized infrastructure would collapse: agriculture, transportation, waste collection, information technology, communications and much of

the prerequisites that developed nations take for granted. A shortage of the energy needed to sustain these infrastructures could lead to a world catastrophe (IACOBONE et al., 2012). This translates into developing energy technologies that are cost-efficient, have practical applications, provide greater safety and are environmentally sustainable. Renewable, green energy sources and systems (GESSs) and related industries emerge with the main aim to develop and use power through sustainable and environmental-friendly technologies (HUGGINS et al., 2009; LERRO et al., 2012).

At the same time, national and regional systems are strongly involved in understanding and exploiting these dynamics about sustainability and GESSs to derive competitive edge and to address smart growth paths, in which environmental, business, social and institutional factors integrate to create employment, wealth, widespread well-being.

Accordingly, in the last years, there is an increasing attention to define and implement effective policies and strategies for support GESSs both at supra-national, national and territorial level. On the base of the general objective and the priorities of the EU Horizon 2020 program and in order to create major attractiveness as a location for defining and implementing GESSs and to effectively link advanced knowledge, research, science and innovation and business, recently different national and regional systems have decided to elaborate and develop a new strategy and different policy interventions based on the creation of specific and right “ecosystems” able to connect world-class science base, advanced knowledge and business in GESSs. Specifically, the design and the creation of Technology Districts (TDs) have been identified as relevant engine for an effective implementation of innovation policies and strategies, and in particular for the definition and implementation of policies and strategies for support GESSs in many Countries according to EU general addresses.

2. The Renewable Green Energy Sources and Systems (GESSs): overview

The energy industry comprises all companies historically operating in oil refining, oil and gas exploration and development, power generation, power transmission, nuclear materials plus companies involved in the emerging alternative and renewable energy sector. The oil industry is generally a very profitable industry, and it is foreseen to remain

so for at least the next 50 years. The International Energy Agency stated that energy use “is on an unprecedented increase, with most coming from developing countries, led by China and India (...) and this makes a significant contribution to meeting future road-transport energy needs, helping to promote energy diversification and reducing emissions”.

Due to such pressures, the renewable/alternative energy sector is increasing in importance in the energy industry. This is related to several reasons: fossil fuels, such as oil, natural gas and coal, become depleted; there is expected to be a doubling of energy use and a tripling of electricity demand in the next 50 years; fossil fuels, when burnt, are seen by many scientists as a main cause of global warming due to the creation of carbon dioxide (CO₂); alternative energy sources have a much smaller environmental impact and are renewable. Alternative energy is described as “renewable energy sources ...which create less environmental damage and pollution than fossil fuels, and offer an alternative to nonrenewable resources” (Alternative Energy Industry Knowledge Guidebook, 2006, p. 7).

At the national and international political level, there is movement toward creating the conditions to allow for alternative energies to flourish as well as the amount of new employment derived from alternative energy sources and more generally from the so-called “green economy”. Recent research has focused on the viability of constructing a new economic engine that generates financial incentives for reducing environmental damage. Rather than promoting environmentalism as such, the focus has switched to ways of selling environmentally-friendly decision-making.

At the industrial level, new start-up or expanding business units of multinational companies are emerging, but the sector is extremely fragmented and mainly made-up of SMEs facing significant challenges. Developing infrastructures to deliver renewable energy needs considerable investment by governments and often these installations meet with criticism from environmentalists concerning their negative impact on the landscape. Moreover, there are many arguing that renewable energy installations cannot act as a means to serve large-scale energy resources due to an unreliability of sources patterns, the cost-structure involved for an efficient production, as well as technological difficulties associated with storing energy created in non-peak usage periods. The activities in the renewable energy sector are very similar across the globe. Although current performance of large renewable companies has been affected by the economic climate, further

government objectives on renewable energy and CO₂ emissions provide a clear ground for future growth in the sector.

At policy level, the European Union's (EU) approach to the renewable energy sector is more coordinated than the individual-state-set regulations. The European Commission has decided to regulate the renewable energy sector growth and its environmental effects by setting limits on CO₂ emissions and levels of renewable energy supply in the EU's total energy market. Therefore, by 2020, the EU aims to achieve an average level of 20% of its total energy final supply from renewable, and 10% of transport fuels supplied by bio-fuels (Renewable Energy Policy Network for the 21st Century, 2007). The European region's energy consumption has been on the rise in recent years, led by fossil fuels. Therefore, the energy sector still holds its position as a major pollution contributor. Scientists, companies and policy-makers argue that in the coming years the renewable energy sector will face some great challenges. Among them, it is possible to note an increasing need to define and implement effective policies and strategies for support GESSs both at supra-national, national and territorial level.

Accordingly, the design and the creation of Technology Districts (TDs) have been identified as relevant engine for the definition and implementation of policies and strategies for support GESSs in many Countries according to EU general addresses.

3. The Technological Districts: background

More recently, there has been a wide debate in academic, economic and policy circles finalized to identify the 'better' scale in which knowledge communities emerge and knowledge-based dynamics activate real development paths. The clustering of R&D activities, new technology creation and implementation, high-tech manufacturing of knowledge-intensive industrial and business sectors, relationships and networking among local, national and international stakeholders have been traditionally identified as key-levers to activate and support these virtuous mechanisms.

Accordingly, the creation and the development of Technological Districts (TDs) have gained an increased prominence among entrepreneurs, manager and policy-makers, influencing the development strategies of local and national systems and luring the attention towards knowledge-based and technological industries as a significant driver of local and national growth. The economy of a TD creates high-value added products and

services using research, technology and brainpower. In a TD, private and public sectors value knowledge, invest in technology, integrate tangible and intangible assets and, ultimately, harness them to create innovative goods and services.

Although there is not yet a clear and shared identification and definition of “Technological District” at economic theory level, and they have been often conceptualized as a modern and dynamic variant of the Industrial Districts, the same literature, together with the managerial one, has provided different perspectives of analysis and it has highlighted specific features characterizing a TD.

Regarding the definition of TD, after reviewing the wide literature involved on these issues, a working definition of TD has been elaborated as “*value chains – geographically or not defined - particularly rich of activities on scientific and technological fields, in which it is often possible to trace profiles of excellence both at the beginning of the value chain in terms of outstanding scientific and technological research and at the end of the value chain, in terms of productive systems and markets in which output and insights might have potential applications*” (LERRO and JACOBONE, 2013a, b).

On the base of the ongoing debate in the academic literature as well as in the managerial and policy circles, it seems to emerge two constituent elements of a TD: the *governance model* and the existence and the *role of the stakeholders* – as any group or individual who can affect or is affected by the achievement of the organization's objectives. Moreover, there has been growing interest at academic and policy level about the factors underpinning TDs' creation and their high performance. Broadly speaking, a set of partly overlapping arguments within this literature have been proposed: these are identified in *economic efficiencies, knowledge and innovation dynamics, geographical agglomeration and systems of relationships* (see LERRO and JACOBONE, 2013a, b for a more-in-depth analysis).

4. The model of the Technological District: evidences from Italy

The model of the TD has been particularly successful in the Italian context. On the base of the three priorities of the Horizon 2020, such as excellence science, industrial leadership and societal challenges and to exploit these opportunities and their related impacts on the dynamics of the economic systems, in Italy it has emerged the relevance of strategic, industrial and organizational models characterized by the presence of different stakeholders – in particular big companies and multinationals, small and medium

enterprises, Universities, research centers, public institutions such as Regions or Chambers of Commerce - finalized to effectively integrate business, research, training and innovation and finally territorial development (LERRO and JACOBONE, 2012). It has been recognized, in fact, that EU policy objectives - climate, environment, energy, transports and so on – cannot be easily achieved without cutting-edge research and innovation paths, and breakthrough solution may effectively derive from multidisciplinary and international collaborations.

According to this picture, the Italian Minister of University and Research (MIUR) by proper laws has attributed strategic importance to the creation and the development of the Technology Districts (TDs) as effective model acting as engines for a smart and sustainable growth of the territorial systems as well as of the whole Country. In particular, on the base of the national and EU strategic agendas and of the analysis of the Italian business, scientific and technological structures, in the last years the MIUR has recognized and supported various TDs operating in the supply chains of the green chemistry, agrifood, technologies for living spaces, life sciences, technologies for smart communities, means and systems for mobility on hearth and sea, aerospace, smart factory, energy sources and systems.

Specifically on these latter, practically, different regional TDs on energy issues were created in Italy, in particular in regions such as Piemonte, Lombardia, Trentino, Liguria, Emilia-Romagna, Toscana and Sardegna.

5. The case of the Italian National Energy Technological District (DiTNE)

Beyond the previous regional TDs, on the base of the strategic relevance of the energy sources and systems, and in order to better tackle societal challenges, specifically about the production and the use of secure, clean and efficient energy, on 2008 the Italian National Energy Technological District (DiTNE) (since now *District*) was created in Puglia region, in the South-East of the Country, specifically around the city of Brindisi, in the local area entitled “Cittadella della Ricerca” (www.ditne.it).

It is based on the excellence of the most important Italian universities, research centers big companies, multinationals and small and medium enterprises. In general terms, the aim of the *District* is to support in the energy's field development of research in the

productive sectors, encouraging technology transfer, promote the links among the world of research, business, financial institutions and the local system, strengthen relationships and scientific cooperation between research and industrial sectors.

More in detail, the *District* acts as relevant engine for the implementation of effective policies and strategies for support GESSs both at supra-national, national and territorial level, and operates to support the institutions promoting scientific and technological research to stimulate interest, coordination and the start of events and projects relating to energy both at the national and international level, to join all the issues involved in the supply chain of the technologies to harness energetic sources, renewable energy and related research. The main research areas of the *District* are mainly components and energy conversion systems, CO2 reduction, new technologies for smart grids, innovative components and systems for renewable energy, efficiency and energy saving.

It also proposes strategies, tools and technologies to revitalize the market for renewable energy sources in Italy. The governance of the DiTNE is entrusted to a Consortium Company with Limited Liability in which at least 51% of the authorized capital is held by public shareholders for statutory requirements.

The DiTNE may be considered a successful experience and a case of excellence in implementing effective GESSs policies and strategies and supporting smart growth dynamics according to EU and national programs. In fact, it is traditionally involved in translating into action a series of Green Energy Sources and Systems (GESSs) policies and strategies developed at national and international level. In particular, 5 projects have gained great relevance and impact.

The first project refers to “*Off-shore Renewable Energy Conversion platforms Coordination Action – ORECCA*” and joined FP7 UE - call FP7-ENERGY-2009. The objectives were to create a framework for knowledge sharing and to develop a research roadmap for activities in the context of offshore renewable energy (RE). In particular, the project has stimulated collaboration in research activities leading towards innovative, cost efficient and environmentally benign offshore renewable energy conversion platforms for wind, wave and other ocean energy resources, for their combined use as well as for the complementary use such as aquaculture and monitoring of the sea environment. The use of the offshore resources for RE generation is a relatively new field of interest. ORECCA has overcome the knowledge fragmentation existing in Europe and stimulated the key experts to provide useful inputs to industries, research organizations and policy makers

(stakeholders) on the necessary next steps to foster the development of the ocean energy sector in a sustainable and environmentally friendly way. A focus has been given to the strategies developed towards an integrated European maritime policy. Moreover, the project has defined the technological state of the art, described the existing economical and legislative framework and identified barriers, constraints and needs within. Finally, it has defined the strategic investment opportunities, the R&D priorities and the regulatory and socio-economic aspects that need to be addressed in the short to the medium term to achieve a vision and a strategy for a European policy towards the development of the offshore RE sector.

The second project refers to “*EFFicient Energy buildIng Innovative soLutions – EFFEDIL*” and joined the program “PON Ricerca e Competitività 2011-2013” funded by the Italian Ministry of Education University and Research. The project aimed at the development of innovative and sustainable solutions, for improving energy efficiency in buildings of countries with temperate and warm climate, in order to satisfy the requirements for the voluntary LEED (Leadership in Energy and Environmental Design, Green Building Rating System) certification. Particularly, one of the main aims of the project has been the development of innovative bricks, in terms of product and industrial process, with characteristics of heat insulation, solar shielding and heat inertia, in order to improve performances of the coverings of the main building typologies, actually present in the regions of the Convergence, in the community area of Mediterranean. The research extended to the process of components production, in order to reduce the incremental price of the innovative products in comparison with the traditional ones, and to the components for connecting and finishing the opaque covering of the building, in order to develop an energy efficient solution, complete and able to guarantee a high house comfort level. As regards plants, the project aimed at developing an innovative ICT system for the active optimization of energy consumptions in the buildings, produced through the use of a Sensor Service Architecture, aimed at the control of the absorptions and of the Energy Renewable Sources micro-generation in the last mile.

The third project refers to “*Development of innovative solar concentration technologies – INNOVASOL*” and joined the program “PON Ricerca e Competitività 2011-2013” funded by the Italian Ministry of Education University and Research. The project focused on the development of innovative solar concentration technologies for electric power generation. Particularly, the aims of this project were the development of

innovative solar concentration technologies for parabolic trough high temperature solar plants, the development of innovative concentrating photovoltaic panels, based on CdTe cells, and the development of innovative solutions for waste water treatment by using solar energy.

The fourth project refers to “*Systems research and development of electrical and thermal energy efficient generation, management and storage, integrated and interconnected in a Virtual Power Plant - SMART ENERGY BOXES*” and joined the program “PON Ricerca e Competitività 2011-2013” funded by the Italian Ministry of Education University and Research. The project had as main objectives the development of units, called Energy Smart Boxes, equipped with high-efficiency technologies, able to manage different energy carriers in an integrated and optimized way in order to satisfy the energy demand of residential and industrial complex of medium size, and the study and implementation of innovative technologies for the production of energy generation, which can be integrated with the management of a SEB, like other technologies currently more developed (photovoltaic, mini / micro wind, etc.).

Finally, the fifth project refers to “*Sustainable development using renewable energy sources in rural villages of Balkan Adriatic region – SUNRISE*” and joined Adriatic IPA Cross Border Cooperation 2007-2013. The idea was to use innovative technology, based on the renewable energy sources, for achieve electric energy independency from grid of a rural Balkan Adriatic village. The project activities encompassed actions such as the optimal design and planning of a renewable energy based microgrid considering various renewable energy technology options and with realistic inputs on their physical, operating and economic characteristics, the break-even distance for connection of the microgrid with the main grid, the comparison of the overall benefits from the optimally designed renewable energy based microgrid with existing microgrid configurations, the setting up of a monitoring and control system for managing the different energy sources inside the microgrid and the interface with the distribution company.

6. Conclusions and future research directions

We believe that the insights discussed in this paper may represent a new basis for enriching a conceptual framework on how GESSs may affect effectively overall business performance and improves value-generating activity within energy industry. Future directions for the research can be addressed. The first one is the need for holistic,

systemic and integrated approaches, policies and tools to deal with the ever-increasing complexity and differentiation of energy industry companies – multinationals on one side mainly operating in traditional energy source, and emerging SMEs which are trying to gain markets niches with renewable energy. Another challenge for researchers and practitioners is to work to unify the still-divergent theoretical and policy approaches in the energy industry. For this purpose, we encourage further research to disentangle the complexities in the relationship among GESSs policies, technological districts, business performance and local development. More empirical inquiry and in-depth case studies are needed to define the modalities and procedures that better help TDs to implement appropriate policies and management practices ensuring the effectiveness of their business processes and in turn the value of their products and services.

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www.ditne.it (accessed on 27th November 2013)

Organizational Boundaries and their Implications for Competitiveness and Strategic Growth

George Tovstiga

Henley Business School,
University of Reading
Greenlands, Henley-on-Thames
Oxfordshire RG9 3AU, UK

Structured Abstract

Purpose – Organizational boundaries of the firm have long been a central theme in organizational theory. An approach to making sense of the strategic significance of the firm’s strategic boundaries is proposed in this.

Design/methodology/approach – The paper develops the concept of the proposed “unique competing space” framework and presents the findings (descriptive statistics, correlation and principal component analyses) of an empirical study involving 75 UK firms carried out to test the applicability of the proposed framework in practice.

Originality/value – This paper proposes a pragmatic analysis approach that provides the strategic practitioner with a practical “back of the envelope” for the analysis of strategic issues and the derivation of strategic implications from these on the basis of relatively simple yet powerful heuristic approach.

Practical implications – The notion of strategic growth invariably invokes some consideration of the firm’s boundaries; both directed outwardly as well as inwardly. This paper proposes a relatively simple yet pragmatic approach for thinking about the firm’s boundaries.

Keywords – Strategic, boundaries, competing space, issues framing and analysis.

Paper type – Academic Research Paper

1. Introduction

The firm’s organizational boundaries have long been a central theme in management theory. Multiple perspectives have been developed over the years to help create a better understanding of the significance of the firm’s boundaries (Thompson, 1967; Pfeffer and Salancik, 1978), and the implications of these for the firm’s competitiveness and strategic position (Santos and Eisenhardt, 2005a).

Much of the research agenda focusing on the firm’s boundaries has been shaped and driven mainly by the rather limiting perspectives of either transaction cost economics (Williamson, 1981; Coase, 1988) or exchange-efficiency (Poppo and Zenger, 1998;

Nickerson and Silverman, 2003). To a great extent, this has led to a discourse on firms' boundaries that has focused on boundary decisions as make-or-buy choices, the rationale of which is provided by governance efficiency considerations (Argyres, 1996; Poppo and Zenger, 1998; Dutton *et al.*, 1994; Kogut, 2000; Brusoni *et al.*, 2001; Macher and Boerner, 2012; Weigelt and Miller, 2013).

Boundaries research has progressed from efficiency-based considerations to encompass other decision-making factors such as competencies (Argyres, 1996; Poppo and Zenger, 1998; Jacobides and Hitt, 2005; Helfat, 1997; Kachra and White, 2008; Parmigiani and Mitchell, 2009; Yang *et al.*, 2010; Macher and Boerner, 2012) the prevailing analysis approach still appears to be focusing on independent boundary choices in well-structured organizations and competitive environments (Santos and Eisenhardt, 2009; Penrose, 1952; D'Aveni, 2001; Parmigiani and Mitchell, 2009). This has led to a renewed effort aimed at extending the understanding of the firm's boundaries. Santos and Eisenhardt (2005, 2009) argue for a more comprehensive typology of the firm's boundaries that encompasses non-efficiency conceptions of the firm's boundaries. Raisch and Birkenshaw (2008) have extended the research agenda to include the notion of ambidexterity; they propose a more granular view of the firm's boundaries to explain how ambidextrous organizations adapt to changing conditions at their boundaries. Even with recent extensions beyond efficiency considerations, however, the focus of the extant firm boundary research has nonetheless remained primarily theoretically focused. Little of the theory related to the firm's boundaries readily translates to guidance for strategic sense making, and ultimately strategic decision-

The central contribution of this paper is a simple heuristic approach that seeks to address that deficit. The heuristic builds on the basic premise that issues of strategic importance and relevance to the firm invariably make their appearance at the firm's strategic boundaries when they arise. The heuristic is based on a framework that maps the firm's 'unique competing space'. This perspective offers a practice-relevant view of the firm's strategic boundaries within the context its competitive context. The heuristic thereby provides a pragmatic explication of its strategic boundaries; empirical findings presented in this paper provide substantiation of its relevance and potential applicability to management practice.

Key insights, supported by empirical findings, emerging from this research suggest that:

1. The firm's strategic boundaries comprise three interfaces: (1) an interface to the firm's competition (competitors and their offerings); (2) an interface to the cluster representing the needs of the firm's stakeholders (which may include its customers, markets and other stakeholders); and (3) a firm-internal boundary representing a threshold separating the firm's potential basis of competitiveness (e.g. its resources, assets and capabilities) and its actual exploitation of that basis for competitive advantage.

2. Issues of strategic relevance to the firm, when they emerge, invariably crop up at one or more of its strategic boundaries. Focus on the firm's strategic boundaries therefore enables keeping tabs on those really critical issues of strategic importance without 'losing sight of the wood for the trees'.

3. The three boundaries are inextricably linked; changes at any one boundary invariably results in changes at one or both of the other boundaries.

The key contribution of this paper is a simple heuristic approach for making sense of the firm's strategic boundaries – and thereby its competitive position. The paper further provides novel empirical evidence of the heuristics applicability to strategy practice.

2. Simple heuristic based on the firm's 'unique competing space'

The basis of the heuristic approach proposed in this paper is a framework representing the firm's *unique competing space*. This framework is a graphical representation of the firm's unique competitive positioning relative to its customers (and their needs) and competitors (and their rival offerings); its unique competing space is represented schematically by a domain within which the firm seeks to deliver an (ideally) uniquely superior and thereby differentiated value offering in a way in which its competitors cannot (Figure 1). This domain depicts as much where the firm seeks to focus its competitive efforts as it does about where it will not seek to pursue opportunities.

The unique competing space framework has been derived from earlier versions of the "3C's" framework (Ohmae, 1991), and its further portrayal as "strategic sweet spot" (Collis and Rukstad, 2008). These earlier frameworks similarly depict three overlapping circles representing the *corporation*, its *customers* and *competitors* (hence "3C's") in a Venn diagram configuration. However, in contrast to these earlier frameworks, the 'unique competing space' framework introduces two additional elements that significantly enhance the richness of the analysis:

(1) it recognizes that the domain depicted as the unique competing space in *Figure 1* has *spatial* character; it is not a mere one-dimensional ‘spot’ as its earlier designation as ‘sweet spot’ (Collis and Rukstad, 2009) might suggest; and

(2) the domain perspective allows the identification of the firm’s strategic boundaries, represented by the three boundaries that form the perimeter of the firm’s unique competing space.

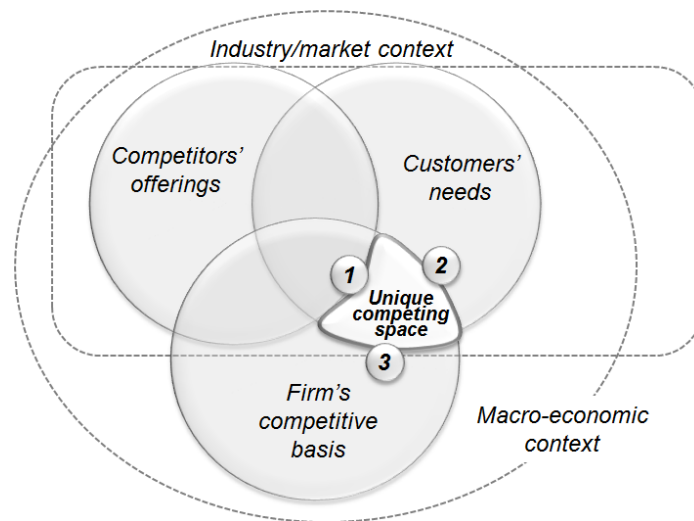


Figure 1: The firm’s ‘unique competing space’ showing the firm’s three strategic boundaries

Composition of the firm’s unique competing space:

- 1. External competitive environment** The *macro-economic environment* (outer circle in *Figure 1*) and *industry/market context* represents all those factors in the firm’s macro environment that are of relevance to its competitive position.
- 2. Competitors and their offering** The cluster in *Figure 1* representing the *competitors’ offerings* narrows the focus of the analysis on the firm’s competitors. In this cluster we find competitors who are vying alongside the firm to fulfill the needs of customers in respective markets.
- 3. Customers (stakeholders) and their needs** *Customers’ needs* are represented by the upper right circle in *Figure 1*. Strictly speaking, this cluster represents the greater community of stakeholders, of which customers represent one particular stakeholder

group. This circle represents the recipients of the value created and delivered by the firm and /or its competitors.

4. ***The firm and its basis of competitiveness*** The lower of the three overlapping circles in the Venn diagram (Figure 1) representing the firm's competitive basis encompasses not only its resources (physical and financial) and capabilities (representing its intellectual capital), but also the greater organizational context embodying the firm's structure, processes, practices, culture and leadership. Therefore, this circle represents the *potential* basis on which the firm competes. The fact that the firm possesses resources and capabilities, however, does not necessarily mean that it is successfully exploiting these for competitive advantage. In order for this to be the case the firm must ensure that it succeeds in *mobilizing* its resources, capabilities and assets *across* the interface designated as "3" in Figure 1. Boundary "3" is therefore about alignment of the organization's resources, structure, culture and other internal factors in a way that most effectively enables the firm to establish competitive advantage from its stock of strategic assets and capabilities.

The firm's unique competing space thus represents the domain in which the firm seeks to position itself competitively with a uniquely differentiated value offering in response to customers' needs in a way that competitors cannot. One can just as easily extend this single value offering perspective to envisage a portfolio of individual value offerings that then collectively s such a differentiated domain. The notion of the 'unique competing space' is, of course, an idealization. In reality, the firm may share its 'unique competing space' with a selected few other competitors. Hence, more appropriately, the firm's 'unique competing space' might be thought of as an opportunity window within which the firm generates above market-average returns on the basis of those activities represented in that domain.

3. The Firm's Strategic Boundaries

Good strategy is about knowing where (and why) to focus the firm's competitive efforts. The firm's strategic boundaries are defined by its *unique competing space*. The strategic boundaries of the *unique competing space* say as much about where the firm's strategic focus is (or should be) as they do about where the firm is *not* focusing its efforts:

1. Boundary '1': represents a *line of demarcation* to the competition – the firm's competitors and their relevant value offerings;

2. Boundary '2': represents the firm's *interface to its markets*; this may include customers and/or relevant stakeholders at large – and the needs of these potential recipients of the value created and delivered by the firm; and
3. Boundary '3': represents an *internal (organizational) threshold* over which the firm must mobilize its resources and capabilities from the repository comprising its competitive basis in order to render them competitively relevant. Simple ownership of resources, assets and capabilities does not suffice if these are not purposefully transferred across boundary "3".

The three boundaries collectively play an important role in defining the firm's strategic agenda. They also provide critical perspectives for the analysis of issues that are of strategic relevance to the firm's competitive position. Issues of strategic relevance, when they arise, invariably do so as a result of changing conditions at one or more of the firm's strategic boundaries. It is this particular feature of the unique competing space that endows this heuristic approach with a powerful means of 'cutting to the chase' and 'not losing sight of the wood for the trees' when examining the firm's strategic position and in setting its agenda in response to changes in its competitive environment.

3.1 Strategic implications of the firm's boundaries.

Two main strategic perspectives on the firm's boundaries present themselves on examination of the unique competing space framework: The first is strategic relevance of each of the three boundaries individually, each of which introduces a unique strategic perspective on the firm's unique competing space. Of particular interest are the implications for the firm's competitive position introduced through changing conditions at the boundary in question. The second perspective relates to the impact of change at any one boundary on one or two or of the other boundaries. In this study we explore both perspectives.

3.1.1 Single boundary analysis

Each of the three boundaries represents an important individual perspective on the firm's competitive position. The three boundaries individually provide perspectives on (1) the competition, (2) the customers (or stakeholders in a broader sense); and (3) the internal competitive wherewithal of the firm. Competitive environments are dynamic; they are continually changing. Changes in the firm's competitive environment inevitably

manifest themselves as perturbations at the boundaries of the firm's *unique competing space*. The firm's boundaries are particularly important in the context of changing competitive contexts. Changes might harbor opportunities as much as they might represent threats to the firm's competitive position. As a result of these changes, a firm's *unique competing space* can expand, or shrink and disappear altogether. Changes at the three strategic boundaries represent quite different challenges – and therefore have different implications for the firm's competitive position.

3.1.2 Multiple boundary analysis

Not only do changing conditions carry very different implications at each of the three boundaries individually, change at one boundary is often inextricably linked to change at one or two of the other boundaries. For example, a competitor's pre-emptive new offering may be in response to changing consumer needs and preferences in the market; this, in turn, may prompt the firm to examine and reconfigure its own portfolio of capabilities for a suitable response. This introduces complexity to the challenge of managing change at the firm's boundaries. Significant and pervasive change simultaneously at all three strategic boundaries very often throws the firm into a tailspin from which it is often difficult to recover. The recent collapse of once dominant industry leaders such as Nokia and Blackberry illustrate the point well; new competitors such as Apple and Samsung with improved offerings in the smartphone sector, changing (smartphone) market needs, and the inability of the two once strong mobile phone players to respond appropriately have resulted in their rapid demise.

4 Research Questions, Propositions And Design

The purpose of the empirical investigation was to probe the suitability of the proposed heuristic for identifying and framing strategic issues relevant to the firm's strategic boundaries. The three boundaries suggested by the unique competing space formed the basis of research questions:

1. Which of the three boundaries most predominantly give rise to strategic issues?
2. What is the nature of the issues arising at the firm's strategic boundaries?
3. (To what extent) are strategic issues arising at the firm's boundaries interrelated?

The following propositions formulated from these questions:

Proposition 1: *The firm's internal boundary representing its ability to configure and mobilize its resources and capabilities most appropriately in response to changing external competitive conditions most often gives rise to strategic issues.*

Proposition 2: *Strategic issues arising at the three boundaries vary individually; typically these revolve changes to (1) competition, (2) stakeholders needs, and (3) to the firm's ability to respond to those changes.*

Proposition 3: *Strategic issues arising at the firm's strategic boundaries are typically interrelated; strategic issues arising at the firm's internal threshold boundary are most often triggered and exacerbated by issues arising at the other two boundaries.*

A quantitative, survey-based approach was selected; senior executives of 75 UK-based firms representing a cross sampling of industries and firm sizes participated in the research. The survey questionnaire solicits the senior executives' perceptions on the incidence and importance of strategic issues arising at various boundaries of their organizations' strategic boundaries. Data collection took place in April and May 2013. Principal component (factor analysis) and correlation analyses were used to probe the incidence of strategic issues at individual boundaries and coupling of effects between boundaries. Statistical analyses were carried out using SPSS v19.

5 Research Findings

59.5 percent of the responses were from organizations with 500 or more employees, while 33.8 per cent of the responses were from organizations with a turnover of £500K or more. The data reliability overall (based on Cronbach's alpha) was 0.747, which indicates a good level of reliability.

5.1 Single boundary analysis

Descriptive statistics, specifically mean values presented in Table 1, indicate the incidence and nature of the issues arising at the individual boundaries. Further exploration of individual boundary effects was carried out with the help of factor analysis (specifically, extraction by principal component analysis). The analysis results are presented in Table 2. These indicates boundary "1" ("emerging new competition") to be most important in terms of strategic issues arising. This boundary contributes 16.5 per cent of the variance; it is followed by boundary "3" ("getting the organizational act

together”), which contributes 15.7 per cent of the variance explained. Boundary “2” then accounts for the subsequent third and fourth most importance components, contributing 14.7 and 14.2 per cent for “emerging markets” and “changes in existing markets”, respectively. The outcomes of this analysis are highly significant at a 99 percent confidence level and a reliability score of 0.605 (KMO).

Table 1. Summary and correlation¹ statistics

Boundary	Coding scheme	Mean ²	SD	1.0	2.0	3.0	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2
Competition	1.0 Boundary 1	3.71	.941											
Customers	2.0 Boundary 2	4.15	.896	.132										
Internal	3.0 Boundary 3	3.71	.955	.279*	.193									
Boundary 1 (Competition)	1.1 New offerings	3.48	.795	.462**	.166	.259*								
	1.2 New competitors	3.00	.930	.355**	.081	.304**	.165							
	1.3 Combinations	3.29	.749	.334**	.197	.480**	.146	.621**						
Boundary 2 (Customers)	2.1 New needs	3.81	.766	.017	.533**	.164	.127	.133	.167					
	2.2 New customers	3.53	.875	.176	-.015	.351**	.074	.266*	.232*	.211				
	2.3 Combinations	3.61	.769	.028	.221	.211	-.090	.094	.246*	.381**	.712**			
Boundary 3 (Internal)	3.1 Sense making	3.44	.721	.053	.024	.327**	.145	-.040	.058	.028	.180	.116		
	3.2 Resources	3.73	.890	.018	.151	.225	-.046	-.131	.099	.263*	.220	.262*	.269*	
	3.3 Mobilisation	3.52	.875	.073	.246*	.314**	-.072	.083	.156	.429**	.215	.222	.146	.579**

Notes: ¹Kendall's tau (2-tailed); ²Mean values range from 1 to 5; N = 75; *p < 0.05; **p < 0.01

Table 2. Principal component analysis; summary of outcomes (N = 75)

Principal components*	Relevant boundary	Percentage of variance explained	
		Individual	Cumulative
1 Interface to emerging new competition	1	16.5	16.5
2 Internal threshold: getting the organizational act together	3	15.7	32.2
3 Interface to emerging markets	2	14.7	46.9
4 Changes in existing markets	2	14.2	61.1

*Extraction method: Principal Component Analysis; Rotation method: Varimax with Kaiser Normalisation; Kaiser-Meyer-Olkin measure of sampling adequacy: 0.605; Statistical significance: **p < 0.01

5.2 Multiple boundary analysis

Interaction and multiple effects between the three boundaries were examined with the help of a correlation analysis (Table 1). The outcome of analysis indicates numerous correlations between individual boundaries and factors prevailing at those boundaries. These are depicted graphically in the mapping presented in Figure 2, which indicates the density of interactions between the three boundaries.

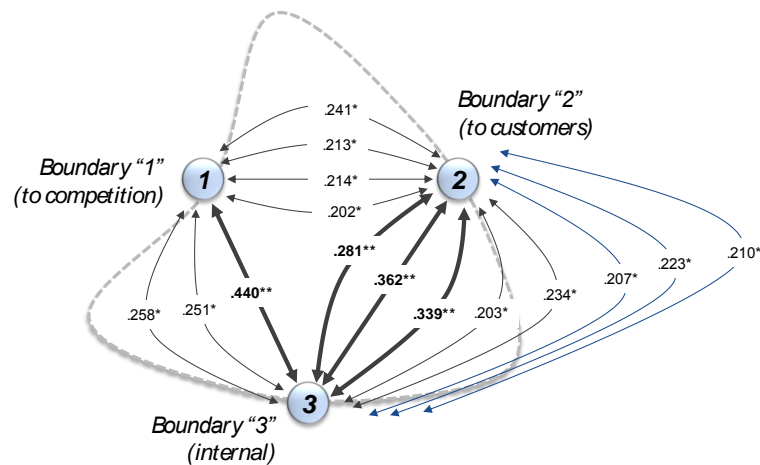


Figure 2. Mapping of interaction effects between boundaries (correlation analysis); bold lines indicate statistical relevance at $**p<0.01$ level; simple lines indicate relevance at $*p<0.1$ level.

The interaction mapping (Figure 2) indicates strong interaction between boundaries “2” and “3”, and to a lesser extent, between boundaries “1” and “3”. The bold lines indicate correlations that are highly significantly (at 99 per cent confidence level); correlations at a $*p<0.1$ level are indicated with simple lines.

6 Discussion And Concluding Remarks

In many ways, the firm’s boundaries define and reflect the essence of the organization; issues of strategic importance and relevance to the firm’s competitive position invariably make their appearance at the firm’s boundaries. The firm’s strategic boundaries represent a demarcation between the firm and its environment. The simple heuristic approach proposed in this paper represents a pragmatic perspective for making sense of the firm’s boundaries; it is based on the premise that the firm’s boundaries represent the interfaces at which issues of strategic importance to the firm arise when the firm is subjected to changes in its competitive position. The underlying framework, the firm’s unique competing space suggests three such boundaries. The empirical findings largely support the propositions formulated: strategic issues arise typically in the face of changing conditions at two of the firm’s interfaces – the interface to its competition and the interface to its stakeholders (*Proposition 1*). Changes at these (external) interfaces

give rise to strategic issues which relate to the firm's ability to respond suitably. Principal component analysis suggests some ranking of the issues clusters. Issues related to changes in competition explain the greatest amount variance, although this is closely followed by internal issues (i.e. issues related to the firm's ability to respond appropriately), and issues related to changing stakeholder cluster (*Proposition 2*). Correlation analysis provides some insight into the interdependencies of the firm's boundaries. The empirical findings suggest that the firm's internal threshold represents a pivotal interface, which largely corroborates *Proposition 3*.

In summary we conclude that the proposed heuristic based on the unique competing space and its boundaries provides a unique strategic lens for making sense of the firm's competitive position, particularly in the face of changing competitive conditions.

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Uncovering the consonance between “play” and organizational learning: evidences from an Italian ‘Play Factory’

Chiara Bartolacci

Department of Economy and Law, University of Macerata
Via Crescimbeni 20 - 62100 - Macerata - Italy

Gianluigi Mangia

University Federico II Naples
Via Cinthia – Complesso di Monte S. Angelo

Federico Niccolini

Department of Economy and Law, University of Macerata
Via Crescimbeni, 20 - 62100 - Macerata - Italy

Maria Laura Toraldo*

University Federico II Naples
Via Cinthia – Complesso di Monte S- Angelo

* *Corresponding author*

Structured Abstract

Purpose – The paper aims to investigate learning processes in organizations characterised by a corporate culture (Hellriegel et al., 2004; Harrison and Stokes, 1992) that might be labelled “play culture”. The paper explores the extent to which a “playful approach” might generate and affect learning processes among organizational members. The paper aims to show that a playful culture is able to support both generative learning processes and double loop ones. It explores how the design of physical spaces intersects with a ‘play culture’ and how this impacts on socialization processes and the enhancement of knowledge creation.

Design/methodology/approach – The article research design is based on a case study approach. The paper focuses on a project named “Play Factory”, developed since 2008 by an Italian small firm (Loccioni Group). Our case study is based on a mixed method approach consisting of three main sources of data: 1. Interviews with organization managers that have implemented the *Play Factory*; 2. Participant observations, where the researcher becomes part of the everyday working life; 3. Archive documents (annual reports, etc.) from the company. The benefit of this type of inquiry is that it permits a detailed understanding of the phenomenon through a richer data collection

Originality/value – The article wants to fill a gap in the current organization studies literature, in order to further investigate the relation between play culture and learning. Indeed, traditional literature has focused on a description of learning characteristics, whilst less has been done to understand which types of tools enhance learning processes. The analysis shows that in some organizational contexts, play can become a powerful tool. A culture of play can be conducive of generative learning processes, thus shaping working practices.

Practical implications – This papers shows the effects of “play culture” on learning processes, along with their physical and spatial consequences and expressions. Indeed a “play approach”, especially if synergized with other interventions oriented to create BA architectures, seems to help organizations to become physical places that stimulate knowledge creation and SECI process triggering and enhancement. Finally, starting with this successful case, it would be possible to show the importance of play culture in supporting creative intelligence inside organizations. It would be then possible to draw some conclusions that can be extended to other organizations, especially regarding the relationship between play culture and generative learning.

Keywords – Organizational learning, Ba, Play culture, Play organization, Sustainability.

Paper type – Academic Research Paper

1 Introduction

A wide and varied literature has investigated play activities as a learning catalyst in human sciences field. However, except for few authors (Costea et al. 2007; Fleming, 2005; Warren, 2002), the topic has been poorly researched by scholars writing in organizational fields.

Scholars writing from different disciplines, such as sociology, psychology or anthropology have recognized the relevance of the ludic dimension. For instance, many psychologists have suggested that play is an essential part of human development and as such, deserves not to be underestimated (Carr, 2003). According to Huizinga (1950), play represents a necessary condition to learning throughout human evolution. In his popular essay, Huizinga discussed about “homo ludens”, and he traces back in the man who plays, the necessary condition to become “homo sapiens”, the man who knows.

Organizational researchers have recognized that play within organizations can have significant benefits such as learning, personal fulfillment, and even performance (Starbuck and Webster, 1991; Hatch, 1999). Fortune-500 companies were consulted on how to incorporate play into businesses and it came out that various companies such as

Google, Patagonia, Gore, Motorola, and Du Pont encourage their employees to use up to 20% of their work time to play freely with new ideas (Kark, 2011)

In sociology researches, play is considered as a process nurturing a dynamic relationship between the self and society. The individual who plays imagines the self “as if” it were other, creating a kind of estrangement (Carr, 2003): this peculiar flexibility of play activities allows new possibilities to be imagined and to come real, increasing people adaptation and evolution capability (Statler, 2009). When it comes to organizational contexts, the role of play activities and a playful culture should not be underestimated. According to the earlier mentioned psychological literature, play activities help in developing individuals’ cognitive and emotional capacities necessary for effective, productive work.

This paper aims to investigate learning processes in organizations characterised by a corporate culture (Hellriegel et al., 2004; Harrison and Stokes, 1992) that might be labelled as “play culture”. The paper explores the extent to which a “playful approach” might generate and affect learning processes among organizational members.

In this vein, the article wants to fill a gap in the current organization studies literature, in order to further investigate the relation between play culture and learning. We aim to show that a playful culture is able to support both generative learning processes and double loop ones. In this regard, a culture of play can be conducive of generative learning processes, thus shaping working practices.

This paper is structured as follows. The first section explores the concept of play within the managerial literature. The focus then moves to the literature on organizational learning, looking in particular at Nonaka and Takeuchi’s (1995) SECI model and “learning places” called Originating BA. The empirical section analyses an Italian small firm and it focuses on a project named “Play Factory”, developed since 2008 by this company.

Considering this case study, it would be possible to describe empirical evidences of “play culture” effects on learning processes, along with their physical and spatial consequences and expressions. Indeed a “play approach”, especially if synergized with other interventions oriented to create BA architectures, seems to help organizations to become physical places that stimulate knowledge creation and SECI process triggering and enhancement.

2 Exploring the connection between play and work

Play activities emerged as pivotal to develop imagination capability, helping children to distinguish between the real and the hypothetical; in this fashion adults can develop an ability to understand meaning within cultural contexts that are framed by more or less complex and explicit roles (Statler, 2009). Moreover, as play involves cooperative interaction, it has been conceptualized as a major organizing principle of human culture and civilization in anthropological studies. Indeed, certain types of play when socially enacted can enhance community building and develop a sense of communal identity (Kark, 2011). In this sense, although play may be considered unproductive because it doesn't result directly in any valuable artifacts, it can produce higher-order benefits at both a cultural and individual level (Statler, 2009).

The anthropological interpretation provides a group level approach to organizational play, that can be conceived to shape culture and identity of organization itself. In addition, at this level of analysis, sociological literature can lead to consider play in organizations as an activity through which people frame and adapt the social contexts and relationships necessary for work (Statler, 2009).

It follows from the above considerations that play and work could be two tightly intertwined concepts. Actually, the postindustrial revolution has firmly separated work sphere from leisure and play, to focus on organizational efficiency, rationalization, and profitability (Kark, 2011). Therefore "play" has been interpreted as opposed to "work". Nevertheless organizational culture (Schein, 1984) may represent and provide a general factor legitimizing or denying this opposite dichotomy. Indeed, as theorized by several authors (e.g. Harrison and Stokes (1992) or Hellriegel et al. (2004)), there are different kinds of cultures, some of which are more focused on trustfully and caring relationships and a sense of "camaderie" to build sense of belonging and commitment, along with self-initiative and personal growth to enhance the organization flexibility and innovation. Thus, work and play notions do not represent incompatible activities, but they rather represent different ways of approaching activities or different frames for acting.

"Play" can be defined as a behavioral orientation (Kark, 2011), and it is distinguished from "work" by different purposes, processes, and spaces in which it takes place. Play has been particularly described as an imaginative, ethical and autotelic process (Statler., 2009). Indeed, while playing, people are involved in a threshold experience. Within organizational contexts, play activities may lead to imagine different forms of

organization, exploring alternative modes of sense-making and social interaction, and constructing new forms of possible identity for the organization itself (Kark, 2011). Consequently, an important characteristic of play process is represented by its boundaries in time and space. Play is, then, circumscribed within limits represented by its constitutive rules. It keeps existing and going on only as long as the self-imposed rules defining play mechanisms are respected. We then speak about ethical play because, as the rules become more complex, they distinguish between right and wrong actions.

It is important to better stress that while work is by definition a means to an end, that is producing value, play produces no concrete or monetary. Play can have no goal or outcome apart from carrying out play activity itself: it is a purposeless activity (Bekoff and Byers, 1981). Although imaginative and ethical are necessary play conditions, this autotelic character is the effective sine qua non condition to completely fulfill the definition of play and definitively distinguish play from other organizational behaviors (Statler, 2009). In order to clarify the organizational usefulness and benefits coming from a purposeless activity, it is necessary to emphasize that the ontology of play is not that of rational and deterministic natural laws, but rather that of uncertainty, complexity and chaos. It is precisely this ontology that allows the possible benefits of play to emerge at different levels, going beyond the frame of the activity itself (Statler, 2009). Play activities rehearse possible future scenario and alternative forms of organization, providing significant agility and possible benefits in facing organizational change. However, play is not a production machine: play processes generate variety not consistency (Kark 2011).

3 Play culture and learning

Piaget (1962) stated that in early childhood, play provides a rich context in which children interact with the environment and create their own knowledge about the world. That is, play is a stimulus-seeking activity that represents a fundamental cognitive processes leading to learning. As noted by Senge (1990: 314), whilst playing with dolls, children rehearse ways of interacting with people. When they play with blocks, they teach themselves basic principles of spatial geometry and mechanics. Later in life they will learn the general properties of the pendulum through swinging on a swing (...).Through experimentation (...) children discover principles and develop skills that are relevant in reality beyond play.

Indeed play is central to the practice of experiential learning, defined by Kolb (1984: 41) as a learning spiral process whereby knowledge is created through the combination of grasping and transforming experience. First, for learners have to set game rules and conduct standards on their own, there are called to take responsibility for their own learning. That is, play encourages learners to achieve authentic and higher order learning. Second, play pays attention not only to the outcome of learning, but on the learning process too. Indeed, implying utility and fun, it permits a fully and truly educational experience to take place. Third, play supports and gives birth to a complete experiential learning cycle by allowing players to look back to a familiar experience with a fresh new perspective. Thanks to play recursive nature, individuals can mature gradually and consciously. Thus, play can be a central form of deep learning, that can be nurtured within formal organizational contexts insofar as they allows participants to express themselves in authentic ways, self-organize, and create boundaries for recursive, timeless play (Kolb and Kolb, 2010). Therefore, the experiential learning triggered by play, as described by Kolb, is not a simple adaptive learning: it is a process that implies a double loop learning (Argyris e Schön, 1978), characterized by a deep and transformational reflection on one owns mental models, beliefs and *modus cogitandi*.

Therefore play processes within organizations can naturally and effortlessly engage people in open-ended processes of continuous learning. Actually, play can foster not just continuous learning activities, but can also trigger a “meta-learning” process, allowing people and organizations to learn how to learn, to introspectively analyze their own cognitive processes. It leads to wisdom, that Weick defined as an attitude taken by persons toward the beliefs, values, knowledge, information, abilities and skills that are held, a tendency to doubt that these are necessarily true or valid and to doubt that they are an exhaustive set of those things that could be known (Weick, 1993). Organizations have better to continually adapt, innovate and reinvent themselves, and consequently, individuals ought to be flexible enough to learn from mistakes, change their assumptions and beliefs, and refine their mental models. Play could be very useful to this attempt, contributing to the development of relevant skills, because it can provide a less risky situation, in which the potential for negative consequences is minimized and, then, people can learn by doing without fears or worries. This safety context enables exploration to discover hidden variables or opportunities, and practice to refine skills in complex and difficult parts of work, stimulating risk taking and learning from errors.

In addition, play offers the chance to gain experience and skills people need to learn, but also the chance to further develop and practice with them by ongoing rehearsal. Play is often seen as a way of practicing skills needed in the future, for example, through reversal pretending for challenges and ambiguities.(Kark 2011).

Within organizations, play activities can be fundamental in providing a supportive and relationally positive context and enhancing trust, dialogue and cooperation, necessary to facilitate knowledge sharing and knowledge creation. Indeed group or organizational play can reinforce or create a collective self and a communal identity, easing socialization process. Through play activities, individuals with different backgrounds and diverse characteristics join in and interact in a playful mode, bringing and sharing their peculiar set of knowledge and competencies. People that engage seriously with play in an organizational context, take part in a process to bring into question the overall significance of who they are as individuals or as a collective. Through this complex, nonlinear process of identity formation, the context and purpose of work itself may, in turn, change radically (Statler, 2009). This re-shaping activity can also affect external environment: through play process individuals and organization can make the world they've imagined and envisioned together, come real, giving birth and committing themselves to a creative learning process (Senge, 1990).

Another important distinction between work and play is the physical, temporal and psychological space in which they take place. As we already stated play is bounded in space and time. Within organizations, play often occurs in a narrow space and time when the dialectical tensions between *agon* (contest) and *paidia* (play), reaches a tenuous balance, with neither dimension overshadowing the other (Huizenga, 1950). Indeed, organizations seem to face the dilemma of balancing two different goals: high productivity and efficiency or creativity and learning. Nevertheless, these goals are complementary and need to coexist to create an environment where members can be creative and productive (Kolb, 2010).

Kolb and Kolb (2010) spoke about ludic learning space: an holistic concept that integrates learning play, describing a free and safe space that provides the opportunity for individuals to play with their potentials and ultimately commit themselves to learn, develop, and grow. These play spaces represents "protected milieux", that have boundaries to partially keep out the world, that reduces disturbing affect and facilitates sense making (Kark, 2011).

Individuals need to step sideward into another reality in order to rediscover play, free from economic pressure and organizational responsibilities. This frame represents a differentiated level of reality, where people ‘play’ with the elements of the familiar and defamiliarize them. Modell (1996: 27) noted that the concept of play is linked to the illusion one: even the etymology of the world illusion, can be traced to the latin world *inlusio*, *illudere*, which means literally “in play”. Such “illusion” can be sustainable only if it is kept within a frame which seeks to separate it from ordinary life. Rules are particularly important in achieving that. The temporary world of play is a self-organizing system where participants set the rules on their own, defining the play space. In this view, the ludic is an autopoietic system that continuously generates its own existence and shape its own identity. The players join the game by choice, imposing on themselves rules and constraints they vowed to observe in order to continue to play. Therefore, on one hand, the fundamental essence of play is the freedom to create and be set apart from ordinary life. Yet, on the other hand, for this be accomplished, constraint is required in the form of rules and other factors related to space and time (Carr, 2003)

Nevertheless, these spaces are presumed to be not just play spaces: a fortiori, they can represent knowledge spaces, in which knowledge creation can be located. Eventually, they could be called Ba: shared spaces for emerging relationships in which knowledge can be shared and created (Nonaka and Konno, 1998).

Playing spaces could be related to both Originating and Interacting Ba concepts. Indeed, the former is the context for socialization. Through sharing common experiences and physical proximity, individuals are enabled to share their own tacit knowledge, ranging from technical expertise and know how, to assumptions and personal beliefs. In this space, sympathizing and empathizing processes let subjects remove barriers between the self and others, in a climate of care and trust. The latter, is defined as a more consciously constructed context, where tacit knowledge is turned into explicit. Externalization process requires the expression and the translation of tacit knowledge. Thus, it involves dialogue and figurative language or visual techniques as key-factors to support the articulation. It let express tacit knowledge, creating a self-transcendent mental world and, then, a shared amount of integrated knowledge, made up with common terms and concepts.

The playing space is presumed to be a support that can represents a trigger for the creation of knowledge. Starting from playing activities among individuals, a spiral of

knowledge (Nonaka and Takeuchi, 1995) can be activated and reach wider epistemological levels, reaching the whole organization.

4 Research Methods

The article research design is based on in-depth qualitative study (Charmaz, 2003). Therefore, to investigate the research problem, the paper adopts an inductive method, rooting the research within a tradition of studies that give credibility to the research findings of an inductive approach (Gioia et al, 2012; Corley et al. 2011; Tracy, 2010; Creswell, 2000). As noted by Gioia et al. (2012) one of the merits of inductive research is its undeniable capacity to extend the existing theoretical knowledge over what is already known. Thus, to produce data, the paper adopts an approach consisting of three main sources of data: 1. Interviews with organization managers that have implemented the *Play Factory* and *2Km of future* projects; 2. Participant observations, where the researcher becomes part of the everyday working life; 3. Archive documents (annual reports, etc.) from the company.

As what concerns the interviews, the paper was heavily influenced by the approach delineated by Roulston (2010). Indeed, the quality of interviewing and the possibility to generate ‘credible’ data are crucial aspects to consider when this method is adopted. The analysis is based on interviews that the researcher (s) had with several managers at Loccioni group. In particular, interviews were undertaken with key informants, such as:

- Loccioni Group Founder and General Manager; Business Units Top Managers and research areas Top Managers, to verify the homogeneity and comprehensiveness of play approach within Loccioni Group;
- Loccioni family second generation, to verify play approach sustainability;
- Communication Manager and one of the external design consultants that have been involved in the concrete realization of “Playfactory” and “2 Km of future” projects.

Key Informants	
Enrico Loccioni	Entrepreneur and Loccioni Group Founder
Renzo Libenzi	General Mnager
Maria Cristina Loccioni	Process Analyst and Procurement
Claudio Loccioni	Humancare Business Unit Manager
Damiano Loppi	Energy Business Unit Manager
Marco Pacenti	Industry Business Unit Manager
Tommaso Puerini	International Seats Manager
Cristina Cristalli	Research and Innovation Manager
Gino Romiti	Research and Development Manager
Maria Paola Palermi	Communication Manager
Lorenzo De Bartolomeis	Isao Hosoe Design

The interviews covered the following points:

A) Play and work: this section has aimed at understanding the relationship between play and work. In particular we wanted to understand if play and work activities are spatially, temporarily and psychologically distinct.

B) Reasons and achievements of play culture implementation: this section has aimed at inquiring causes and effects of play approach formalization within Loccioni Gorup. Particularly we wanted to inquire if play activities are really purposeless within organizations as well.

C) Play and learning: this group of questions were asked to learn about the relationship between play and learn. In particular, we wanted to know if play activities can enact experiential and rehearsal learning.

D) Play and Ba: these questions were to know more about the relationship between play and knowledge creation space. Specifically, we were inquiring the existence of a link between space designing and play activities, on one hand; between space designing and knowledge sharing and creation, on the other.

E) Game and play: this section was aimed at making play concept more explicit. In detail, we wanted to know which kind of play Managers referred to.

Interviews typically lasted between 20 and 40 minutes and were tape-recorded. Besides, the researcher (s) took part in the everyday working life of the organizational members. Participant observation lasted for about 4 months. The researcher (s) participated in the company's working life and she was able to observe in detail learning

processes within the Play Factory. In fact, this method allows investigating a contemporary phenomenon within its real-life context. Indeed, as observed by Hammersley (2007), the benefit of this type of inquiry is that it permits a detailed understanding of the phenomenon through a richer data collection. At the same time, documentary evidences were produced, by collecting archive documents (websites, annual reports and internal house organ). We looked through archival documents in order to track the history and the present-day activities of the organization.

4.1 The research setting

The setting for our data production occurred over the months of October-February 2014 at Loccioni Group. Loccioni Group is a medium-sized Italian company based in Ancona (Italy) and specialised in technological solutions addressed to diverse clients in the field of automotive, home appliance, environment, and health care. In particular, the company provides energy and environmental solutions, quality control for industrial processes and health care, assembly, testing and quality control systems for automotive components.

The intensive technological sectors in which Loccioni Group operates oblige it to consistently invest on innovation processes to keep up the technological entry barrier, to preserve its competitive advantage and its leadership position in heterogeneous niche markets. Consequently, learning and knowledge creation processes are fundamental in Loccioni Group everyday activities and they deeply affect company production and economical results.

Nowadays Loccioni Group operates in five different business areas (Mobility, Environment, Home, Humancare and Energy), has four headquarters (Italy, Germany, USA and China) and has its solutions installed in more than 40 countries worldwide. What makes it a more interesting and consistent case of study are also its economical performances over the years: trends are clearly positive, showing a continuous and solid growth. Below, some key figures are highlighted.

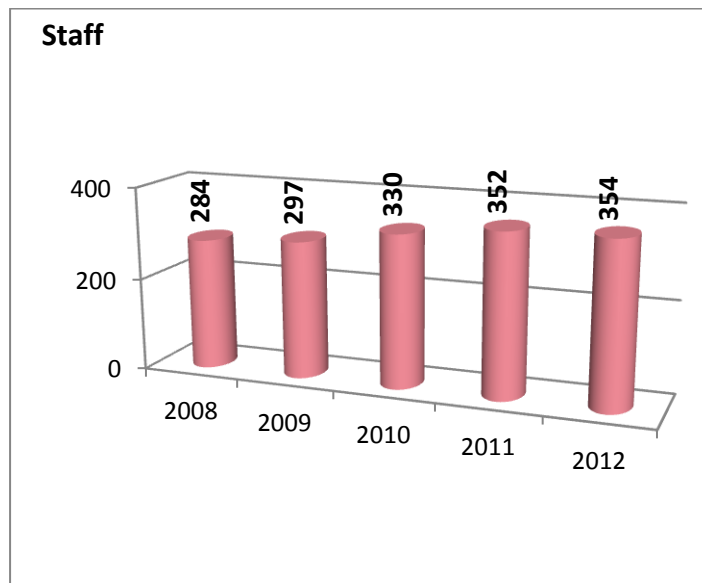
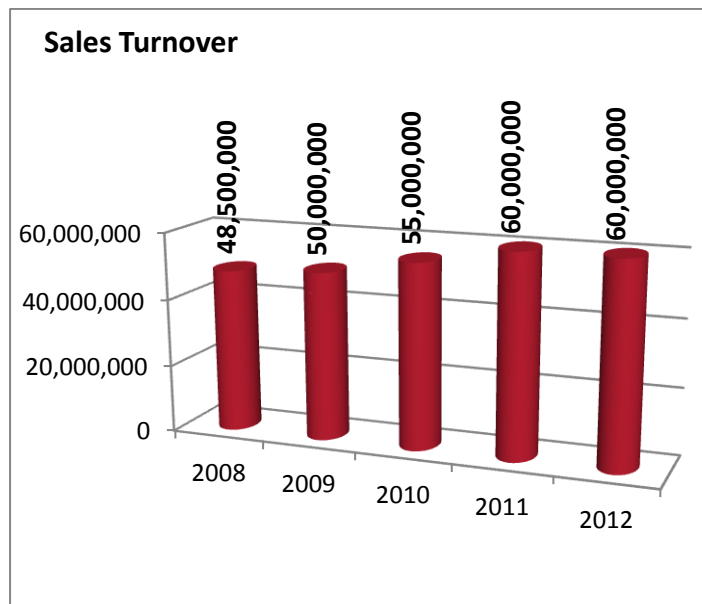


Figure 1: Sales Turnover and Staff trends.

Nevertheless, the main reason why the company was selected is because it has been considered as a unique case within the Italian context to introduce 'play' politics and for implementing them.

The paper focuses on a project named “Play Factory”, developed since 2008 by an Italian small firm (Loccioni Group). Loccioni Group initiated a project of ‘Play Factory’ in 2008, with the purpose to ‘encourage and spreads a new culture of work and “creative doing”’ (Social Balance, 2012). The project “Play Factory” has aimed to promote a playful culture, stimulating collective and generative learning loops.

Moreover Loccioni Group was ranked third in the Italian Best Places to Work in 2014, distinguished itself for camaraderie, respect, pride, credibility and fairness: all values that show a strong sense of belonging and a deeply rooted team spirit and, for instance, create an ultimate atmosphere and climate to develop an organizational play approach.

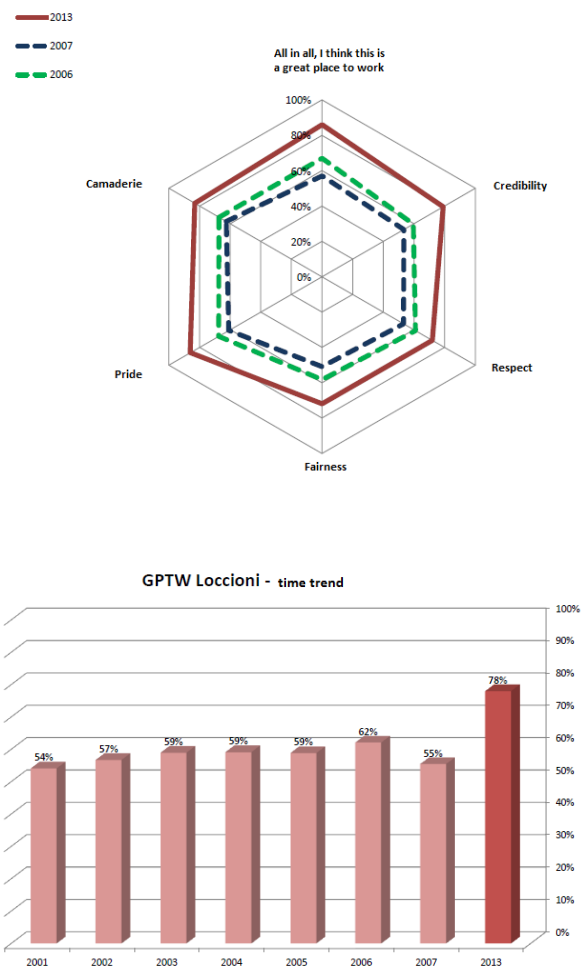


Figure 2: Loccioni Group elaboration of GPTW data survey over time.

'Play Factory' was born from the collaboration between the company and a Japanese engineer and designer, Isao Hosoe, specialized in studying workplaces and their impact on people. Indeed, along with Play Factory, Loccioni is developing a wider knowledge company model focused on the learning aspect strongly characterizing its culture. "2 Kilometres of future" is another project aiming to contextualize Loccioni Group in a sort of macro-BA space, thanks also to Thomas Herzog's urban planning.

In this sense, Loccioni's focus on enlighten human resources policy, such as the opportunity to stimulate creativity and individual growth, become extremely interesting for our analysis. The next section will be devoted to the present of the findings coming from the interviews.

3 Findings

Play culture

As emerged from the analysis of data, Play is interpreted as an approach to the work through which it is possible support socialization process and learning processes. Enrico Loccioni defines Play Factory as follows:

"on one hand, Factory is an environment that is not the traditional manufacturing place: it is wider and its definition includes also all the collaborators. On the other, play is the most important part of the work, because thanks to play people can meet and speak with each other".

Indeed the Factory is the organizational concrete recipient that has to follow market logics and give birth to economical production activities. Play Factory is the combination of these two co-existing concepts: it is the organization where it is possible to apply play approach in order to pursue economical goals. Loccioni Group and Enrico Loccioni himself have developed the awareness that play culture approach is rooted in children behavior and that it is aimed at adopting free thoughts typical of childhood. Consequently, being a play organization is a cultural and attitudinal matter: *"the organization itself is not a game, but people's attitude in facing problems, dealing with clients or life should be play"* claims R&D Manager, Gino Romiti. That means that play culture supports attitudes that consider problems as growth chances and opportunities, and as ways to get self-gratification and sometimes fun.

As observed during the fieldwork, a specific organizational culture is envisioned by the top manager. For example, General Manager Renzo Libenzi one afternoon was coming back at work with a big smile after lunch. As soon as he entered the office that he shares with other top managers, he claimed to be very excited and satisfied of his day. He added that he and another Loccioni BU manager went out for lunch because they were having lot of problems with an order of a client. He surprisingly stated that they had to celebrate this situation of trouble: as successes, problems need to be ritualized as well and, moreover need to be faced with cheerful mind and approach to avoid to stuck in unproductive behavior and complains. He added that they go out for lunch and they even got a big ice-cream cup to celebrate their problems.

Play Factory is then considered by Loccioni managers as a place where it is possible to create innovation through creative processes triggered by play activities and playful ultimate atmosphere and context. Innovation is interpreted not just as a final result, but as a pervasive modus agendi. "Our Play factory is a place where creativity and innovation moments are stimulated by play approach and where these ideas turns into a concrete and tangible reality of the industrial dimension", reports R&I Manager, Cristina Cristalli. Adopting an organizational Play culture requires interpreting the organization as an everlasting start up, where there is both the innovative recipient and young entrepreneurs that become knowledge workers. Knowledge workers are particular organization figures with no timetables or physical boundaries, but they are always productive (active). Indeed, their work does not end up with a mere task execution, but it goes further developing a thoughts. As in the words of the Humancare BU Manager, Claudio Loccioni.

"Play culture is, for example, me that right now, at 10.30 pm, I'm heading to Bologna airport for a business trip. It would be stressful and tiring, if I hadn't travelled with a colleague with which I have fun" claims"

For almost all the interviewed managers, being a corporate culture rooted in play means trying to also have fun while working, while putting forward the corporate mission. In this vein, motivation is crucial:

"Play is doing things you like doing. "We do a job requiring us to be available almost 24 hours per day: if there is a pleasure in doing so, it becomes possible to even have fun while working" (Communication Manager, Maria Paola Palmeri)

More specifically, Play Factory is considered as an environment where life and work goals are interconnected (for someone they are even exactly the same), because there's a tight symbiosis between the two spheres. According to almost all managers, Loccioni play culture lives outside workplace and time as well. Indeed, they pick out the person not the profession, because play is not just an approach to face work, but to face the whole life. In fact they believe that there are no boundaries between personal life and work, but there is a continuum.

There are several examples of pervasive play culture from different business units and functions of Loccioni Group, showing how play culture crosses work place and time boundaries.

In the past Humancare BU was a young start up, made up by young people with a local market and team used to go out very often after work, and many appointments were become fixed every week. Now it has become more difficult to organize because team members are always around the word.

As regards Energy BU, the guys of the team have created a Whatsapp community to constantly exchange cheerful moments of their own lives not strictly linked to work. Or again, every Friday going to a local village (Genga) at lunch to eat the local bread (crescia) it has become a regular thing for Research for Innovation team. There is even a photo of them hung on the stand wall.

Obviously this kind of relations have fruitful implications on team building and team spirit rooting. It also emerges that managing a play organization means not only supporting collaborators' creativity preventing them from getting annoyed during their work daily routines, but at the same time it means being able to set goals. Managing a Play Factory is challenging because it is a very unconventional way of managing and relating with people. Nevertheless it is also difficult because, as stated by Industry BU Manager, Marco Pacenti:

"goals have to be achieved anyway and it is important to make it clear that while playing, people focus has to remain on the results and on being on time".

Being a Play Factory means doing all the activities in a dynamic and fluid manner, without rigid structures or hierarchies. *"This way of working could appear as a play if observed from the outside, but it is not just that"* adds Industry BU Manager. A play organization is somehow opposite to pyramidal hierarchic structure that prevents from speaking and exchanging information freely with anyone within the organization. But it

doesn't imply the absence of responsibility or specified roles. Someone even think that, by definition, play factory can be managed, but can be just guided towards a goal by anyone within the company, there's not a hierarchy to be observed. Moreover at the base of this culture, trusting people is essential. Moreover Loccioni is a company that adopts team working as constant modus operandi, so its collaborators need to be very tight-knit. *"Trust is something to conquer bit by bit, it takes time to be built up and, consequently, it's expensive"* (International Seats Manager)

It's not hierarchical but is related to the coherence between one's words and actions. Consequently if some serious errors occur and undermine shared values and principles, managers strongly believe that they can break up trust relationship and, then, it would be difficult keeping working on team. Having fun doesn't imply being careless about rules or not following a strict ethics; on the contrary, *"at the base of our play culture there is a strong and well defined organizational and personal ethics, and play helps us putting it into practice"* (Energy BU Manager)

While the researcher was interviewing GM Renzo Libenzi, we were interrupted and a new intern was introduced to us. He said to him *"Enjoy yourself immediately and please do not hesitate to bother anyone within the Group to obtain information you need!"*

Loccioni Group main Results and Achievements through Play Factory formalization

Loccioni Group along with the "play designer" Isao Hosoe gave birth to this series of projects ranging from renewable energies to medical devices field, from ideas generation (with *Play 40*) to corporate values communication (*Pro-gettare* behavioral installation), from proxemics concept application to work emplacement to software design of new interfaces. Design through play has been transformed into a tangible element pervasive in all corporate divisions and processes.¹

However all the interviewed managers agree in saying that the formalization of Play Factory has been useful to qualify a pre-existing model, stressing work convictions and behaviors that didn't need to change to fit in an the model proposed by Hosoe. That means that the definition is an ex-post definition: "the reality of our valley and our territory was already strong in hosting our customers, we already took care of them with Shatzu massages for example; play activities for our guys were already implemented and Professor Butera had already developed with us revolutionary Leaf House

¹ 15th December 2011 post on Play Factory Blog

project”recounts Communication Manager. Play approach is considered to be innate within Loccioni Group, so since formalization things haven’t change a lot. It has been mainly a matter of communication tools that have helped the Group to describe itself and become fully aware of its own identity. It has pointed out some peculiar attitudes that Loccioni people unconsciously have or that were taken for granted.

Working at Loccioni Group for one of our engineer is play itself, because they are involved in continuous innovation paths during which, for definition, boredom doesn’t exist and moreover, the Group has chosen to work with young people entering the world of work, with extremely high enthusiasm. The impact of this formalization was particularly strong on the external relationships with Loccioni Group customers because “it’s not common seeing people enjoying themselves and smiling while working, showing workplace as a place where it is possible to do more than work” claims Energy Bu Manager, Damiano Loppi. Actually the focus of Loccioni activities to gain customers’ attention and loyalty remains on distinctive highly technical competences in solving complex problems. Play approach is an intimate part of the higher and more abstract part of Loccioni approach, that is distinct from the “Factory” one, that is more operative and pragmatic: *“the challenge of our Play Factory is to merge these two complementary distinctive aspects and make them coherent with each other, letting people work hard with play spirit” (R&D Manager, Gino Romiti)*

Play factory formalization has resulted in important achievements for Loccioni Group, from both external and internal point of view. Indeed play approach has been not just an external communication approach, but it has significantly affect on organizational culture, bringing the focus of work activities on clients and collaborators. “Play culture importance is all about surprising others, both colleagues and customers” affirms General Manager.

Moreover Play culture formalization have had also internal effects, making organizational vision more vivid to be reached and bringing collaborators at the hearth of technical challenges: *“Play factory formalization has represented the starting point of our knowledge company model” recounts Communication Manager.*

Play and learn

Learning processes are crucial to Loccioni activity and to its success: all managers are really aware that risk is ubiquitous and unavoidable in their work and markets, dealing

with cutting edge technologies and innovation boundary. In this sense, in Loccioni culture, *“playing is not being more risky, but turns out to be simply a kind of approach to risk”* (Industry BU Manager)

Adopting play approach prevents people from over thinking about risk because playing requires the irrational and spontaneous approach of children affirms Enrico Loccioni, perfectly matching with the aforementioned theoretical play concepts. In this reality, it is obvious that accepting errors is important according to every interviewed manager. *“Errors represent our everyday normality because we have chosen to invest on young guys without working experiences and moreover, because we realize prototype. Consequently we have decided to balanced errors with ad hoc projects, such as Silverzone that places side by side one of our young collaborators and a major retired person with lots of experience and successes, to ease learning processes and preventing errors”* (Cristina Loccioni, Process Analyst and Procurement)

In effect young people that entered the Group are suddenly called to action: they have to cope with major customers or contact potential clients, they take part to important events or meeting representing the company. They are requested to be proactive and be purposeful and have their luggage always ready to leave.

Anyway, it emerges from managers' answers that Loccioni risk concept is not extreme: it is always balanced by a strong confidence in their own capabilities and competencies in doing their job. So play doesn't mean being more inclined to risk, but rather being more motivated in achieving the goals that have been set and doing better the things that they want to do because of the pleasure and fun they get in doing so. Indeed playing in team, makes people be more enthusiastically involved in achieving goals, putting less attention on risk. In addition *“being with others is more pleasant and it helps us with risk analysis: playing with others doesn't mean acting irresponsibly”* (Cristina Loccioni, Process Analyst and Procurement)

International Seats Manager, Tommaso Puerini, explains this concept with an effective play metaphor:

“It's like a football match that is the results of equilibrium among strategy, our own capabilities, adversary and place evaluations. But if there is perfect equilibrium, the two teams will always tie the match. Then, if you want to make the difference, you need to plash out every now and then. But this is a calculated and prevented risk”.

For example, when they have recently decided to enter the food and beverage market, it was a completely new challenge. They decided to face it not moving big resources and energies to this sector: they started introducing just a new person, co-financing a doctoral research student, to gather information to elaborate a coherent strategy and elaborate a preventive risk analysis. Play let the Group researchers continually deal with innovative challenges and projects. Obviously, afterwards, rational thoughts are necessary as well. This is particularly true in Research for Innovation, coordinating long term research activities, as reported by its Manager: *“we always repeat our mantra -if you do nothing, you break nothing- to remind ourselves that if we didn’t take risks we would end up following the beaten path”*.

Play culture means stimulating a positive culture that is not aimed at punishing errors, but rather at rewarding positive attitudes, supporting risk taking and action taking. Indeed, according to all manager sample, the error represents a way to learn, so it doesn’t have to be punished: it should be underlined to prevent other people from repeating it. For Enrico Loccioni mistakes represents a damage only if they’re hidden or denied. They agree that it’s normal being wrong one or two times, but it’s important to question yourself why you are keeping mistaking, giving a huge relevance to double loop learning implementation. When errors occur, they are focused on analyzing and understanding the causes not to further repeat them. R&I Manager, Cristina Cristalli adds: *“In this culture, errors are welcomed: they are one of the unavoidable aspects of playing activities, but obviously we are not speaking about errors caused by ignorance or carelessness”*.

For example, some years ago Research for Innovation team bought a very expensive robot: they were working on it, but they couldn’t connect the cables in the right way. They tried, but they didn’t succeed and the robot miserably got burnt. That represented a huge cost for the company, but it represented a fundamental step to learn something as well. *“During the history of Loccioni Group there were lots of projects like this that didn’t have positive results and represented mere costs, but being play means being able to take the positive side from all the situations to always learn something”* recounts Cristina Cristalli.

When something gets wrong, they all declared not to look for someone to blame, but they aim at valorizing the error. *“The biggest is the error, the highest are the chances to have chosen the wrong approach and direction to face the whole order. Consequently it’s*

not one individual's fault, but the blame is to be put on the whole team" (Energy BU Manager)

Play and space

According to Enrico Loccioni "Work spaces are educational spaces. Every space needs to be projected according to the activity it is destined to: spaces represent not just work quality, but also life quality. For this reason, it is important never giving up to improve spaces: *we have still lots to do, but we are working on it.*" In this sense, spaces become crucial for people to work harmoniously and efficiently together and, for instance, to get more significant results. It is easy to team up in suitable spaces.

Nevertheless, there are many managers that don't see the evidence of this relationships within Loccioni company and culture: they stress first of all that in order to have a play culture, play people are needed, otherwise having fun and feeling comfortable is not possible, even in a nice space. Play culture lies more on people attitudes and behavior rather than on space design: Claudio Loccioni states "*good ideas can occur also in terrible spaces, history is full of important people that had genial ideas while in jail*".

Play Factory started with a design projects that is quite strange for a machine seller: it is the result of Isao Hosoe's external stimulus that has made Loccioni Group reflect upon the corporate identity itself. Lorenzo de Bartolomeis, Isao Hosoe collaborator, stated that the aim of this design project is to design a new concept of workplaces. Indeed nowadays there is a tendency to design offices that look a little bit like children's playground or playroom. The fundamental motivation is to delete the formality concept at work to enhance a new and deeper openness among people to sustain ideas exchange and dialogue. We have chosen to mainly focus our attention on play tools (Play Forty, Progettare, Behavioral Energy and Energetic Meridian) to enable people's interaction and reasoning through play.

As regards internal spaces, managers stated that spaces in order to implement play culture, should be livable, luminous, tidy to enhance people collaborating and being more positive. They should be open and flexible, according to the idea of a common place for team dialogue and confrontation. Loccioni space design is actually sober in order to maintain and preserve order and accuracy, that are reflected in the attention that ever collaborators should reserve to punctuality and cleanness of spaces, desks and emplacement. Claudio Loccioni notes "*In this sense, we are quite different to Google play*

and space culture: I think that in realities like Google the focus is too much on design and furniture, diverting the attention from people and their smiles”.

Open space concept does support sharing and contamination of cross projects: within Loccioni Groups there are almost not personal offices and there are a lot of meeting rooms. Loccioni employees often move easily from one room to another, switch their emplacements according to their needing and activities and are often busy with meetings with their colleagues. *“It’s the same concept of a locker room shared by the sportive team where there are not singular chairs, but benches”* affirms one of them. In this regard, several managers, instead, wish there were larger and homogeneous spaces. For example they suggest there should be a creative space ad hoc to ease interaction. This place should be distinct from production spaces or spaces dedicated to other activities, but it should not be a private space and visible to everyone. They suddenly declare that’s a work in fieri: *“we are always experimenting new solutions”*. For example only some years ago Humancare team was set in the middle of production spaces and it was difficult to build a real team spirit, but now they have a dedicated space and things have got sensibly better.

On the contrary, each manager that was interviewed agreed with the existence of a tight relationship between knowledge sharing and place designing. For instance every Loccioni laboratory has been projected to have production at the center of its map, to let the activities be visible from any point of view.

Workplace should ease communication among people: open spaces, despite their negative aspects, such as noises and commotion that are frequently present within Loccioni offices, make it possible to maintain direct contact with activities and people and to stimulate ideas through everyday observation. Open space ease information and ideas sharing and spreading.

In Loccioni Headquarters, there are ad hoc areas dedicated to physical play, like ping pong or billiard table. Then there are also some spaces devoted to play as real fun where visitors, ranking from MBA students to children of elementary schools, can learn something while playing. In the new building they, *“want to integrate the reception hall with Pro-gettare behavioral installation to show to each of our hosts the importance of merging professional and private sphere since the beginning of the company tour”* states General Manager. In fact, as noted by several interviewed managers, if work activities are interpreted as play, all the spaces of Loccioni Group can be considered as play spaces, also interpreted as non physical spaces built from people relationships. It is a working

kind of play that has to be contextualized in a company environment, nevertheless it implies taking oneself less seriously.

For example, Claudio Loccioni tells *“when I worked in Germany with some Italian colleagues we brought a coffee machine into the office. German colleagues seemed to be quite disoriented, but after a few time it has become an excuse to arrive earlier at office and have breakfast all together with brioche and cappuccino”*.

Clearly, observing a large organization reality, it could be noted that play approach is not equally perceived and equally pervasive at all levels and in all the organizational units: it certainly depends upon individual personality and inclinations, but it's also a matter of one own' role or activity. There are some organizational functions, such as administration ones, that are far away play approach and in which this particular modus operandi can't be applied, because a certain rigor is required and hence rehearsal profitable learning through play wouldn't be applicable or favorable. Being a play organization is also offering a more pleasant environment along with more friendly people to welcome visiting people: for example, it implies taking the incoming clients out for dinner or schedule their week-end, to make them discover the surrounding territory and its typical dishes.

Consequently, this design project is concerning both internal and external places, going out company boundaries to *“avoid being a non-integrated oasis in the middle of the desert”*, as suggested by R&D Manager. General manager affirms *“Our vision is to become famous not just as a single company with ad hoc rooms or spaces to implement play culture, but as an entire integrated heritage area (the Vallesina valley). We are currently working on it”*. In effect, they started a public-private co-operation to restore two Kilometers of river Esino flowing next to their headquarters and they are thinking about building areas to let people always gather together autonomously and respectfully.

Hence play factory formalization has been particularly useful for the internal and external dynamics linked to people relationships, rather than for becoming a communication slogan for enhance Loccioni Group external perception.

Play and Game

“When I think about play within Loccioni Group I think about a game to invent every day, actually a real play supply-chain, starting from designing and arriving at result achievement and satisfaction” states Enrico Loccioni. Indeed Loccioni Group perceived

itself as a real team and, hence, it needs to have supporters, that are collaborators themselves but also clients, that should be ambassadors of the company and wear “Loccioni Group shirt” showing team fondness, affirmed General Manager. The team, then, needs to win and convince in the market fields. The game that is often used for representing Loccioni Group is Isao Hosoe’ Play 40 cards because they represent corporate values and culture, letting groups of people playing with ideas and imagines.

In this context, this choice appears particularly important, because the description of this game seems to be particularly suitable and coherent with the concept of play that has emerged from the literature theories previously analyzed

“With Play40 it is possible to invent different ways to play, since the aim is not what but how we play. (...) The aesthetical education develops through the game since it is not subordinated to a rational goal nor the intellectual moment is sacrificed to the sensible impulse: the only goal of this activity is itself.”¹

Then the metaphor of sport team is frequently used, even if sport team are normally more structured than Loccioni team. Basket was chosen to represent the Group some years ago, when the contribution of the individual, especially in certain role, was more significant and used to make a great difference. Football was chosen for representing the shift towards a team spirit focus, but also for requiring creativity and fantasy rather than relying on physical strength. Some others managers wanted to further stress the importance of the team work and then chose sports like curling (where there is one person proposing an idea, but there are other team members that are fundamental as well to push it further) or motorsport (where there is a mix of fundamental components: the team, the machine technology and the driving leader).

This team sport orientation is particularly evident earring Loccioni collaborators chatting: it’s not infrequent earring them scheduling some football, tennis, beach volley matches with the colleagues, or planning trip during the week-ends to go to watch rugby or basket matches. During hiring interview, young guys are often explicitly asked about the sports or hobbies they practice, interpreted as team working discriminant factors. Indeed lots of Loccioni Group members have not only significant experience in playing team sports, but also in training teams.

Particularly interesting is the metaphor proposed by GM Renzo Libenzi *“the Group is a kind of breeding ground for young talents, so it would take part at youth*

¹ 20th November 2008 post on Play Factory blog <http://www.play-factory.it/>

championship". Anyway everyone agreed in saying that Loccioni Group would be a team playing to win its championships: the majority of them stated without any doubts that the Group would play in the highest world championships. "We want to play with the best teams in the words and be the best team in the word" affirmed Enrico Loccioni referring to their declared vision statement that is "Loccioni: the Open Company. The choice of the best in the world".

As regards external competition, it is an important factor, because the goal to win the concurrency and to conquer the leadership position is deeply and widely shared, but it is mitigated by the open company culture that aimed at building partnership relations when possible, and because of the technological differentiation strategy that sets the Group in a market niche with high technological barriers. Enrico Loccioni says "Play approach starts to fall apart when it starts requiring a sacrifice, I mean when competition appears and play is no longer spontaneous, but it becomes a commitment to prevail."

Actually from our survey rises a significant role of competitiveness in Loccioni Group. Indeed it is commonly believed that good and transparent competitiveness is healthy, but it should be first of all a competition with one own self and then a chance of confrontation with others, aiming at continuous personal improvement rather than at battling and being in conflict with others. More interestingly, some managers perceive a strong push coming from internal competition: "the positive and healthy competitiveness existing among the different business units in which the group is organized, the engine that sustains Loccioni Group growth" significantly sustains Industry BU Manager, Marco Pacenti.

In this vein, we believe that this competitive orientation should be seriously taken into account as a major interesting aspects because as stated by one of the interviewed manager "Actually there is a very strong competitiveness: play is a tough challenge for the victory. I think that, in this respect, it could be more appropriate speaking about game rather than play".

7 Concluding discussion

Through this case study, we have aimed at inquiring the relationship between play and learning. We have started from the theoretical analysis, considering multidisciplinary contributions to finally arrive at organizational context enriching the study framework with a concrete example. Play has been introduced as a behavioral orientation (Kark,

2011) that can be applied also within organizational contexts. Anyway, playing activities have to be circumscribed within specified boundaries in time and space and moreover they are defined as autotelic activities, as to say, they can not have a preset goal or purpose to achieve (Statler, 2009).

As emerged from our analysis, play can be considered as an approach linked to personal attitudes and behavior, but it also clearly appears how boundary-less is play approach: on the contrary, all the interviewed Loccioni Managers, wish for play to be an approach affecting not just work, but more generally the whole life.

In this vein, our case study goes further in applying play within organizational context and exploiting its beneficial characteristics: play approach at Loccioni Group has not stopped at individual behavior applications in developing individuals' cognitive and emotional capacities necessary for effective, productive work. But it deeply influenced the organizational culture, becoming a *modus operandi* to face the heterogeneous and complex technological markets they constantly have to deal with. Play is not a purposeless activity on its own, or at least it's not just that.

However, we think that it's not reasonable speaking about play culture *latu sensu*, but rather we prefer speaking about a play aspect that stands out from organizational culture. In fact, although play approach is a distinctive Loccioni characteristic from an external point of view, it is not as homogeneous and widely shared as its core values from the internal perspective. Indeed, as stated in findings paragraph, play approach depends on personal inclination and functional requirements as well; and moreover the essence of play lies in players' freedom to join the game by choice, accepting and observing roles in order to continue to play (Carr, 2003).

Certainly, it could be misleading and over-simplificating to consider Loccioni Group success as a result of play approach that could be translated in other realities. The sectors and markets Loccioni Group operates in, are highly complex and continuously challenging: the competencies are needed to meet customers exigencies and needs are mostly grounded in pure rationality, meticulous precision and careful planning. Then, it could happen that sometimes play approach that is instinctive and creative, comes into conflict with organizational exigencies and production logics, as stated also by Kolb (2010). "The challenge of our Play Factory is to merge these two complementary distinctive aspects and make them coherent with each other, letting people work hard with

play spirit” stated R&D Manager, Gino Romiti: it’s clear that it is not easy neither obvious to achieve.

Indeed, play principles within organizational culture aren’t to be blindly and exclusively followed, but they need to be mitigated by and matched with other principles of management. Play aspects should represent a support and a stimulation for an organization to turn into a performing and successful one, inviting organizational members, if possible, to work and participate in a playing way to organizational activities.

Consequently, we believe that from an organizational point of view it is relevant to merge the concept of game with the play one. Thus, as already noted during our case study analysis, competitiveness is a fundamental factor for an organization: it pushes organizational members and organization itself to continuously learn to improve and adapt to external changes. Moreover, a more structured approach better reflects organizational realities, making it possible to properly match play approach with economical world and rationality, without losing play flexibility. Play and game often interact in a synergic relationship determining a sort of “plame” approach to organizational reality.

Loccioni Group and organizations, in general, need not to stop reinventing themselves and innovating their activities to maintain their technological competitive advantage; they have better to be flexible and reshape themselves activating creative learning processes.

As affirmed by all Loccioni Managers, play has to be intended as a way of facing uncertain and new situations, balancing risk with an objective evaluation of their capabilities and competencies in doing their job. Then, play represents a way to practice experiential learning (Kolb, 1984), gradually and consciously learning by doing from mistakes and errors, thinking about causes and reasons of the mistakes, not punishing them. This peculiar flexibility of play activities enhances people and organization adaptation and evolution capability, triggering imagination and problem solving capabilities (Statler, 2009).

Play organization is then considered by Loccioni managers as a place where it is possible to create innovation through creative processes triggered by play activities and playful ultimate atmosphere and context. Consequently, play activities in Loccioni Group, if intended *latu sensu*, can really be the start for learning processes, or, as stated by Nonaka and Takeuchi (1995) can be the start for a spiral of knowledge creation, that from individuals can reach team and organizational ontological levels, letting individual or

team experiential learning be profitable for other business units or the whole organization as well. In other words, Loccioni spaces can be intended as BA, knowledge creation spaces, with a particular focus that has emerged on socialization and proximity dimensions: space projecting and designing are aimed at easing dialoguing and sharing of ideas, not at building up ad hoc playing spaces. Accordingly, play approach is focused on play people rather than spaces: first of all trustfully and caring relationships and a sense of camaraderie are needed to build a sense of belonging and commitment. Obviously this is made easier by suitable spaces existence: at Loccioni Group spaces are open to get rid of formality and hierarchy and to ease ideas and knowledge exchanges, but they are also sober to maintain and preserve order and accuracy, to reflect the attention that ever collaborators should reserves to punctuality and precision. Actually, space conception itself represents the co-existence of a “play” and a “game” side; the existence of a creative and playful aspect of Loccioni culture within the essential organizational nature of its purposes. Finally, this particular combination is the foundation of this organizational model sustainability.

Appendix

Research tool: semi-structured questionnaire

Section A- Play and work

- A1) According to you, what does it mean being a play organization (or Play Factory, as you have defined it)?
- A2) What does it mean working and managing a play organization?
- A3) How intensely and extensively do play culture and philosophy live outside working time and place?

Section B- Reasons and achievements of play culture implementation

- B1) Which changes or effects have been caused by the formalization of your play approach (through Play Factory definition)?
- B2) Which are the main reasons that lead you to undertake such a peculiar path?
- B3) Did you expect the results you have achieved? In particular, which did you expect and which not?

Section C- Play and learning

- C1) According to you, what is the relation between game and risk? Does playing mean being less rational and more risk-lover?
- C2) How important trust and error tolerance are within Loccioni Group?
- C3) What happens when someone makes a serious mistake while playing?

Section D- Play and Ba

- D1) Which is the role of designing and planning physical spaces, in play approach implementation?
- D2) How these designing activities affect ideas and competences sharing?
- D3) Are there ad hoc spaces for playing activities at Loccioni Group?

Section E- Game and play

- E1) Which kind of play you mostly refer to?
- E2) Do you remember some interesting playing activities of your childhood that affect your personal growth and your managerial style?
- E3) According to your opinion, which is the relationship between Loccioni Group and a sport team playing in a league? In which championship Loccioni Group would play?

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Collecting and managing knowledge in Smart Cities

Francesco Bifulco*, Marco Tregua, Cristina C.
Amitrano

Department of Economics, Management, Institutions
University of Naples "Federico II"
Complesso Universitario Monte Sant'Angelo - Via Cintia, 26 - 80126
Napoli

* *Corresponding author*

Structured Abstract

Purpose – We aim to describe how knowledge is collected in smart cities contexts and projects as knowledge management is pivotal to support strategic decision-making (Lee et al., 2013). We want to depict the set of knowledge and other resources collected (van den Hooff, de Ridder, 2004) and coordinated in *smartization* processes. We analyse the paths leading to the continuous improvement of the knowledge available thanks to partners involved (Lee et al., 2013) to identify how to create a potential set to improve cities' management. We propose a model to describe knowledge collecting and mixing towards new knowledge generation (Wiig, 1997).

Design/methodology/approach – We found 144 projects launched in recent years through the recognition of activities carried on and reported by industry players and Institutions when partnering local agencies in *smartization*; we selected the ones started at least in 2010, in order to opt for relevant information. To prevent the analysis of projects based just on episodic interventions, we focused on projects involving at least two of the *smartization* domains. Hence we had a final list of case studies (Yin, 2003), composed by 19 projects in different cities. These cases took into account cities from Europe, America, Asia, and Oceania.

Originality/value – The most important models useful to describe the interactions emerging in smart cities contexts are based on actors. Among them there are the triple (Etzkowitz and Leydesdorff, 2008), quadruple (Lombardi et al., 2011) and quintuple (Carayannis et al., 2012) helices paying attention to the involvement of different actors as carriers of resources, without a focus on them. In our perspective the focus on resources is pivotal, leading to a more complex model useful to describe the different and several kinds of resources needed - with particular reference to knowledge - and the phases to combine them in a process.

Practical implications – The model we want to propose can allow the definition of a particular set of resources, to be considered as necessary in *smartization* processes. Knowledge has to be considered as embedded in territories (Komninos, 2006), thus the analysis of empirical evidences lead us to reflect on customization for each city; by the

way knowledge and the other resources are combined to favour the implementation of model and the circulation (Anttiroiko et al., 2013) of new knowledge can be favoured. This last outcome can allow the improvement of smart performances; hence new knowledge generation can catalyze better results.

Keywords – smart cities, knowledge, resources, smartization.

Paper type – Academic Research Paper

1 Introduction

Smart cities projects are flourishing all over the world in last decade, in order to improve metropolitan and urban contexts and in particular to achieve a better provision of services and a higher quality of life. Interventions to favour the development of smart cities go back to about 15 years ago (Hartley, 2005) when the first approaches described a focus on hardware as the most relevant feature was the creation of a hi-tech basis to improve city services. The city went towards its first evolution in the so-called *digital city* (Qi and Shaofu, 2001). It was just the first phase of the process leading to smart city, both in management literature and from an empirical perspective. Several definitions described this process, often overlapping (D’Auria et al., 2014) one another. Indeed at the beginning the idea of digital city was sometimes forestalled and some other times joined (Nam and Pardo, 2011) by concepts like *intelligent city*, *ubiquitous city*, *wired city*, and so on (Hall, 2000; Lee et al., 2013). The evolution process kept going on both from a definitory perspective and in the interventions performed by different actors in city contexts. Time by time more attention has been paid to people shaping these contexts, with particular reference to a set of issues grouped with the ‘software’ label, leading to the concept of *inclusive city*, as «a city well performing in a forward-looking way in economy, people, governance, mobility, environment, and living, built on the smart combination of endowments and activities of self-decisive, independent and aware citizens» (Giffinger et al., 2007). The ‘software’ characteristics consist of people involvement and in their awareness about the contribution they can give to the improvement of a city.

The two approaches, namely hardware-based and software-based, arose one after the other, and they were considered as mutually necessary as interventions in cities were performed. So a perspective merging both of them is needed to better describe the interventions, leading to a context aiming to a higher quality of life (Anttiroiko et al.,

2013), conceived around the contribution of technology and the involvement and the active participation of citizens.

The role of resources in these projects is strictly related to their carriers, namely both to contexts and to actors involved; the set of resources is heterogeneous, due to the different domains involved in such a kind of transformation, viz. mobility, health, services to businesses, environment, governance, energy, ICT, education, tourism, and so on (Giffinger et al., 2007). In a general overview natural resources are the first ones to be considered as they both shape the context and are the object of some interventions, especially as it regards the deployment of a wise management (Caragliu et al., 2009). Moreover as smart city projects are an innovative way to manage metropolitan and urban contexts, the innovation carried on is based on an engine consisting of a set of resources in an open approach to make resources available to both “users and developers” (Schaffers et al., 2011).

Knowledge as a resource plays a fundamental role in smart interventions, as it has to be used and generated together with the other available resources; among the topics related to knowledge more attention is paid to the most important ones, such as its circulation (Anttiroiko et al., 2013), its generation and transfer (Vaattovaara and Kortteinen, 2003), its role as a performance indicator (Yigitcanlar and Lönnqvist, 2013), its usefulness as a lever (Coe et al., 2001), its support to service provision (Rodier and Shaheen, 2010), and as a gap to be filled for citizens (Bingham et al., 2005). Its multifaceted role and the need to manage and generate it in smart city projects in connections among all the involved actors are the basis to focus on interventions to be made on it and through it.

2 Literature review

2.1 Overview on smart cities

The evolution towards a conceptualisation about smart city has to be described through an entangled path, both in literature and in whatever empirical analysis. In the former it is necessary to describe the path towards this concept starting from some ancestors linked to investigations based on the so-called hardware or software components. In the latter it is requested to take into consideration Official Reports issued by Local Agencies or Corporations leading the projects and coordinating the activities

performed by different actors taking part to the complex systems built around the notion of smart city.

A smart city is a metropolitan or urban context where services are provided in an efficient way through the implementation of an ICT infrastructure; even if the path towards a definite notion of smart city was time-consuming and something full of misunderstandings, there are different helpful conceptualisations to better understand what it is. One of the most accurate definitions was proposed by Hall in 2000 and this depiction has to be considered as a ground-breaking idea when looking at the time in which it appeared. Hall highlighted smart city as “a city that monitors and integrates conditions of all of its critical infrastructures, including roads, bridges, tunnels, rails, subways, airports, seaports, *communications*, water, power, even major buildings, can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens”. The depiction of this concept emerging in the following years were similar but in the same time they miss some focus and they add the relevance of ICT in smart projects. This happens in one of the most cited definitions, presented by Caragliu et al. (2009) stating that a city should be considered smart “when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance”. The approach by Caragliu et al. is particularly useful as it overtakes a recurring problem in this domain of the literature, namely the focus on hardware or software features to describe a smart city. At the beginning of the 21st century more attention had been paid to hardware components, viz. to elements like internet broadband, ICT and its related networks, level of connectivity and so on. A similar perspective is adopted by Schuler (2002) when considering a city “that is being transformed or re-oriented through digital technology”. This definition and other ones similar to it are closer to the concept of digital city, namely as a city in which the investments have been focused on ICT and this is just a myopic vision when talking about smart city. If we take into account one of the most relevant conceptualizations about digital city by Qi and Shaofu (2001), it appears as a “substantively an open, complex and adaptive system based on computer network and urban information resources, which forms a virtual *digital space* for a city. It creates an information service marketplace and information resource deployment center”. Thus, digital city is far from being something similar to smart city

and even if this is in some way easy to be understood, the misusages of both terms are very common, even in Official Reports (Tregua et al., 2014). In order to move towards a suitable and recent definition of smart city the so-called software features have to be considered together with the hardware ones. This is the shift from the half of the first decade of the 21st century leading to the definition of smart city, thanks to a crossed consideration of both hardware and software aspects.

As a consequence of the above considered kinds of features recent contributions on this issue recall what Hall has stated about 15 years ago, when considering both ICT and people contributions to achieve a smart development of metropolitan and urban contexts. Among the authors embracing this way of thinking we want to underline a couple of contributions; firstly the one by Washburn et al. (2010), considering smart city as a collection of smart technologies, namely as “a new generation of integrated hardware, software, and network technologies that provide IT systems with real-time awareness of the real world and advanced analytics to help people make more intelligent decisions about alternatives and actions that will optimize business processes and business balance sheet results”; secondly European Union (2012) in one of its project launched to encourage smart development in European cities, defined the smart city by looking at “the whole range of subjects involved in smart cities management shape an ecosystem, considered as an urban laboratory, and in a more detailed way an urban innovation ecosystem”.

In the definitory path towards smart city there are lots of definitions starting from digital city and continuing with a series of adjectives coupled to city to shape some new definition, like intelligent, wired, information, knowledge, and humane city. Time by time scholars (Nam and Pardo, 2011; Lee et al., 2013) tried to depict the path towards a conceptualization for smart city and different definitions seem to act as a support in achieving a complete definition.

2.2 The knowledge city

We want to focus on one of the definitions among the ones from the above cited path towards the conceptualization of smart city; in particular we highlighted the so-called *knowledge city*. One of the first scholars proposing the notion of knowledge city – and its definition – was Edvinsson (2003), depicting it “as a city that was purposefully designed to encourage the nurturing of knowledge”. This approach was embraced by Yigitcanlar et

al. (2008) in investigating the interventions in urban contexts in Australia. Moreover – on the basis of their empirical research – they defined the making of a KC as “a long and complicated process, but it is evidently a path to follow for the most sustainable urban development”. The role of knowledge in this perspective is obviously crucial as it is the main element of what actors are requested to do and of the way activities have to be performed. Starting from knowledge the authors tried to define the layers shaping a model to build a smart city, even by referring to a previous contribution by van Winden et al. (2007). These layers are the knowledge base, the industrial structure, the quality of life, the urban diversity and the cultural mix, the accessibility, the social equity and inclusion, and the scale of a city. Apart from going deeper in introducing these elements it is relevant to underline how several kinds of actors are asked to take part to the process of building a knowledge city by bringing their own knowledge to create a unique set to lever on. Yigitcanlar went on in depicting knowledge cities even outside Australia (2013), by performing an analysis through the above cited layers to evaluate the achievements in Helsinki. What is even more relevant from its contribution – co-authored by Lönnqvist – is the chance to extend the knowledge-based development to regions instead of restricting it to a city; in this approach knowledge acts as a mechanism to put together cities in a common effort toward a regional development.

Knowledge city is considered in a slightly different way by Nam and Pardo (2011), as they parallel it with other notions in this domain, like intelligent city and learning city, due to the central role played by knowledge in favouring the deployment of these typologies of project. The focus in their definition differs from the previous cited perspectives since there is a stress on innovation as a result to be achieved through knowledge and as an equipment to be used in order to support the achievement of the expected aims.

Finally it is possible to position the contribution by Marsal-Llacuna et al. (2014) on a similar perspective to Nam and Pardo, as they considered knowledge city as a bridge between the intelligent city and the smart city. The knowledge is considered as embedded in initiatives connected to specialized education and it represents a “flywheel effect” to improve quality of life to city stakeholders.

2.3 The role of knowledge in smart cities

In a more general way we want to frame the role of knowledge in city management, apart from knowledge city and in particular in connection with smart cities. Berman and West (1995) were pioneering in providing contribution considering knowledge in cities management; their investigation with city managers underlined the role of knowledge as a necessary support to favour the implementation of TQM.

Knowledge is considered as an unavoidable element to favour both specialization and social learning (Paquet and Roy, 2002) and because of this a governance structure should define actions to coordinate knowledge arising from each actors of the context, and knowledge distribution to favour the expression of its potential. ICT is one of the most effective solutions in favouring collection and management of knowledge in contexts like cities. The need for knowledge coordination is as greater as wider is the knowledge and governance should be able to manage it in a suitable balance between centralization and decentralization (Roy, 2005).

The central role played by knowledge is confirmed when considering the innovative context created to implement smart cities projects, as the interventions rely on “architecture of knowledge networks” (Komninos, 2006). The author framed knowledge in intelligent cities, and ICT is considered as a facilitator towards the combining of creativity and knowledge, but knowledge is defined as the “connecting substance of all network” for all partners. His vision was enlarged some years later (Komninos, 2006), when knowledge is expected to be sustained through smart cities. The relevance of knowledge is introduced in a different way by Anttiroiko et al. (2013), when they propose to favour its circulation through electronic networks among partners in the so-called *learning organisations*, viz. actors aiming to create, acquire, cultivate and transfer knowledge in smart cities. The same authors go deeper in depicting the usefulness of knowledge in *smartization* projects, when they connect it to the ICT infrastructure to provide services, known in literature as *platform*. The platform is a facilitator in services provision to city stakeholders and knowledge is itself a facilitator for the workability of platform; the support from knowledge is classified on the basis of governance in four categories, namely: routine processes, individualised decision-making, negotiations, and democratic deliberation. With particular reference to the last categories among the four cited above the role of actors owning knowledge is highly interesting, as every single author is taken into account as a contributor, due to the held knowledge.

The knowledge accumulated among actors has to be addressed to others sharing mechanisms – based on ICT – to enhance the participation to democratic city governance (Batty et al., 2012). The authors stated the accumulation process should take place by mixing different typologies of knowledge, since there are differences among stakeholders and because knowledge from experts, the one from users, and the one from organizations and institutions are one complementary to the other.

A description of the way knowledge has to be mixed, no matter of the subjects holding it, is provided by Hernández-Muñoz et al. (2011); they consider the required capacities, their scalability and interoperability and its development and innovative applications to support the design of the “Future Internet” architecture. The Future Internet consists of three pillars: Internet of Things, Internet of Services, and Internet of People. They respectively represent the communication protocols, the open approach, and the role of people into intelligent networks.

Finally the knowledge is pivotal in the definition of the most important model describing innovation in cities management and in particular in smart cities; the so-called *helices models* are based on knowledge, first of all when the Triple Helix Model was launched to represent a networks consisting of relations among university, government, and industry (Etzkowitz and Leydesdorff, 2000). The result of these interactions support the processes of cross-learning among different typologies of knowledge. The Quadruple Helix Model (Carayannis and Campbell, 2009) extended the set of relationships by involving the public too; in this way the variety of knowledge becomes bigger, leading to a context known as *creative class*. The more recent evolution is the Quintuple Helix Model (Carayannis and Campbell et al., 2012; Lombardi et al., 2011), with a further expansion of the actors contributing to the knowledge mixing, as it takes into account the natural environment linked to the four actors previously considered.

3 Research methodology

3.1 Aim and research question

The aim of our research is to describe the role of knowledge in different innovation projects linked to smart cities; more in detail as the domains of activities in smart interventions are several we want to investigate the contribution arising from knowledge in relation to different domains and to describe the way in which different actors support

these processes together. As a consequence we will be able to portray the relevance of different activities collected to knowledge and the necessity to collect and combine them towards the achievement of the expected aims.

In our analysis we want to describe the process leading to the combination of knowledge starting from the literature perspective provided by the so-called helices models (Etzkowitz and Leydesdorff, 2000; Carayannis and Campbell, 2009; Carayannis and Campbell et al., 2012; Lombardi et al., 2011). In addition to what is already proposed in these contributions we want to be in line with Berry et al. when defining the call for a mix of different sources of knowledge and we want to fill the gap about the ways to collect and manage knowledge in smart projects. In particular we refer to Hernández-Muñoz et al. contribution as it represent the starting point to depict an approach to knowledge, but a careful description of such an activity is missing.

Our intervention on this gap can become a guideline for city managers when creating the actions useful to favour support by everyone to the platform, by considering it as a collector of knowledge to be put together and managed to catalyse processes useful for the achievement of the overall goals.

3.2 Method and context of investigation

We found 144 projects launched in recent years all around the world to achieve smarter contexts. The word context is necessary to group all different possibility, like smart cities, smart regions, smart districts, and so on, as they are different as it regards the scope of the actions, but they are comparable as it concerns the basic idea inspiring the interventions to be performed.

The recognition of activities carried on by industry players and Institutions (like European Union or similar) when partnering local agencies in *smartization* where collected through Official reports, and this process took place both from literature and from official websites. Literature was helpful as several scholars have based their investigations on case studies, leading us to a series of useful information to be analysed again in order to achieve the aim of this research. Parallel to this a selection of the websites publishing information through reports on smart interventions has been performed. The websites took into account were the official ones from Municipalities, Local Agencies, Associations (Copenhagen Cleantech Cluster, 2012), Industry players – like IBM, Microsoft, Accenture, Vodafone –, and bigger Institutions, like European

Union or European Commission, especially as it concerns the smart projects carried on in the framework of international financing program led by these actors (FIREBALL, 2012; JESSICA, 2012).

After the selection of the websites we acquired documents and we selected the ones related to projects started at least in 2010, in order to opt for relevant information as the interventions had performed activities and results in last three years, leading to relevant information.

Moreover we prevented the analysis of projects based just on episodic interventions, since we focused on projects involving at least two of the *smartization* domains (mobility, society, environment, services to citizens, participation, economic growth). Hence we had a final list of case studies (Yin, 2003), composed by 19 projects in different cities. These cases took into account cities from Europe, America, Asia, and Oceania, favouring a wider research approach and a potential higher relevance to the results we can achieve through the investigation.

4 Findings

The cases we selected on the basis of what we presented in the previous part of this research are shown in the following table. The information provided are referred to the cities, the year in which the projects have been launched and the Industry player or the Institution supporting the planning activities and the performance of the interventions by local agencies. Some cities are linked to more than one project (i.e. Amsterdam), due to their choice to benefit from knowledge and experience of a specific partner, with a specialization acquired in relation to a domain of intervention.

City	Year of intervention	Leading industry player / Institution
Amsterdam	2008	Siemens
Barcelona	2008	European Union
Brno	2008	European Union
Busan	2010	Cisco
Copenhagen	2009	Accenture
Dubuque	2005	IBM
Firenze	2009	European Union
Gent	2010	Alcatel
Hamilton	2010	Oracle
Honolulu	2010	IBM
Houston	2008	Schneider Electric
Leipzig	2007	European Union
Melbourne	2010	Arup
Portland	2010	IBM
Qatar	2009	Vodafone

San Francisco	2009	Microsoft
Seattle	2008	Microsoft
Szeged	2009	Siemens
Tallinn	2005	Fujitsu

Starting from the cases presented in the table above, we presented the most relevant ones, useful to describe different ways of approaching to knowledge in smart interventions in metropolitan and urban contexts; this kind of investigation is useful to depict the alternative paths based on knowledge, aiming to analyse its role in these projects, addressed to *smartization*; more in detail we want to depict the whole process carried on through knowledge, starting from the actor - or the actors - attracting partners to collect knowledge, going towards the way knowledge has deployed its effects, the way it is shared and finally the reason why the usage of knowledge can be even useful to make a clear distinction between the *so-called* 'knowledge city' and a 'smart city'.

The City of Amsterdam decided to have more than one project in the process towards a smart city and different partners have been involved in these interventions. Among the industry players it is possible to find Arup, Cisco, and Siemens and they all have been chosen by the governance of the city on the basis of their experience. The other actors involved are the citizens, some local businesses and some other organizations from the international context, due to their experience. This wide range of actors depends on the different domains of interventions, namely facilities, environmental issues, mobility, and waste management and this is the reason why Amsterdam can be considered as a smart city instead of a knowledge city. Thus, the knowledge has been carried on by different actors collected by city governance, then it has been developed by them and finally it has been shared through the different domains of intervention and through apps, prepared during the projects.

Barcelona is one more city developing more than one project and among the actors taking part in them, the most important are European Union and Microsoft, both for their relevance in this issues and for the role they had in the city to support the Municipality when carrying on these processes. The involvement of actors depended on a top-down approach, as the governance of the city decided to have an open data approach involving all citizens in the choice of the projects to be carried on in the so-called "22" a Urban Living Lab grouping a wide range of different actors. Microsoft created a platform to favour the sharing of data and to provide services during the projects. Since the domains of the projects are several, Barcelona can be considered a smart city as it happened with

Amsterdam. These domains are citizen services, business services, environmental issues, and culture. The knowledge was developed starting from the open data by citizens, then they were used through smartphones and finally the sharing of the results took place through an official website and through apps, and it was the chance to favour the beginning of a new process.

Busan started its path towards smart interventions when the Local government decided to involve Cisco and they carried on the whole process together. The range of knowledge necessary to perform the project is wide, and it is embodied in actors creating a flow of knowledge. More in detail the University was chosen as starter of this project; then the proposals were evaluated by Cisco and the Municipality, before favouring the intervention of apps developers. The specificity of this approach depends on the role of citizens as they take part to the project just to test new services through the apps created and through the platform created by Cisco. The domains of interventions are several - as in the other smart cities - and the most important ones are health services, environment, mobility, and services to businesses. The knowledge and the services are embedded in apps to feed a system giving interesting feedback to better perform services as the time goes by.

Honolulu is different from the other cases, as the interventions started with the willingness to fill the gap about the technology. Then the municipality thought about the high level of performance achieved in ICT and considered it as a tool to solve the other issues of the city, first of all some services to citizens. In order to leverage on the ICT system, the partnership with IBM was enforced and a platform of smart services was created. Together with this a model known as "Honolulu311" enabled interventions from people all over the island to give new ideas about the projects to be launched and managed. The domains involved in these interventions were the environment, the services to citizens, the tourism, the culture, and the services to businesses. For each of these domains at least one app has been created to favour the dialogue among citizens and institutions and even to the provision of new services.

Melbourne had a unique way to perform its projects, as the interventions started with a workshop and this idea was carried on and managed by the Municipality, thanks to the support of a partner, the Arup, with a high experience in different cities all over the world. No other partners were involved as everything took place through meetings similar to the workshop and citizens were the main actors. More in detail periodic meetings took

place to decide how to perform some interventions, based on the collection of knowledge by people, through the managing action by Arup and the Municipality. The domains of intervention are mobility, health services, other services to citizens, and business services too, leading to the definition of smart city.

San Francisco is one more interesting case as Arup played a relevant role as it happened in the above cited of Melbourne. The city launched the project and as first task the governance involved Arup, Cisco, and Microsoft as main partners; then other partners were involved, but the most important were the citizens, as subjects expressing the needs, testing the apps, and reporting the results. Mobility, waste management and services to citizens were the most relevant domains of intervention and the knowledge carried on by different actors was an important factor in supporting the development of all interventions and the coordination among them. As it regards this last point, the coordinating activity was performed by the Municipality together with Microsoft, to favour the sharing of knowledge as a tool supporting different projects.

5 Implications

As the cases took into consideration showed, the role of knowledge is so relevant in this kind of projects. More in detail knowledge permeates the different phases in which these interventions took place, from the beginning to the reporting of the performance, becoming the fuel of a virtuous path.

The projects starts when one actor (a Local or Central Institution) focused on an issue and decides to involve partner due to the necessity of collecting knowledge to be used in the activities to be performed. The partners can be big organizations (as we have seen with IBM, Cisco, Microsoft, and so on) or SMEs (especially if there is a local issue to be solved), and the citizens as they are carriers of knowledge directly linked to the needs of the metropolitan and urban context of intervention.

After the first task, namely the collection of knowledge, the leading actor has to decide how to lever on different sources of knowledge and in all cases we took into account it has always been necessary the support of one of the partners among the bigger ones, due to the expertise on the usage of ICT, as a tool to favour this process.

When the collection of knowledge is considered as passable to start with the projects, the actors are all involved in the decisional process to use knowledge and to combine the different sources, as it happens with open data, meetings, apps to be created and so on. the

leading role is fading in this phase as all actors are relevant and the managing mechanism are already running.

The mix of knowledge starts to perform its effect and the first results are decisions, interventions, and apps and different actors took part to testing phase, to reporting results about the first usages, and to propose changes.

As the results are considered as satisfying, the sharing of knowledge takes place, as all actors can benefit from it, apart from being or not direct beneficiaries of the smart interventions. Moreover this sharing activity is relevant even for one more reason, as the knowledge arising from the usage of the apps or from the provision of new services can be useful to activate again the process thanks to the knowledge generated.

This process can be considered as a guideline to city managers or to firms supporting city management, to better understand the means of collection and the ways to manage knowledge, before deciding the actors to be involved. Moreover the sharing activity appears as necessary due to the role played by knowledge in giving new inputs for the improvements of the projects already started and to perform new ones.

6 Limitations and further research

As a qualitative study we based our investigation on detailed reports from city management actors or from industry players supporting them. The use of report is common in qualitative research and due to this it is significant, but an approach on the field can be useful to support our consideration. Moreover we would like to focus on ongoing projects, in order to better understand the different phases we described. In this case we would like to choose an action research approach. The context we are interested in analysing to perform this different kind of investigation is Naples, as the project OR.C.HE.S.T.R.A. (ORganization of Cultural HEritage for Smart Tourism and Real-time Accessibility - in the Italian National Operative Program 2007-13) is based on a series of interventions similar to the on described in the cases above.

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Environmental Management to Improve Quality of Life in Smart Cities

Tommaso Savino *, Vito Albino

Department of Mechanics, Mathematic and Management
Polytechnic of Bari, Viale Japigia 182

Rosa Maria Dangelico

Department of Computer, Control, and Management Engineering
“Antonio Ruberti”
Sapienza - University of Rome
Via Ariosto, 25 - 00185 – Rome, Italy

* *Corresponding author*

Structured Abstract

Purpose - The development of smart cities has become a topic of huge interest in the academic and public debate (e.g. Albino et al. 2013; Bouton et al. 2013; ISTAT 2013). Specifically, scholars have highlighted the critical role that smart cities exert to improve the quality of life of their citizens (Lombardi et al. 2012; Ballas 2013). Therefore, the present study aims at shedding further light to this emerging issue, by providing empirical evidence on the factors which affect quality of life in smart cities. The focus is on the effects that environmental management may have on quality of life.

Design/methodology/approach - This study is divided into two phases. The former consisted of a literature review about smart cities, their objectives, and implemented solutions. The latter analysed the influences exerted by two smart city characteristics, *smart environment* and *smart energy*, on a third characteristic, *smart living* (Giffinger et al. 2007). To this aim, we collected data regarding 133 different indicators referred to the city of Bari in Italy. To this purpose we used different data sources, among which ISTAT, ENEL, TERNA, Sole 24ore, and Legambiente. Then, we tested correlations between *smart environment* and *smart living* indicators as well as between *smart energy* and *smart living* ones.

Originality/value - Literature has widely discussed the influence of mobility on pollution (e.g., Anderson, 1998; Wilson and Chakraborty, 2013), or how new sustainable mobility favours environment protection (e.g. Kenworthy, 2009; La Greca et al., 2011) and better health conditions (e.g., Karvonen et al., 1999; ISTAT, 2013). Nevertheless, the interactions between living conditions of cities and other factors, such energy and environmental management, have been scanty investigated. In this line of inquiry, only some empirical evidences have underlined the problems perceived in more sustainable cities (e.g. Southworth and Ben-Joseph, 2004; Yang 2008). Hence, we investigated the elements of energy and environmental management which influence the citizens' quality of life.

Practical implications - This study provides interesting policy implications to enhance quality of life in smart cities. Specifically, we identified energy and environmental indicators having the greatest number of significant correlations with smart living indicators. Some of them are the consumption of water for domestic use, the number of pollutants, the separate collection of rubbish, and the consumption of electricity.

Keywords – smart city; quality of life; environment; energy

Paper type – Academic Research Paper

1 Introduction

The smartness of a city has been shifted from the use of information and communication technologies (ICT) to the capacity to improve the living conditions of inhabitants (e.g. Chen, 2010; Gabriel Cretu, 2012; Lombardi et al. 2012; Turcu, 2012; Ballas 2013). In fact, recent studies have specified that quality of life is the main purpose of a smart city (e.g. Geller, 2003; Caragliu et al., 2009; Chen, 2010; Thuzar, 2011; Lazaroiu and Roscia, 2012). Therefore, the investigation about factors affecting the quality of life may be interesting for both scholars and policy makers.

This kind of research could be based on the six characteristics of a smart city which are broadly adopted in the literature (e.g. Giffinger et al., 2007; Van Soom, 2009; Fusco Girard et al., 2009; Albino et al., 2013). Indeed, one of them is *smart living* which groups factors related to the quality of life, as health, safety, education and cultural facilities, quality of buildings, social cohesion, and touristic attractivity (Giffinger et al., 2007). Hence, if we use *smart living* as a proxy of life quality, it is possible to analyse how other characteristics (economy, mobility, environment, people, governance) impact on it.

Existing studies have hugely explored how mobility affects the natural environment and the quality of life. Specifically, the literature analysed the implications of local accessibility systems on pollution (e.g. Hansen, 1959; U.S. Department of Transportation, 1994; Anderson 1998), environmental protection (e.g. Kenworthy, 2009; La Greca et al., 2011), and health conditions (e.g. Geller, 2003). Although these research works have been a useful beginning for understanding the relationships between cities' characteristics, an investigation about the relationships between other key characteristics of smart cities and quality of life is still lacking. Therefore, the present study aims at shedding further light to this emerging issue, by providing empirical evidence on the factors which affect quality of life in smart cities. Specifically, the focus is on the effects that environmental

management, considering energy and environmental factors, may have on quality of life. This choice is also justified by the effort that cities should make to become more sustainable because of their critical role as worldwide natural resources consumers (e.g. Mori and Christodoulou, 2012; Turcu, 2012; Albino et al., 2013).

The paper is organized as follows. First, a theoretical framework is developed to introduce the literature about smart cities and the effects of mobility and other characteristics on living conditions. Secondly, we explain the methodology used to collect data and to analyse them. Thirdly, we summarize results regarding the correlations between energy and environmental factors and quality of life. Finally, the last section provides an overview of the key implications, limitations, and an outlook on future research directions.

2 Theoretical Background

2.1 Smart City

The term “smart city” was initially used to discuss the role of modern information technologies in urban daily life (Mahizhnan , 1999). However, the smartness of a city is linked to the existence of networks of sensors, devices, real time data and ICT infrastructure which effectively improve various aspects of human life (Chen, 2010; Gabriel Cretu, 2012) such as traffic, mobility, security/safety, electrical transportation, and consumption of resources (Benner 2003, Komninos 2007, Giffinger et al. 2007, Caragliu et al. 2009, Chen, 2010). However, the complexity of these issues requires the intelligent and coordinated implementation of all available technologies (Barrionuevo et al., 2012) and the involvement of various competencies (Holland 2008; Winters, 2011; Kourtit et al., 2012; Zygiaris, 2013). To this purpose, a smart city has to invest in the human capital development and in citizens’ participation in decision-making processes (Caragliu et al., 2009; Thuzar, 2011). Afterwards, the focus of a smart city has been shifted from technology implementation to the capacity to respond to people’s needs (Turcu, 2012). Indeed, recent studies have specified the improvements of inhabitants’ quality of life as the main objective of a smart city (Geller, 2003; Caragliu et al., 2009; Chen, 2010; Thuzar, 2011; Lazaroiu and Roscia, 2012). Within this literature stream, Guan (2012) defined smart a city that “provides conditions for a healthy and happy community” (p.25). In fact, only a city with the better living conditions can be

competitive and attract the best talented workers through which a sustainable economic development can be pursued (Thite, 2011). Therefore, the identification of factors that influence the quality of life in a smart city is critical for scholars and policy makers. To this aim, it could be useful to exploit the six characteristics of a smart city as economy, mobility, environment, people, living, and governance (Giffinger et al., 2007; Van Soom, 2009; Fusco Girard et al., 2009; Albino et al., 2013). In fact, smart living characteristic may provide information about quality of life by using indicators on health, safety, education and cultural facilities, quality of buildings, social cohesion, and touristic attractiveness. Thereby, it is possible to analyse the effects of each characteristic on smart living, and consequently on quality of life.

2.2 Mobility and Quality of life

Prior research has especially focused on the effects caused by mobility on environment as well as on living conditions of people. At first, scholars investigated how accessibility to commercial, industrial, and residential locations influence pollution (Hansen, 1959; Anderson 1998). Typically, the choice to travel depends on price and duration of trips (Anderson 1998). Therefore, the structure of cities has been changed during the last century by engine invention that allowed people to move over long distances with reduced costs and duration. In fact, people had the possibility to live in distant areas from cities' centres at much lower densities (Cervero, 1995; Giuliano, 1995; Glaeser and Kohlhase, 2004). This phenomenon created the "sprawl" which is characterised by a widely dispersed population, a network of roads with huge blocks, a rigid separation among homes, shops, and workplaces, a lack of well-defined activity centers such as downtowns and town centers (Geller, 2003). One of the most significant results of sprawl is dependence on the automobile whose motor is responsible of over one-quarter of the nitrogen oxide, carbon monoxide, and volatile organic compounds released into the air each year (U.S. Department of Transportation, 1994; Anderson 1998). The resulting effects on the human health are significant if we consider that asthma affects 17 million adults and 4 million children in the United States (e.g. Geller, 2003). In addition, automobile dependence promotes sedentary lifestyle habits which has created an epidemic rise of chronic diseases such as obesity, diabetes, high blood pressure, coronary artery, osteoporosis, cancer and stroke (e.g. Geller, 2003; ISTAT 2013). Another effect on living conditions due to automobile dependence is the high number of people that is killed

every year because of traffic fatalities (e.g. Geller, 2003). Hence, recent solutions for transport systems are designed to avoid private car usage by reducing car trip frequency and trip lengths, and shifting to alternative modes of transport, which includes walking and cycling (e.g., Kenworthy, 2009; La Greca et al., 2011). The tool that could be a promising solution is the Transit Oriented Development (TOD). This concept is based on the idea to locate new construction in and around transit nodes (TCRP Report 102, 2004, p.3). The implementation of this strategy considers an optimal walking distance between a transit stop and core urban area within 2000 feet, which equates to 0.6 km. The result may be an urban area that combines transit accessibility and well-connected networks to be accessed by walking, biking, or leaving the car in park-and-ride facilities. Hence, the city with a smart mobility could be more liveable because of its capacity to mix “residential, retail, office, open space, and public uses in a walkable environment, making it convenient for residents and employees to travel by transit, bicycle, foot, or car” (Calthorpe, 1993 p. 56). Real examples are converging to Bus Rapid Transit (BRT) model which has a system of distinct buses running on their own infrastructure without interactions with usual car traffic. Furthermore, the stops are spaced at 300-600 m in the city centre and at greater distances if in suburban areas. This solution allows higher speed, reliability and safety than a common bus transit system (Vuchic, 2007). Nevertheless, it is needed a complementary system which makes it simpler to reach destinations from bus stop points. In fact, cities as Paris, London, Rennes, Berlin, Amsterdam, Copenhagen and many other cities in 33 countries around the world are managing bicycle-sharing schemes (Associated Press 1998, De Maio, 2009). This solution has become sustainable thanks to the introduction of smartcard technology and subsequent improvements which has limited vandalism and thefts (Associated Press 1998, De Maio, 2009). However, the bicycle-sharing has still a limited impact on the car dependence reduction. Indeed, the percentage of car or motorcycle trips replaced by bicycles does not overcome the 10 per cent (Midgley, 2011). The next generation of this system could be more attractive thanks to the introduction of solar-powered docking stations, electric bicycles and mobile phone applications providing real time services (Midgley, 2011). At the end, we can say that both BRT and bicycle-sharing can improve the life quality of smart cities’ inhabitants. They may favour air pollution decrease as well as the raise of physical exercise of people. In fact, a more physical activity plays a critical role to protect the human body against cardiovascular, musculoskeletal, cerebrovascular, and metabolic diseases (ISTAT, 2013).

2.3 Other smart city characteristics and quality of life

The interactions between living conditions of cities and factors not related with mobility have been scantily investigated in the literature. In this line of inquiry, some empirical evidences underlined problems that citizens encounter when policy makers implemented actions to protect natural resources such as the urban density increasing (Baldassarre, 1982; Krupat, 1985; Kearns, 2001; Southworth and Ben-Joseph, 2004; Yang 2008). In fact, a city with high density could indicate a minor distance to reach work places, houses, and commercial areas and consequently it means a less energy consumption per person in transport (Yang, 2008; Shell International BV, 2014). Hence, higher density of urban areas significantly drops CO₂ emissions per capita (Hammer et al. 2011; Shell International BV, 2014). Nevertheless, existing studies observed how the possibility to live in an environment of single family houses is perceived as an element positively affecting the quality of life for their sense of privacy and relaxation (Kearns and Parkinson, 2001; Southworth and Ben-Joseph, 2004; Yang, 2008). Instead, people living at higher urban densities have highlighted problems such as frustrations, crime, traffic, noise, air pollution (Lofland, 1973; Krupat, 1985; Southworth and Ben-Joseph, 2004; Verbrugge and Taylor, 1980; Yang, 2008). However, there is also a strong correlation between higher density and accessibility to urban amenities such as public transportation, close shopping, and community services (Yang, 2008).

Despite the debate over the influences on quality of life in smart cities, there is little empirical evidence on the actual effects on citizens' life conditions provoked by factors strictly related to environmental management such as attractivity of natural conditions, environmental protection, sustainable resource management, and pollution. In addition, the necessity to make this analysis is witnessed by the fact that most resources are nowadays consumed in cities worldwide (e.g., Hammer et al. 2011; Mori and Christodoulou, 2012). Specifically, the actual proportion of global energy use due to cities is around 66% and consequently they cause large shares of GHG emissions (e.g., Hammer et al. 2011, Shell International BV, 2014). Furthermore, cities will use 80% of global energy by 2040 (Shell International BV, 2014). At the same time, if we consider that most urban energy consumption is centred in buildings, both homes and offices, and is driven by heating, lighting, and appliances (Shell International BV, 2014), we can appreciate how the environmental management could affect the quality of life of citizens.

Thereby, if policy makers decide to improve environmental conditions, they have to know how the quality of life could change. Consequently, we investigated which elements of environmental management influence the living conditions of citizens.

3. Methodology

3.1 Data collection

3.1.1 Data source

In order to investigate the effect of factors, which received scant attention in the literature so far, on citizens' quality of life, we tested the existence of correlations of energy and environmental indicators referred to cities with smart living indicators. To this purpose, we collected data for several indicators referred to the city of Bari in Italy. The choice of the city of Bari is motivated by several reasons. The city of Bari adheres to the "Covenant of Mayors", an initiative of the European Commission to create a community of municipalities that draw solutions for climate protection and CO₂ reduction. The adhesion at the Covenant is subsequent to the submission of a SEAP (Sustainable Energy Action Plan) which comprehends energy efficiency projects, urban planning, improvements for heating and lighting infrastructure and networks, intelligent buildings, the introduction of renewable energy sources, and education campaigns. The SEAP of Bari was awarded with a mention for "Green Employment Program" by technical and scientific committee of A+CoM, a competition for municipalities organised by Climate Alliance Italy and Kyoto Club. Some results that Bari achieved with the implementation of the measures included in the SEAP are: 1) the creation of 18,800 new housing units with energy consumption systems through which CO₂ emissions were cut by approximately 8,752 TOE (tons of oil equivalent); 2) optimization of water supply contracts which led to the achievement of economic benefits to Bari amounting to € 5,949,012; 3) optimization of electricity supply contracts for municipal assets that led to the achievement of economic benefits amounting to € 634,215.

Data collection revealed particularly hard due to the multi-dimensional feature of the smart city characteristics "smart environment" and "smart living" as well as to the lack of a single database wherein all data were included. Thus, prior to data collection we needed to identify the data sources wherein relevant data were available. Data sources include ISTAT, ENEL, TERNA, Sole 24ore, and Legambiente.

From each source, we collected data referred to several years. Since different data sources have been used, it should be noticed that different indicators are non-homogeneous in terms of data availability years.

3.1.2 Database building

Indicators have been grouped within three *Smart city characteristics*:

- *Smart environment*: identified by Giffinger et al. (2007), it includes indicators referred to attractivity of natural conditions, pollution, environmental protection, and sustainable resource management.
- *Smart energy*: despite not explicitly included in Giffinger et al. (2007), due to the more and more relevant and strategic role of energy resources management within cities, we believed it appropriate to make this dimension explicit and consider it separately from the smart city characteristic “*smart environment*”. This smart city characteristic includes indicators referred to the efficient use of energy and to the use of renewable energy sources.
- *Smart living*: identified by Giffinger et al. (2007), it includes indicators referred to several dimensions of quality of life such as cultural facilities, health conditions, safety, housing quality, education facilities, social cohesion and touristic attractivity.

Within each of these *smart city characteristics*, we defined several thematic areas and sub-areas, consistent with those identified within the Smart City Index (Between, 2013). Thus, the database reports the values of different indicators referred to several available years (ranging from 2000 to 2012). For each indicator we specified the smart city characteristic, the thematic area and the thematic sub-area.

3.1.3 Indicator selection process

Before conducting correlation analysis, we performed a selection of indicators within the database. In particular, we removed all indicators:

- for which data were not available for at least five years;
- for which data were the same for each year (this is the case of binary variables whose value was always 1 or 0);
- that represented a score or a position in a specific ranking.

This selection process led to build a database made of 133 indicators, each of which identified with a number, grouped into the three *smart city characteristics* as follows:

- *smart environment*: 35 indicators (identification numbers 1-35);
- *smart energy*: 11 indicators (identification numbers 36-46);
- *smart living*: 87 indicators (identification numbers 47-133).

The whole lists of indicators are reported in Appendices I, II, and III..

4 Data analysis and Results

Correlation analyses have been conducted between energy indicators and quality of life indicators as well as between environmental indicators and quality of life indicators.

Due to their large dimensions, correlation tables will not be appended to the paper but can be provided upon request.

Table 1 reports a summary of significant correlations ($p < .05$) between environmental indicators and quality of life indicators, while Table 2 reports a summary of significant correlations ($p < .05$) between energy indicators and quality of life indicators.

Table 1: Summary of significant correlations ($p < .05$) between environmental indicators and quality of life indicators.

Environment indicators	Quality of life indicators with positive correlation	Quality of life indicators with negative correlation
1	48; 49; 95; 96; 97; 103; 114; 118; 120; 122; 124; 126	77; 81; 92; 99; 100; 107; 108; 109; 131; 132
2	58; 118; 124	133
3	79; 82; 83; 84; 85; 86; 88; 113; 114	77; 90; 93; 99; 100; 107; 109; 133
4	48; 49; 50; 51; 77; 95; 96; 127	83; 84; 86; 128
5	81; 108; 131	88; 121
6	47; 48; 49; 81; 82; 85; 114; 124	107; 108; 109; 132
7	47; 48; 49; 82; 85; 114; 124	107; 108; 109; 132
8	48; 49; 80; 83; 84; 86; 88; 95; 96; 97; 103; 114; 118; 120; 121; 122; 124	50; 51; 77; 92; 99; 100; 107; 108; 109; 110; 112; 131; 132
9	79; 80; 83; 84; 86; 96; 128	51; 77; 100; 107; 109; 133
10	48; 49; 87; 95; 96; 102	
11	61; 111; 113; 114; 122; 125; 130	57; 76; 89
12	66; 67; 116; 120	
13	87; 121	
14	48; 49; 95; 96	
15	47; 50; 51; 77; 93	83; 84; 86

16	53; 60	70; 130
17	77; 98; 99; 100; 115	83; 84; 86; 97
18	47; 50; 51; 77; 93	83; 84; 86
19	47; 50; 77; 93	83; 84; 86
20	50; 51; 77; 81; 93	83; 84; 86; 88; 126
21	50; 51; 77; 81; 93	83; 84; 86; 88; 126
22	77	79; 80
23	78; 96; 102	82; 85; 87; 113; 114
24	47; 82; 85	107; 108; 109; 131; 133
25	50; 51; 77; 90; 92; 93; 106	79; 80; 83; 84; 86; 88; 114
26	107; 109; 127	87; 88; 114; 117
27	58; 84; 86; 122; 126	50; 51; 77; 81; 92; 100; 107; 109; 110; 112; 131
28	75	54; 67; 110; 112
29	50; 51; 73; 99; 100; 109; 110; 112	83; 84; 86
30	93; 94; 96; 108; 131	97
31		91
32	59; 61; 72; 125	78; 128
33	47; 48; 77; 99; 100; 107; 109; 110; 112; 131	86
34	61; 67; 71	
35	63	61; 132

Table 2: Summary of significant correlations ($p < .05$) between energy indicators and quality of life indicators.

Energy indicators	Quality of life indicators with positive correlation	Quality of life indicators with negative correlation
36	47; 98; 124	108; 132
37	50; 51; 77; 90; 127; 133	79; 83; 84; 86
38	47; 79; 82; 85; 88; 113; 114; 121	89; 90; 94; 107; 109; 133
39	85; 88; 97; 121; 124	90; 93; 94
40	79; 80; 82; 83; 84; 85; 86; 88; 97	50; 51; 77; 90; 92; 93; 99; 100; 107; 109; 112; 131
41	47; 50; 59; 87; 111; 113	58; 78; 86; 101; 102; 122; 126
42	79; 82; 85; 88; 113; 114	89; 90; 93; 94; 107; 109; 133
43	48; 49; 50; 51; 95; 96	126
44	48; 49; 84; 88; 95; 96	77; 90
45	48; 49; 78; 95; 96; 102	127
46	115	

Correlation analysis revealed the existence of a high number of correlations both between environmental indicators and quality of life indicators and between energy indicators and quality of life indicators.

With regard to correlations between environmental indicators and quality of life indicators, Table 1 shows that environmental indicators with the greatest number of correlations are those identified by the numbers 1, 3, 4, 6, 8, 9, and 33. These indicators are related to water consumption and purification, air quality, and selective waste collection.

With regard to correlations between energy indicators and quality of life indicators, Table 2 shows that environmental indicators with the greatest number of correlations are those identified by the numbers 38, 40, 41, and 42. These indicators are related to electricity consumption.

5. Implications, limitations, and future research directions

This study is a preliminary study in a quite unexplored research area, related to the relationships between different dimensions of a smart city, such as energy, environment, and quality of life. It has important implications as well as limitations that should be acknowledged.

With regard to implications, this study provides interesting insights for policy makers on how to enhance quality of life in cities. In particular, we identified the most important energy and environmental indicators that impact on citizens' quality of life, thus highlighting the factors that should be carefully and primarily managed by policy makers to favor the best living conditions in cities, an important feature for a smart city. Specifically, we found the energy and environmental indicators that have the greatest number of significant correlations with quality of life indicators. These factors are the consumption of water for domestic use, the percentage of population connected to wastewater treatment plants, the number of air quality monitoring stations, the number of pollutants, the separate collection of rubbish, and the consumption of electricity.

With regard to limitations, first of all, the number of available data points (years) for each indicator is quite limited (minimum 5 and maximum 12 years). Some indicators, despite conventional transformation attempts, showed departure from normality (in terms of kurtosis), so limiting the effectiveness of correlation analysis. However, we believed it

useful to leave these indicators in the analysis to have a complete set of indicators and first evidence of correlations among them. Secondly, only correlations have been analyzed while causal relationships between indicators have not been explored. Further, the analysis has been conducted only on one city, so limiting the generalizability of results. Future research could be devoted to deepen the analysis of the relationships between the indicators that revealed to be the most strategic ones also seeking for causal relationships between them as well as to extend the data collection and analysis to other cities.

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Appendix I – Environmental indicators

ID	Area	Sub-Area	Indicator description
1	Natural Resources	Water	Household water consumption (m3 per inhabitant)
2	Natural Resources	Water	Per capita daily consumption of drinking water for domestic use (litres per inhabitant)
3	Natural Resources	Water	Water dispersion in the network (Difference between water input and the consumed water for domestic, industrial, agricultural)
4	Natural Resources	Water	Population percentage which is connected to sewage disposals
5	Natural Resources	Water	Purification capacity
6	Natural Resources	Air	Number of air quality controllers per 100,000 inhabitants
7	Natural Resources	Air	Number of air quality controllers per km ²
8	Natural Resources	Air	Number of pollutants
9	Natural Resources	Air	Number of exceedances of PM ₁₀ limit quantity
10	Natural Resources	Waste	Quantity of municipal waste (kg per inhabitant)
11	Natural Resources	Waste	Quantity of municipal waste (tons)
12	Natural Resources	Waste	Per capita urban waste production (kg/inhabitant*year)
13	Natural Resources	Waste	Per capita urban waste production (kg/inhabitant*year)
14	Natural Resources	Waste	Population served by separate collection of rubbish (percentage value)
15	Natural Resources	Waste	separate collection of rubbish (percentage value)
16	Natural Resources	Waste	separate collection of rubbish (percentage value)
17	Natural Resources	Waste	separate collection of rubbish (percentage value)
18	Natural Resources	Waste	separate collection of rubbish (kg per inhabitant)
19	Natural Resources	Waste	Wastepaper collection (kg per inhabitant)
20	Natural Resources	Waste	Glass collection (kg per inhabitant)
21	Natural Resources	Waste	Plastics collection (kg per inhabitant)
22	Natural Resources	Waste	Metal collection (kg per inhabitant)
23	Natural Resources	Waste	Selective collection (used batteries, drugs, etc.) (kg per inhabitant)
24	Natural Resources	Waste	Organic waste collection (kg per inhabitant)
25	Natural Resources	Waste	Collection of other types of waste materials (kg per inhabitant)

ID	Area	Sub-Area	Indicator description
26	Natural Resources	Pollution	NO ₂ annual average values (µg/m ³)
27	Natural Resources	Pollution	PM ₁₀ annual averages values (µg/m ³)
28	Natural Resources	Pollution	Number of exceedances of Ozone limit quantity
29	Natural Resources	sustainable resource management	Number of ISO 14001 certifications per 1,000 firms
30	Natural Resources	sustainable resource management	Index of Environment planning and participation
31	Natural Resources	sustainable resource management	Eco Management Index
32	Natural Resources	sustainable resource management	Responsiveness of municipal government (percentage value)
33	Service Quality	sustainable resource management	Separate collection of rubbish (percentage value)
34	Environment Health service	Climate	Difference between the warmest month and the coldest one
35	Environment Health service	Ecological Report	“Legambiente” Urban Ecosystem Index

Appendix II – Energy Indicators

ID	Area	Sub-Area	Indicator description
37	Renawble Energy	Energy	Home Energy Policy Index
38	Energy Efficiency	Smart building	Electricity Consumption (GWh)
39	Energy Efficiency	Smart building	Electrical Energy consumption in Agriculture (GWh)
40	Energy Efficiency	Smart building	Electrical Energy consumption in Manufacturing (GWh)
41	Energy Efficiency	Smart building	Electrical Energy consumption in Service Industry (GWh)
42	Energy Efficiency	Smart building	Household Electrical Energy consumption (GWh)
43	Energy Efficiency	Smart building	Household Electrical Energy consumption per capita (kWh per inhabitant)
44	Energy Efficiency	Smart building	Household Electrical Energy consumption per houses (kWh per house)
45	Energy Efficiency	Smart building	Household consumption of natural gas per capita (m ³ per inhabitant)
Of na46	Energy Efficiency	Smart building	Annual Household consumption of Electrical Energy per capita

Appendix III – Living Indicators

ID Indicators	Area	Sub-Area	Indicator description
47	Liveability	Noise	Noise barriers in the municipal area
48	Liveability	Urban Environment Index	Green Spaces extension (percentage of urban surface)
49	Liveability	Urban Environment Index	Green Spaces availability (m ² per inhabitant)
50	Liveability	Urban Environment Index	Usable Green Spaces (m ² per inhabitant)
51	Liveability	Urban Environment Index	Total surface of green spaces (m ² per inhabitant)
52	Liveability	Ranking	Annual Urban Ecosystem ranking
53	Health	Eating Habits	3 years old people and older who make a proper breakfast (percentage value)
54	Health	Eating Habits	3 years old people and older who make breakfast with milk and something else (percentage value)
55	Health	Eating Habits	3 years old people and older who lunch at home (percentage value)
56	Health	Eating Habits	3 years old people and older who lunch at canteen (percentage value)
57	Health	Eating Habits	3 years old people and older who lunch at restaurant (percentage value)
58	Health	Eating Habits	3 years old people and older who lunch at cafeteria (percentage value)
59	Health	Eating Habits	3 years old people and older who lunch at work place (percentage value)
60	Health	Eating Habits	3 years old people and older who define lunch as main meal (percentage value)
61	Health	Eating Habits	3 years old people and older who define dinner as main meal (percentage value)
62	Health	Smoking	14 years old people and older who smoke (percentage value)
63	Health	Smoking	14 years old people and older who have ceased to (percentage value)
64	Health	Smoking	14 years old people and older who do not smoke (percentage value)
65	Health	People with chronic diseases	People with one chronic disease at least (percentage value)
66	Health	People with chronic diseases	People with two chronic diseases at least (percentage value)
67	Health	People with chronic diseases	People with diabetes (percentage value)
68	Health	People with chronic diseases	People with hypertension (percentage value)
69	Health	People with chronic diseases	People with chronic bronchitis, bronchial asthma (percentage value)
70	Health	People with chronic diseases	People with osteoarthritis, arthritis (percentage value)
71	Health	People with	People with osteoporosis (percentage value)

ID Indicators	Area	Sub-Area	Indicator description
		chronic diseases	
72	Health	People with chronic diseases	People with heart disease (percentage value)
73	Health	People with chronic diseases	People with allergic diseases (percentage value)
74	Health	People with chronic diseases	People with nervous disorders (percentage value)
75	Health	People with chronic diseases	People with gastric and duodenal ulcer (percentage value)
76	Health	Health conditions	People who use drugs in the two days preceding the interview (percentage value)
77	Health	Death rate	Life expectancy at birth
78	Health	Death rate	Infant mortality rates
79	Health	Death rate	Standardized mortality rate for transport accidents
80	Health	Death rate	Standardized mortality rate for cancer
81	Health	Death rate	Standardized mortality rate for dementia and diseases of the nervous system
82	Health	Traffic accidents	Traffic accidents with personal injury
83	Health	Traffic accidents	Traffic accidents with fatal injuries
84	Health	Traffic accidents	Killed in road accidents
85	Health	Traffic accidents	Injured in road accidents
86	Health	Traffic accidents	Killed in road accidents - compared to the total number of accidents (percentage value)
87	Health	Traffic accidents	Injured in road accidents - compared to the total number of accidents (percentage value)
88	Health	Mental disorders	The resignation of hospitalized patients
89	Health	Mental disorders	The resignation of patients hospitalized in different provinces rather than the residence one
90	Health	Mental disorders	The resignation of patients hospitalized in different provinces rather than the residence one (percentage value)
91	Safety		Voluntary manslaughter rate
92	Culture and Leisure	Shows	6 years old people and older who claim to have attended theatre at least once in the last year
93	Culture and Leisure	Shows	6 years old people and older who claim to have attended cinema at least once in the last year
94	Culture and Leisure	Shows	6 years old people and older who claim to have attended classical music concert at least once in the last year
95	Culture and Leisure	Shows	6 years old people and older who claim to have attended concerts at least once in the last year
96	Culture and Leisure	Shows	6 years old people and older who claim to have attended sports shows at least once in the last year
97	Culture and Leisure	Music	6 years old people and older who claim to have attended dancing at least once in the last year
98	Culture and	Books	How many books read in the last year

ID Indicators	Area	Sub-Area	Indicator description
	Leisure		
99	Culture and Leisure	Computer Literacy	3 years old people and older who have used PC in the last year
100	Culture and Leisure	Computer Literacy	6 years old people and older who have used PC in the last year
101	Culture and Leisure	Cultural trips	6 years old people and older who claim to have visited museums or exhibits at least once in the last year
102	Culture and Leisure	Cultural trips	6 years old people and older who claim to have visited archaeological sites or monuments at least once in the last year
103	Culture and Leisure	Sports	3 years old people and older who claim to play sport on an ongoing basis
104	Culture and Leisure	Sports	3 years old people and older who claim to play sport occasionally
105	Culture and Leisure	Sports	3 years old people and older who claim to play some sport
106	Culture and Leisure	Sports	3 years old people and older who claim to not play sport
107	Tourism	Accommodation facilities	Number of Hotels and complementary exercises on municipal area
108	Tourism	Accommodation facilities	Number of Hotels on municipal area
109	Tourism	Accommodation facilities	Number of complementary exercises on municipal area
110	Tourism	Accommodation facilities	Number of Hotels and complementary exercises on district area
111	Tourism	Accommodation facilities	Number of Hotels on district area
112	Tourism	Accommodation facilities	Number of complementary exercises on district area
113	Tourism	Clients of accommodation facilities	Incoming clients
114	Tourism	Clients of accommodation facilities	Presence of clients
115	Personal Well-Being	Problems in the housing area	House-holdings reporting the problem of dirty streets
116	Personal Well-Being	Problems in the housing area	House-holdings reporting the problem of parking
117	Personal Well-Being	Problems in the housing area	House-holdings reporting difficulties in connection with public transport system
118	Personal	Problems in the	House-holdings reporting the problem of traffic

ID	Indicatore	Area	Sub-Area	Indicator description
		Well-Being	housing area	
119		Personal Well-Being	Problems in the housing area	House-holdings reporting the problem of air pollution
120		Personal Well-Being	Problems in the housing area	House-holdings reporting the problem of noise
121		Personal Well-Being	Problems in the housing area	House-holdings reporting the crime risk
122		Personal Well-Being	Problems in the housing area	House-holdings reporting irregular water supply
123		Personal Well-Being	Problems in the housing area	House-holdings declaring lack of confidence in drinking tap water
124		Standard of living	Residential Buildings	Prices
125		Law and Order	Burglarized apartments	Home burglaries per 100,000 inhabitants
126		Law and Order	Young Outlaws	Reported Minors
127		Law and Order	Street risks	Reported Snatching and pickpocketing per 100,000 inhabitants
128		Law and Order	Robberies	Reported robberies per 100,000 inhabitants
129		Law and Order	Thefted Auto	Auto thefts per 100,000 inhabitants
130		Service Quality	Healthcare	Hospital emigration index - percentage
131		Leisure	Trim	Sportsmanship Index
132		Leisure	restaurants	Restaurants and Bar per 100,000 inhabitants
133		Leisure	Shows	Performances per 100,000 inhabitants

Evaluating Relational Capital by Social Networks: Applications in the Professional Football Clubs Industry

Raffaele Trequattrini , Rosa Lombardi, Alessandra
Lardo

Department of Economics and Law
University of Cassino and Southern Lazio
Via S. Angelo, Loc. Folcara, 03043 Cassino (FR), Italy

** Corresponding author*

Structured Abstract

Purpose – The objective of the paper is to prove how it is possible to enhance relational capital in the football industry by proposing an innovative approach in the evaluation of football clubs and football players founded on their popularity on the social network. The research is directed in representing how the value created by social networks can be a determinant of relational capital value, by increasing strong and trustworthy relationships, especially, with young clients.

Design/methodology/approach – The methodology is based on a qualitative and quantitative approach. Following the analysis of existing literature on intellectual capital and on social media, research has been across two analyses. The first analysis has been carried out by international professional football clubs on which popularity on social networks may have an important influence. The second objective is to check whether the economic value of footballers is taken from the total of human capital value and their value of relational capital developed through new digital platforms. Empirical research aims at proving the correlation that exists between the decisive factors indicated above.

Originality/value – The methodology puts in evidence the existence of economic opportunities, deriving from the management of web platforms, especially with reference to the needs of managers to take advantage of competences deriving from the social media to transform fans and followers in consumers. The analysis configures future research through the integration of social networks impact in the evaluation formula of relational capital of professional football clubs and players, with reference to their transfer prices.

Practical implications – From a comparison carried out with the sales' value of a sample of clubs belonging to the Top 30 ranking, drawn up by Deloitte in the Football Money League 2014 Report, and their level of popularity on social networks, research investigates into the existence of a correlation between sales of football clubs and the number of fans present on the web platforms. The aim is to prove that social networks are indicators of the relational capital value. Using the same approach, the analysis focuses on the transfer prices of a sample of footballers playing in the most important European League clubs.

Keywords – relational capital, new media, social networks, football clubs, football players.

Paper type – Academic Research Paper

1 Introduction

The paper investigates the relational capital in order to evaluate the social media impact on its assessment as knowledge generators.

The purpose of the study is to demonstrate in which measure social networks are able to endorse relational capital in the football industry.

The research is directed in representing how the value created by social networks can be a determinant of the relational capital value, by increasing strong and trustworthy relationships, especially, with young clients.

Some authors (Prahalad e Ramaswany, 2000; Bernestein, 2005; Hamil and Chadwick, 2010) argue that clients satisfaction and engagement represent the first source to obtain companies competitive advantages. This aspect is valid for football clubs by referring to supporters.

In this direction, a primary role is recognized to the web and to the new tools of interaction between individuals, such as social media (Enders et al., 2008).

In the field of social media, the social networks takes on a relevant position. They are a tool both in evaluating brand and in engagement of fans and supporters. They are also a tool in developing a range of relationships on global scale.

The company mission permits to define social networks as useful means in going near fans and supporters in real time, as well as an access means with exclusive contents. The aim is to transform fans and followers in consumers.

Research approach is based on qualitative and quantitative method. The objective is to propose an innovative approach in the evaluation of football clubs and football players relational capital, founded on popularity on the social networks.

Among the analysed dimensions there are the football clubs sales and the footballers transfer prices.

The sources are of secondary nature. The research approach is exploratory (Hair, Celsi, Money, Samouel, Page, 2003) with the aim to fill the literature gap in the field of impact evaluation of social media on relational capital.

The article has the following structure. After the introduction, section two provides a literature analysis of intellectual capital, by referring principally to relational capital and to the impact of social media on relational capital in the football industry. Section three describes methodology and research approach. Section four proposes the research findings and the discussion, by including implications on research. Section five illustrates the limitations of the study and suggests future research.

The research question is the following: Are social networks determinant factors of relational capital value of professional football clubs and footballers transfer price?

2 Literature Review

2.1 Intellectual capital

Intellectual capital of contemporary companies is a strategic asset able to increase added value and to create competitive advantages on the market in the long term (Teece and Pisano, 1998).

Knowledge is the mainly strategic resource that permits to create new knowledge (Stewart and Ruckdeschel, 1998).

In the perspective of value creation, the Resource Based View (Barney, 1991) has stated how intangible assets, such as know how, patents, management skills, image, relationships, reputation, brand, are essential resources.

Many authors (Teece, Pisano, Shuen, 1997) argue that company's value is related to the dynamic capabilities by their internal organization.

Particularly, it is possible to refer to the capacity of strategic management to adapt, integrate and configure again resources, knowledge, management skills, both inside and out of the company, by proposing an answer to the needs of a changing market (Dumay, 2012).

In this way, contemporary company is a coordinated system of tangible and intangible assets; it interacts with external environment with which there are exchange of energy, information and knowledge (Zanda, 2011). The above exchanges are important because they give to the company the possibility to survive and to growth on the basis of continue and repeated relationships.

Stewart recognizes as intangible assets or intellectual capital the following dimensions: the human capital (Edvinsson, Malone, 1997), the structural capital (Bontis,

1991) and the relational capital (Prahalad and Ramaswamy, 2000; Martin de Castro et al. 2011).

Among these dimensions, relational capital represents the knowledge incorporated in a set of relationships, of paths, of business networks that influence organization (Prahalad e Ramaswamy, 2000; Dorrego et al., 2013).

Relationships with stakeholders are the essential condition to build, to keep and to renew resources, structures and processes during the time. The reason is that companies are able to access to critical and complementary resources through external relationships.

The concept of relational capital is based on the consideration that organizations are not isolated system but they have maintained relationships of different type with clients, suppliers and other stakeholders (Roos et al., 2001). It permits to obtain critical information about market opportunities and needs. This type of information is a guide for companies in order to develop and implement new knowledge (Martin de Castro et al., 2011).

The rapid changings of context dictate to the companies to assume a dynamic organization model by involving all clients, suppliers and other strategic partners. Therefore, there is the activation of relationships establishing high level of creativity and satisfaction. In other words, there is the born of significant relationships.

The relational appearance is particularly essential because it is characterized by committed and durable relationships.

This logical assumption leads companies to have a confrontation with clients and suppliers. It is possible to build a connection over the usual phases of companies life with the perspective of long term relationships (Shirouyehzad et al., 2013).

Some authors (Prahalad, Ramaswamy, 2000) state that, among different stakeholders, client represents the new source of competitive advantage. From here, relationships implementation, client satisfaction and loyalty are became the primary objective for contemporary companies with the aim to obtain higher business performance and to increase their value in the long term.

Many authors (Bontis, 1998, Nives and Osorio, 2012) argue that the utilization of relational and marketing channels established with clients are the two principal elements of relational capital.

Relationships need to be evaluate in order to provide a right representation of companies economic value. Infact, relationships influence companies performance through the new knowledge (Chen, Zhu and Xie, 2004).

Economic value of a company is strictly connected with intellectual capital value (Zanda et al., 2005).

Specifically, relational capital of a company is related both to the trustworthy relationships built up between firm and clients and to the plurality of relationships that organization maintains with its stakeholders. Finally, relationships permit to work on the market.

2.2 Social media function

In the last years, the companies competitiveness is focused on capturing consumer attention; in obtaining a competitive advantage, each company needs to use opportunity coming from new media in order to maximize the utility deriving from interaction with clients (Hea, Zhab, and Li, 2013).

Social media represent a group of application internet-based. They are built on the ideological and technological basis of web 2.0 (Kaplan and Haenlein, 2010). They permits to create, transfer and exchange of user generated content.

They represent a new and revolutionary trend that is directed to modify the behaviour of contemporary companies; managers and consultants try to determine key elements for the adequate utilization of the above application.

With the born of internet-based social media (Mangold and Faulds, 2009), communication between individuals is grown and the exchange of information and opinions about goods and services has generated the need to manage relational paths. The impact of relationships is directly linked to relational capital.

Actually the utilization of social media required new ways of companied thinking and operating. For this reason, there has been the establishment of new professional figures such as digital web master and new media managers.

The new media and entertainment revolution is associated to the collaboration mass. It changes economy and business models utilized by companies.

Blogs, chats, search engines, auction advertisings, personal broadcasting are new form of entertainment and interaction able to create value also at commercial level (Tapscott, Williams, 2008).

Therefore, social media identify different new sources of online information. The last one are created, propagated and utilized by consumers by referring to products, brands, services, well-recognized people and problems of every type (Mangold and Faulds, 2009).

Social media are all web-based services such as blogs, forum, social networks that allows message socialization in term of transfer and transformation. In other words, they permit people to be an active figure in the communication (Kietzmann et al., 2011).

Advantages generated by social media are various. First of all, they allow prompt and direct communication between companies and their consumers. In this scenario, there are low costs and more efficiency than traditional communication tools.

Secondly, social media promote comparison among consumers to which they allow to establish direct relationships with companies assuming a perspective both top down and bottom up.

Finally, social media permit to companies to obtain potential profits. The reason is that they are tools able to loyalize users and they allow the market penetration.

Moreover, by comparing with conventional standards, various studies demonstrate as metrics of social media are essential predictive indicators of the companies' market value tasting the power that they have in transforming organization (Luo, Zhang and Duan, 2013).

Among social media, it is possible to recognize the relevance of social network.

The last one is an application able to connect users among them through the creation of personal profiles, by inviting friends and colleagues in sharing personal data. The method of interaction is in sending email and instantaneous message.

Several companies utilize social networking sites in order to create brand communities. Infact, the brand's relational evaluation can be improved and pursued through the utilization of new digital technologies (O'Reilly and Madill, 2007).

Some company utilizes Facebook or other social networks such as distribution and informative channels to show new products and services with sale alerts (Kaplan and Haenlein, 2010).

In this way, companies use the implementation of new relational channels in order to obtain an increasing in the sales.

All the above configures social media as generator of relational capital that are essential both for multinational companies and for medium-small companies. Social media are also relevant for no profit and conventional agencies.

2.3 Social media and professional football industry

Modern professional football companies are high intensity business enterprises (Piantoni, 1999) and their intellectual capital is composed of the players, the brand and the right to participate to competition: they can be considered respectively the human capital, the relational capital and the structural capital of the firms (Lacchini and Trequatrini, 2012).

Synergic relations between sport and new media is facilitated by the increasing demand of sporting contents from global mass media and by the fast convergence of the consumers needs all over the world (Hamil and Chadwick, 2010).

Sport industry is always characterized by an elevated media attention. Particularly, football is one of the most popular mean of broadcasting of sporting contents: the first source of revenues for most European clubs is generated by television rights (Deloitte, 2014).

Football entertainment and his contents are goods that, by attracting new consumers, sponsor and partnership, can cause significant revenues.

Social media revolution has contributed to develop the football content value. It has created a full range of new distribution channels on different digital platforms (Boyle and Hayenes, 2004), inventing original and dynamic connections with the consumers of the football show. In this way, it has allowed the massive reproduction of the sporting product, facilitating the market expansion and increasing the value of the relations between football clubs and their stakeholders (Hamil and Chadwick, 2010).

In order to pursue their company mission and to contribute to the realization of the performance objectives, many football club managers are being oriented towards the implementation of strategies for the optimal social media exploitation (Molina, 2014).

At present, the most popular social networks in Europe are Facebook (www.facebook.com), Twitter (www.twitter.com), Instagram (www.instagram.com) and Google Plus (www.plus.google.com): they represent platforms that allow to the clubs and to the football players to communicate directly with the fans. Therefore, football clubs are

valuing possible investments in the development of websites, mobile applications and games, in order to increase fans loyalty.

In a context of progressive globalisation and internationalisation, competition is focused on the skill of football club managers of capture consumer's attention and of inglobe new multimedial technologies inside the organisation. Therefore, new professional roles are emerging in football clubs organisations, like digital web masters and new media managers.

Social media are modifying the ways to produce, distribute and consume sporting contents and football managers are understanding the benefits and the potential opportunities connected with the exploitation of such tools, in the perspective of a increasingly competitive and technologically complex environment (Bernstein, 2005).

Social networks are also able to create strong relations between fans, activating significant links that can be transformed into economic returns for the single footballers and for clubs. The most important opportunity is constituted by the possibility of develop bidirectional relations with consumers and increase the relational capital value in the long period.

In a perspective strongly business oriented, a footballer can be considered as an enterprise that offers his services to other enterprises operating in the sporting entertainment industry.

Similarly, the transfer price of a footballer can be considered as an expression of his economic value and the social media become the driver for the promotion of the image and the popularity of the footballers all over the world.

In first approximation, transfer price of a footballer has been estimated by the same methods used for the human capital evaluation, considering three principal variables: variables relating to the morphological characteristics of the player, performance variables and context variables (Carmichael, Forrest and Simmons, 1999; Dobson and Gerrard, 1999).

In following studies, the relational capital component, with reference to its media value, has been included in the algorithm estimating transfer price of a player, considering exclusively the popularity and the notoriety obtained through the traditional mass media (Garcia-del-Barro and Pujol, 2006), without taking into account of social media.

Other studies investigate the issue of footballer's image rights in the new media era (Haynes, 2007) and the link between professional player popularity and his emolument

compared to the marginal productivity. They recognize the superstar effect, calculated on the basis of the higher price a spectator is ready to pay to see a specific football player. Such an issue, included in a work on Italian footballers with reference to the season 1995/96 (Lucifora and Simmons, 2003), does not investigate the social media role.

Therefore, the study aims to evaluate also the contribution of the popularity on the most popular social networks to the transfer price of a footballer. The objective is to demonstrate that the above-mentioned popularity constitutes a determinant part of the relational capital of a footballer.

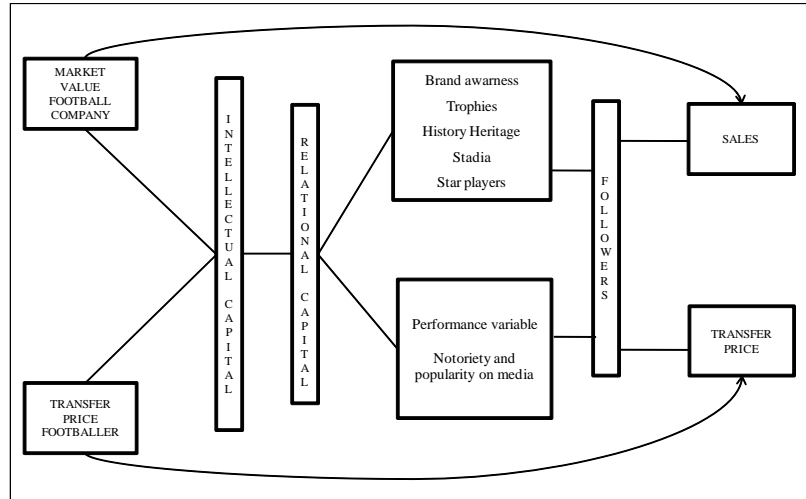
The work is based on the logical assumption that the ability of attracting fans for the popularity allowed by the mass media could be defined relational capital of the single footballer and that his price of transfer (W_f) is strongly connected with his human capital and the relational capital.

3 Research approach

The methodology is based on quali-quantitative method. The research approach is exploratory. The analysis is based on the evaluation of football clubs and football players relational capital, through their popularity on social networks.

The research framework (Figure 1) starts with the analysis of market value of football clubs and of transfer prices of footballers. The value of both variables depends on intellectual capital, which includes relational capital. The relational capital of football companies reflects brand awareness, trophies wins, history heritage, quality of facilities and stars players members of the clubs. Instead, the relational capital of footballers depends on performance variables, popularity and notoriety on all types of media. The numbers of fans and followers are related to relational capital and they impact on sales and transfer price respectively of football clubs and professional football players.

Figure 1- Research Theoretical Framework



In order to answer to the research question, the next hypotheses have been structured:

Hp1: *Does a correlation exist between the popularity on social networks of the professional football clubs and the value of their relational capital?*

Hp2: *Does the popularity on social networks of the professional footballers have an influence on their transfer price?*

On the first level of analysis a study on professional football clubs is carried out, considering as main variable the company’s sales.

The analysis sample consists of thirty professional football clubs belonging to the major international federations. These have been selected by the ranking edited annually by Deloitte and published in the report Football Money League 2014, identifying companies with the highest amount of sales for 2012-2013 season.

Particularly, it is possible to define the following characteristic of the sample (Table 1), in order to explain its representativeness:

Table 1- Characteristics of the football clubs

	Numbers of clubs	%	Total
Nationality			
<i>English</i>	8	27%	30
<i>Italian</i>	6	20%	

<i>German</i>	5	17%	
<i>Spanish</i>	4	13%	
<i>French</i>	2	7%	
<i>Turkish</i>	2	7%	
<i>Netherlands</i>	1	3%	
<i>Portuguese</i>	1	3%	
<i>Brazilian</i>	1	3%	
Sales			
$100 < x < 150$	14	47%	30
$150 < x < 350$	11	37%	
$x > 350$	5	17%	
International Trophies			
$x < 5$	18	60%	30
$5 < x < 10$	5	17%	
$x > 10$	7	23%	

On the second level of analysis a study on professional football players is carried out, considering as main variable their transfer price.

The sample consists of forty professional footballers, who are active in the major European Leagues, in the role of striker and who were object of outright transfer in the last three seasons.

The sample selection was made on the basis of the following characteristics (Table 2), in order to determine its representativeness:

Table 2- Characteristics of the football players

	Numbers of players	%	Total
Nationality			
<i>European</i>	22	55%	40
<i>Extra-European</i>	18	45%	
Age at transfer			
$19-23$	13	33%	40
$24-28$	21	53%	
$28-31$	6	15%	
Matches per age			
$x < 10$	18	45%	40

$10 < x < 15$	16	40%	
$x > 15$	6	15%	
Minutes per Goal			
$x < 150$	10	25%	40
$150 < x < 300$	24	60%	
$x > 300$	6	15%	

The empirical analysis contributes to enrich the existing literature, in order to offer, both to the scientific community, both to the industry, an updated conceptualization of how the relational capital of professional football clubs and the transfer price of professional football players are evaluated.

Data sourcing has been carried out using the following sources (Yin, 2003):

a) direct access to the official pages of the major social networks in Europe. In particular, for each football company were found at the same date, the number of fans on Facebook, the number of followers on Twitter, Instagram, and the number of followers on Google Plus;

b) relating to the market value of football players transfers, consulting specialized websites (transfermarkt.com, fullsoccer.eu, calciomercato.it), and press releases on outright acquisitions or disposals;

c) relating to the popularity of football players, direct access at the same date to the official pages of footballers on social networks such as Facebook, Twitter, Instagram;

d) sites of collection of data on social networks, which process the global media charts.

Overall, the research sources are of secondary nature (documents, reports, news, journal articles in open sources, scientific papers and books, databases).

Empirical research is conducted using a statistical software and is directed to demonstrate the correlation between the variables previously identified.

The analysis integrates, updates and extends the existing literature on the determinants of the relational capital value, expanding the issue to the professional football industry.

4 Findings and Discussion

4.1 Results on Hp1

The findings of the research are based on the systematization of the literature and on the analysis of data defined earlier.

The analysis of the collected data has been made using the statistical model of bivariate linear regression, assuming the following variables:

- the popularity of the social networks of professional football clubs, as the independent variable;
- companies sales of the thirty clubs belonging to the statistical sample, as the dependent variable.

Values resulting from the popularity of thirty football clubs on four social networks (Facebook, Twitter, Instagram, Google Plus) were examined at the date of 31.01.2014 and four separate linear regressions has been created.

In the following tables, for each social network, the correlation with the companies sales has been identified trough Pearson coefficient. Subsequently, the regression line has been drawn ($Y = B_0 + \beta X$).

With reference to the analysis on Facebook (Table 3; Figure 2), the coefficient R is equal to 0,826. This indicates a reasonably strong linear relationship between sales and popularity on Facebook of football clubs. R^2 coefficient value is 0,682.

Table 3 - Results of correlation analysis of Facebook (Sales)

Model	R	R-square	Adjusted R-square	Std. Error of Estimate
1	,826 ^a	,682	,671	72,77690

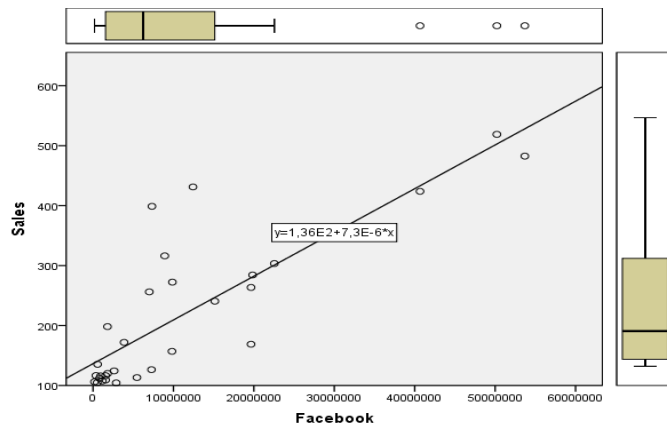


Figure 2- Regression line of Facebook (Sales)

The results of analysis of Twitter (Table 4; Figure 3) show the coefficient R equal to 0,655. A moderate correlation between sales and Twitter popularity is demonstrated. R² coefficient value is 0,429.

Table 4 - Results of correlation analysis of Twitter (Sales)

Model	R	R-square	Adjusted R-square	Std. Error of Estimate
1	,655 ^a	,429	,408	97,63581

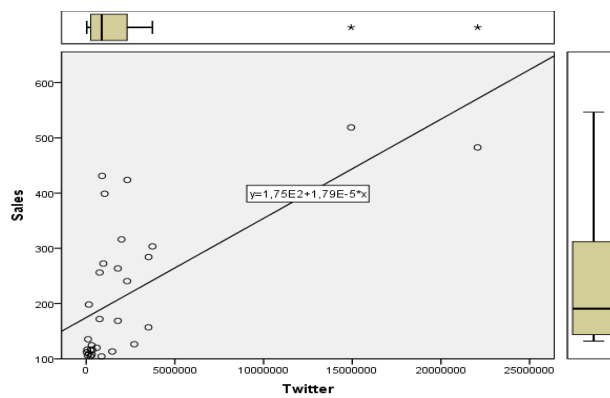


Figure 3 - Regression line of Twitter (Sales)

The results of the analysis on the social network Instagram (Table 5; Figure 4) show the value of the coefficient R equal to 0,792. A moderate correlation between sales and Instagram popularity is shown. R² coefficient value is 0,628.

Table 5 - Results of correlation analysis of Instagram (Sales)

Model	R	R-square	Adjusted R-square	Std. Error of Estimate
1	,792 ^a	,628	,614	78,81203

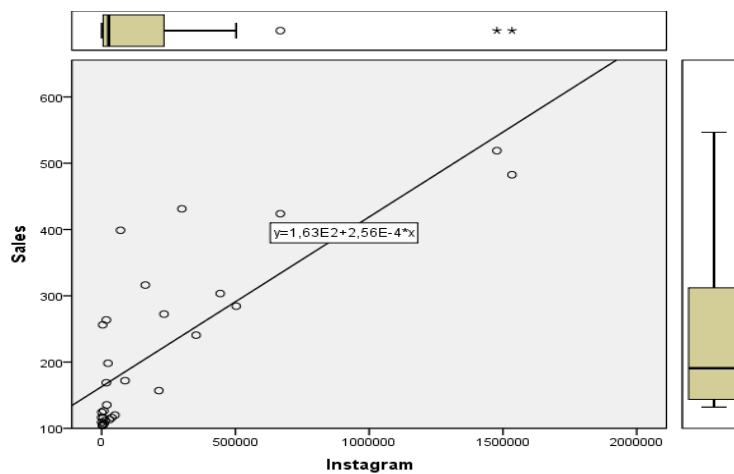


Figure 4 - Regression line of Instagram (Sales)

Finally, for the analysis relating to Google's social network (Table 6; Figure 5), the coefficient R is equal to 0,723. This means a moderate correlation between sales and Google Plus popularity of the football companies. R² coefficient value is of 0,522.

Table 6 - Results of correlation analysis of Google Plus (Sales)

Model	R	R-square	Adjusted R-square	Std. Error of Estimate
1	,723 ^a	,522	,505	89,26146

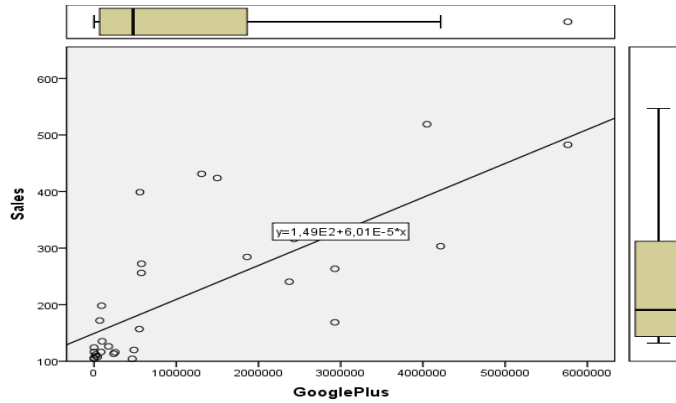


Figure 5 - Regression line of Google Plus (Sales)

The analysis, based on the first hypothesis (Hp1), shows that the value of social networks is a determinant of the value of professional football clubs relational capital, as demonstrated by the parameters identified (Table 7).

The results of analysis are statistically significant ($p\text{-value} < 0,05$) with a confidence level of 95% for all analysis carried out and it is possible to assert that the sample is representative of the total population consisting of the companies with sales of more than 100 million euro. Furthermore, the analysis on the sample shows the statistical significance of the estimated regression coefficients by the statistical t-test.

In fact, the empirical values of t of the two coefficients are major than the critical value identified in the table of Student ($t_{(\alpha,df)} = 1,699$, where: $\alpha = 0,05$; $df = 29$).

Table 7 - Summary of results Hp1

	Sales						
	R	R ²	B ₀	t _{B0}	β ₁	t _{β1}	Sig.
Fans Facebook	0,826	0,682	136,392	8,098	0,000007297	7,758	0,000
Followers Twitter	0,655	0,429	174,746	8,721	0,000001795	4,582	0,000
Followers Instagram	0,792	0,628	162,969	9,952	0,000256042	6,87	0,000
Followers Google Plus	0,723	0,522	149,264	7,336	0,000006006	5,534	0,000

Based on the formula to determine the economic value of relational capital, the popularity on social networks can affect the percentage of sales attributable to the relational capital. This is evidenced by the positive correlation between popularity and sales of football companies for each social network analysed.

4.2 Results on Hp 2

With regard to the empirical analysis on the value of outright transfers of forty strikers playing in the major European Leagues, has been used three social networks (Facebook, Twitter, Instagram). Particularly, the second analysis does not consider the social network Google plus, because not all the football players of the sample are active on this platform.

Using the same method adopted for previous investigation, the following variables are hypothesized:

- the independent variable is the popularity on social networks of forty football players;
- the dependent variable is the price of the outright transfer of players.

In the following tables, for each social network, the correlation with the football players transfers prices has been identified through Pearson coefficient. Subsequently, the regression line has been drawn ($Y = B_0 + \beta X$).

Specifically, the results of the analysis of Facebook (Table 8; Figure 6) show the coefficient R equal to 0,562. This means a moderate correlation between the economic value of football players and their popularity on Facebook. R^2 coefficient value is 0,316.

Table 8 - Results of correlation analysis of Facebook (W football player)

Model	R	R-square	Adjusted R-square	Std. Error of Estimate
1	,562 ^a	,316	,298	13075264,967

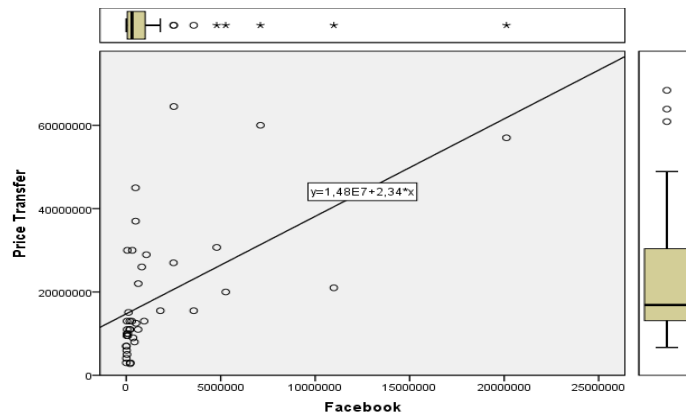


Figure 6 - Regression line of Facebook (W_f)

Concerning the Twitter analysis (Table 9; Figure 7), the coefficient R is equal to 0,665. This shows a moderate correlation between the economic value of the football players and their Twitter popularity. The coefficient R^2 has a value of 0,442.

This social network identifies the highest correlation value of the second level of analysis. It is the most suitable for the interaction between single player and fans.

Table 9 - Results of correlation analysis of Twitter (W football player)

Model	R	R-square	Adjusted R-square	Std. Error of Estimate
1	,665 ^a	,442	,427	11806061,217

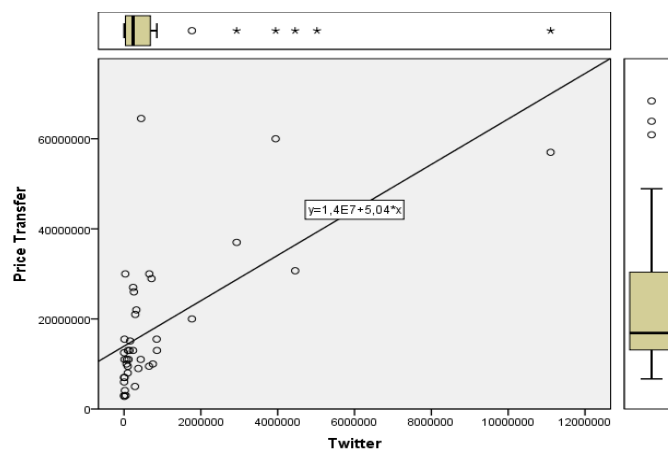


Figure 7 - Regression line of Twitter (W_f)

Finally, the analysis has been elaborated with reference to the social network Instagram (Table 10; Figure 8), according to which the coefficient R is equal to 0,517. This shows a moderate correlation between the price transfer of football players and their Instagram popularity. R^2 coefficient value is 0,267.

Table 10 - Results of correlation analysis of Instagram (W football player)

Model	R	R-square	Adjusted R-square	Std. Error of Estimate
1	,517 ^a	,267	,248	13529075,244

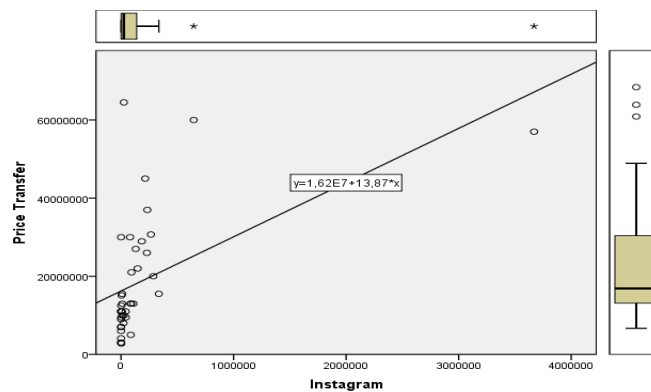


Figure 8 - Regression line of Instagram (W_f)

With regard to the second hypothesis (H_{p2}), it is shown that the value of social networks is a determinant of the price of transfer of the football players, given by the sum of the value of human capital and relational capital, as demonstrated by the parameters identified (Table 11).

The results of analysis are statistically significant ($p\text{-value} < 0,05$) with a confidence level of 95%. Furthermore, the analysis on the sample shows the statistical significance of the estimated regression coefficients by the statistical t-test.

In fact, the empirical values of t of the two coefficients are major than the critical value identified in the table of Student ($t_{(\alpha;df)} = 1,685$, where: $\alpha = 0,05$; $df = 39$). Therefore, it is possible to assert that the behaviour observed on the sample approximates that of the population.

Table 11 - Summary of results Hp2

Transfer Price							
	R	R ²	B ₀	t _{B0}	β ₁	t _{β1}	Sig.
Fans Facebook	0,562	0,316	14757961,35	6,499	2,339	4,185	0,000
Followers Twitter	0,665	0,442	13953087,61	6,784	5,045	5,486	0,000
Followers Instagram	0,517	0,267	16232198,02	7,25	13,874	3,722	0,001

The positive correlation, identified from the empirical analysis between the transfer price and football players popularity profiles on social networks, allows to say that the greatest value given to players because of their reputation is directly attributable to relational capital, in the mean of capability to attract fans and followers.

It should be noted that football players have lower levels of popularity on social networks than clubs. The greater capability to attract fans by professional football clubs is due to several factors, including supporters loyalty and history heritage. So, an increase of social network popularity for players is more relevant than the same increase of clubs popularity.

Finally, it is considered that no strong correlation could be due to the lack of management strategies based on social networks. Football clubs and professional players have not yet identified a model for the profitable management of this resource, minimizing the associated risks; as for all media, a distorted use can be counterproductive.

In this sense, there are some proposals to regulate the use of social networks, or even forbid its use, in some competitions especially for athletes. This happened, for example, for the Olympic Games of London 2012 and for the final stages of Euro 2012; at the next World Cup 2014, also the coach of the Italian national football team has announced he is going to forbid the use of social networks to the players.

5. Conclusions, limitations and proposal for future research

The research has analysed the impact that social networks have on the professional football clubs value and on the footballers transfer price as their relational capital's value drivers.

By the definition of stable and lasting connections with the fans and the followers, there has been verified the existence of a positive correlation between social profile of the clubs and the footballers and their relational capital value.

In this perspective, the research can be useful to identify corrections for the traditional methodologies for the evaluation of:

- a) the professional football clubs relational capital, in the meaning of corporate brand;
- b) the footballers transfer price.

With regard to the first aspect, corporate brand value is generally calculated multiplying company sales for a coefficient (royalty) expressive of numerous factors between which brand's popularity has a preeminent position. Modifying the formula, it is possible to include the popularity on the social networks as additional component for the relational capital definition: in particular, to higher levels of popularity on the social networks will correspond a royalty more elevated to attribute to the relational capital, in its meaning referred to the brand.

With regard to the second aspect, it is demonstrated that popularity on social networks of the footballers affects positively their fair market value.

Therefore, in the formula for the estimate of the transfer price, which generally takes into account traditional variables tied to characteristics of the player, individual performances and variables of context, there must be included the component tied to the footballer relational capital; this last one is expression of variable "popularity", whose value must be connected also to the number of followers on the social networks.

In the strategic and managerial perspective, the research has remarked the existence of economic opportunities deriving from the management of the new platforms, with particular reference to the demands of the managers of exploiting knowledge deriving from social media in order to transform fans and followers in consumers.

Company relational capital is influenced by the satisfaction and the loyalty of clients; in this sense, social media represent a tool to realise strategies one to one with consumers, as knowledge and strong relationship generators.

Popularity of social media is in strong expansion between citizens: the result is that companies can extract value with this tool to innovate their business models and their managerial practice.

In order to increase relational capital value, professional football clubs can use social media and, in particular, social networks as distributive channels to the e-commerce and as tools in support of the brand diffusion.

At the same time, footballer also have to learn to exploit social media in ways of increasing his popularity level, avoiding abuses able to put in danger his image or the image of the club in which he plays.

The work presents relevant limits; it is possible to mention, first of all, the fact that the empiric analysis has presupposed constant all the other determinants of the companies sales and of the footballers transfer price.

With reference to the professional football clubs, the future research will have to be orientated to validate the results by the insertion in the analysis of other drivers of the relational capital value and, particularly, to integrate in the formulas the impact of new and old media, avoiding possible overlaps and duplications.

With reference to the football players, the aim of future research will have to be oriented to identify new models of evaluation keeping in due consideration traditional variables and variables deriving from the player's popularity on social media in addition to the determinants deriving from the popularity on press and television.

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Novel customer collaboration and networking tools for cultivating external information

Niksa Alfirevic*

University of Split, Faculty of Economics
Cvite Fiskovica 5, 21000 Split, Croatia

Matilda Dorotic

BI Norwegian Business School
0442 Oslo, Norway

Mira Hajdic

Elekta-C plc
Smiljaniceva 2, 21000 Split, Croatia

** Corresponding author*

Structured Abstract

Purpose – The purpose of this paper is to explore numerous new tools, which have been developed to track and capture customer preferences, behavioural patterns and attitudinal responses, in order to improve firm's knowledge management (KM). In this way, authors present the most important determinants of a 'unified' approach to knowledge management and provide directions for further research.

Design/methodology/approach – We propose to develop and present a comprehensive framework for managing knowledge, which can be acquired from external sources with purpose of improving managerial outcomes. In this context, we place a special emphasis to the 'social technologies', such as social networking, corporate blogging, customer/brand virtual communities, etc. These tools represent novel sources for cultivating external information which affect all aspects of management process: from ideation and new product development which nowadays rely on co-creation with customers and open-source innovation; to process improvements and long-term relationship development with customers and other stakeholders.

Originality/value – Our approach brings together in a single framework management of both the external, customer-held knowledge, as well as internal sources of knowledge, examined by the traditional knowledge management discourse. It is based on an integration of relevant theories and practices from the fields of management and marketing, which provides an inter-disciplinary approach to knowledge management. Therefore, we propose that future research equates an organization's market orientation to the fundamental activities of knowledge management, since this would also enable

researchers to use the well-accepted tools, such as MARKOR scale/questionnaire for market orientation in a new research setting.

Practical implications – The outcomes of previous application of different tools, contributing to the ‘unified’ knowledge management approach are explored. In addition, potential practical benefits of such an approach are explored throughout three different dimensions: (a) managing credibility of peer-to-peer communication about an organization, its products, activities, etc.; (b) using social media as major, low-cost customer support channel; (c) making use of external knowledge sources to include customers’ input into the new product development as value co-creators.

Keywords – Knowledge management, Unified approach, Customer knowledge management

Paper type – Academic Research Paper

1 Introduction

More than ever, sustainable competitive advantage depends on firms’ ability to utilize a wealth of data that contemporary customer relationship management (CRM) tools provide (from Internet sources to loyalty program data to social media, etc.). These tools represent novel sources for cultivating external information which affect all aspects of management process: from ideation and new product development which nowadays rely on co-creation with customers and open-source innovation; to process improvements and long-term relationship development with customers and other stakeholders through CRM and social media tools.

We believe that an analysis of contemporary practices in using peer-to-peer and customer-to-company sources of knowledge may assist other practices relevant for management of overall knowledge available to an organization. Therefore, the objective of this article is to use the overview of state-of-the-art collaboration and networking sources and tools, in order to ‘sketch’ the most important determinants of the comprehensive, ‘unified’ model of knowledge management, as well as to provide directions for further research.

2 Background

As knowledge emerges as a central resource essential to the development of capabilities and competitive advantage of firms (Barney, 1991; Grant,1996a; Grant, 1996b), both theoretical and practical discussion focused on the knowledge creation,

transfer and application either within organizations (Alavi & Leidner, 2001) or through strategic alliances (Meier, 2011). Theoretical perspectives identify several manners in which knowledge can be used to obtain such a strategic advantage. They include development of innovative strategies, better execution of existing strategies, development of new products/services (or enhancing the current products/services) and more efficient execution of business processes (Liebowitz, 1999).

However, there seem to be many different *forms of knowledge*, such as (Nonaka et al., 1995; Quinn et al., 1996): (a) *know-what*, which is related to the classification of the facts known, without any reference to the context in which these facts could be used; (b) *know-how*, i.e. knowing how to apply the facts in a given context; (c) *know-why*, i.e. the ‘in-depth’ understanding of the known facts and their relationships with the elements of the context, as to predict and manage possible outcomes in advance; (d) *care-why*, i.e. having motivation for creative application of knowledge in the best possible way.

Data from different sources are incorporated into these forms of knowledge, with the *internal sources of data on customers* being predominant in traditional organizations. In this context, management of knowledge is ‘just’ a rational process, expected to systematically collect, organize, secure, share and facilitate the utilization of knowledge (Lehaney et al., 2004). However, this approach presupposes that knowledge is (more or less) readily available for processing and that an organization simply ‘*does not know what it knows*’, which can be solved by an introduction of a rational management process. At the other hand, it should be analyzed whether an organization *knows everything that it should know*, i.e. if it has acquired all relevant knowledge *from* and *about* its customers and the environment.

This article will, therefore, build upon the well-known distinction on *knowledge for, from* and *about customers*, as related to (Salomann et al, 2005): (a) information that should be provided to (*for*) customers, in order to ensure their satisfaction and loyalty, (b) information collected *from* customers, relevant for product, service and/or business improvement and (c) information *about* customers’ needs, expectations, etc., usually captured by the customer relationship management (CRM) tools and approaches. However, we strive to build a ‘unified’ model, addressing management of all these sources of knowledge, as well as relevant relationships among employees - fundamental actors of knowledge work.

3 New developments in knowledge acquisition

We believe that in an era of increasing development of information technology (IT) and empowering end-customers, the locus of power in knowledge creation is shifted from companies to consumers. As Lager (2007) stated: “*The future of business may not be in the hands of the executives, but those of the customer instead*” (p. 23). Empowered with social media like Facebook, LinkedIn, Twitter, MySpace, customer review’s sites and similar social media channels, customers are not anymore passive spectators waiting to be sold products to, but rather active participants in the two-way interaction with product- and service providers. In such an environment, the previously neglected dimension of knowledge management can be identified in the knowledge creation, based on appropriating customer experiences and discovering knowledge in customer interactions. It is, therefore, crucial to bridge the gap between what is traditionally seen as management of customer relationships to discovering customer-based knowledge and ‘fitting’ it into the knowledge management system of a firm.

Namely, the rise of information and communication technologies, as well as development of business intelligence (such as data warehousing, data mining, etc.) influenced the popularization of CRM and its tools as ways to access and manage the wealth of data on customer behavior and preferences (Winer 2001). Traditionally, the role of CRM includes the building of a single view of the customer across all contact channels of this customer with the firm and companywide distribution of customer intelligence (Reinartz, Hoyer & Krafft, 2004). *Data on customers* is gathered and managed by using tools like call centers, loyalty programs and salesforce automation, i.e. by using the one-dimensional corporate interaction. However, with the development of new communication channels, such as social networks and other social media, it became much more difficult to obtain the single view of a customer and its decision-making parameters. Contemporary customers obtain information from various sources to increase information credibility and facilitate comparisons between products. In addition, any of their experiences, either good or bad, can be disseminated faster and more efficiently than ever, since consumers spend about 700 billion minutes per month on social media (Beck, 2011).

This creates a large potential for incorporating knowledge from 'social technology', such as ‘liking’ a specific product or a brand on Facebook, ‘tweeting’ about a product or a firm on Tweeter, blogging about one’s customer experiences, into the traditional customer

relationship management (CRM) systems, which is sometimes referred to as CRM 2.0 or social CRM (Lager, 2007; Stone, 2009). The social media proliferated in recent years, creating remarkable changes in business environment. In 2011 activity on Twitter reached 140 million tweets daily, while Facebook attracted more than 500 million active users in more than 70 languages (Beck 2011). The total minutes spent on Facebook increased by remarkable 700 percent year-over-year (Nielsen Company, 2009). As a result, companies are shifting their attention and resources to leverage the information from social media. According to the leading IT consulting company *Gartner*, the developing social CRM application market reached \$600 million in 2010, and it is expected to reach \$1 billion by 2013. By the year 2015, Gartner predicts that as much as 80 percent of consumers' discretionary spending will be influenced by digital strategies, such as social and mobile marketing (Gartner Inc., 2011).

One of the main advantages that companies can achieve with successful integration of social media is a wider reach (spread of the word) and higher credibility of peer-to-peer communication for customers (the word-of-mouth recommendation). For example, CEO of social targeting platform CrowdFactory, Sanjay Dholakia (cited by Beck, 2011) found that about 78 percent of consumers trust recommendation by their peers, compared to only 15 percent of consumers who trust advertisements from a company. In addition, the social media provides an instant feedback, which allows product/service providers to respond to 'critical incidents' in customer relationships in real time. Therefore, it is not a rare case that organizations employ professional 'social media officers', who follow the comments which customers post on social media websites and solve the potential service problems. For instance, the experience of an US-based designer and maker of bicycles and related equipment and apparel, *Specialized Bicycle Components*, has been discussed by Klie (2011). Screening what customers posted on social media channels allowed the company to predict and solve potential critical incidents and in turn obtain a positive word-of-mouth and loyalty from customers active in social media. This motivated Specialized Bicycle Components to move further and create its own virtual customer community. Today, the company reports that its social community platforms account for 15 percent of all company's interactions with consumers (Klie, 2011).

As the second important advantage, companies such as the UK mobile virtual network operator *Giffgaff*, or the similar Croatian counterpart *BonBon* (a rebranded part of the T-Mobile Croatia network), use social media as major customer support channels to reduce

the operating costs. Instead of having a costly customer contact center, Giffgaff asks customers to post their questions on their help forum, while *BonBon* uses its 'official' Facebook and Twitter accounts. Such an approach can lead to substantial cost savings, as demonstrated by *Linksys*, which markets networking products on the SOHO (Small Office/Home Office) market. By introducing the online customer support community, Linksys was able to substantially reduce the number of calls to their customer support centers and completely eliminate the email support service. More than 120 000 potential service requests per month are addressed by customers themselves, since they are able to find the previously posted solutions. Moreover, some 1000 service requests per month are re-routed from the traditional channels to the new online support community of customers (Klie, 2011).

Thirdly, companies can use external knowledge sources to include customers' input into the new product development and serve as value co-creators. Co-creation as a practice can be described in terms of collaborative product development by firms and consumers, in which consumers actively contribute and select various elements of a new product offering (Hoyer et al., 2010). This allows companies to increase effectiveness of innovations since such co-created products better reflect true customer needs and to reduce costs by replacing costly internal (employees') input in the new product development with the external input from customers. For instance, *Procter & Gamble*, through its *Connect+Develop* innovation program collects now more than 50 percent of all its product initiatives from collaboration with customers and other external parties (Procter & Gamble, 2011).

Very often, the easiest way for a company to engage in co-creation is by setting up a product innovation contests for customers. In 2005, one of the world leaders in mobile phones, the Finnish *Nokia* launched highly successful *The Concept Lounge* competition, which invited users to help create the new phone. Nokia now harnesses the customer-centric knowledge management opportunities through Nokia Developers online communities which are tailored to receive input at different stages of product development through creation of specialized communities. In addition, the *Nokia Beta Lab* community members are provided with free access to product development tools and releases of software in testing ('beta') stage, which allows customers to provide feedback and interact with Nokia software developers. Finally, launched in 2005 under the original name of Lego Factory, *LEGO's* current initiative *Lego Design by Me* allows customers to

design their own models of *Lego* toys with an easy-to-use, freely downloadable software. The designs can then be uploaded to the Lego website and shared with others to receive feedback and see what other creators have uploaded. Such co-created product can be then ordered to delivery. Lego Design By Me users are motivated through participation in contest for the best product or design. According to TrendWatching (2006) in one of such contest winners were awarded with a 5 percent royalty on each set sold.

4 Toward a unified model of knowledge management

Previously described marketing-based dimension of acquiring relevant external knowledge can be successfully incorporated into the knowledge management framework developed by Ackerman et al. (2003), who believe there are two fundamental viewpoints of knowledge management. The ‘technical’ viewpoint is concerned with the transformation of tacit forms of knowledge into the explicit, as well as collection and organization of explicit knowledge by using databases and repositories. The ‘collaborative’ viewpoint is related to the socio-cultural aspects of connecting and empowering employees, as to enable knowledge sharing and the development of ever ‘deeper’ forms of knowledge, i.e. moving from ‘know-what’ toward ‘care-why’.

In this context, unification of knowledge management should also move in two different, but complementary directions. On one hand, it should be ensured that all information, regardless of its origin, is placed within a comprehensive and systematically created ‘knowledge map’, which is made available to all knowledge workers via adequate technical means. On the other hand, associated processes among knowledge workers should be aligned with the knowledge acquisition, transformation and distribution tasks of the knowledge management system.

What seems to be most important, our framework requires explicit identification of knowledge concepts and their sources, as well as of inter-personal processes leading to the ‘knowledge flow’ (i.e. adequate utilization of knowledge). In addition, we wish to provide the *‘market-aware’ context for the functioning of knowledge management, i.e. bridge the gap between the internally-oriented management of knowledge assets and customer-oriented tools of knowledge acquisition.* This is achieved by using the classical Kohli & Jaworski’s (1990) concept of market orientation, defined as a sequence of three activities: *generation, dissemination and response to market stimuli.* These activities

constitute the fundamental elements of an organization's agility for a continuous (re)orientation, directed by market intelligence.

We believe that the *stages of knowledge management*, as identified by previous research, should be (re)interpreted in terms of ensuring that knowledge collected, stored and used is relevant for the customers' needs. Building on this proposition, the conventional knowledge management cycle (Mertins et al., 2003), consisting of knowledge generation, storage, distribution and application, can be augmented. We believe that such a model should be integrated with the activities related to market intelligence, as a form of acquiring relevant external knowledge.

A comprehensive model, bridging the existing gap between the market intelligence/orientation and knowledge management theories is proposed and demonstrated by the following figure. The model also especially refers to new sources of customer knowledge, i.e. on *knowledge from the customer or external (to company) knowledge*, which can be acquired both via traditional tools and approaches (such as market research), as well as the non-traditional ones (e.g. social media). These linkages between managerial and marketing aspects of relevant constructs, actors and processes should constitute the 'technical' viewpoint of the knowledge management.

In addition, there are enablers and tools to be used by different stages in the entire process. While knowledge storage especially benefits from those emanating from the field of information technology, the adequate organizational culture is especially relevant for the stage of knowledge distribution, in order to avoid the orientation toward knowledge management as 'appropriation' of individual (expert) knowledge (Bahra, 2001). It could be also stated that such a culture may also represent a significant factor for the success of the *entire knowledge management cycle*, which corresponds to the literature, representing the 'cultural school' of market orientation. Namely, Narver & Slater (1990), Deshpande et al. (1993), as well as other studies, have indicated that customer-oriented organizational culture both increases the efficiency of organizational processes and their final output, viewed in terms of organizational performance. In the knowledge management context, we propose that this kind of culture serves as a comprehensive 'enabler' of activities and processes relevant for all knowledge management activities, i.e. that it represents the 'collaborative' viewpoint of the overall knowledge management cycle.

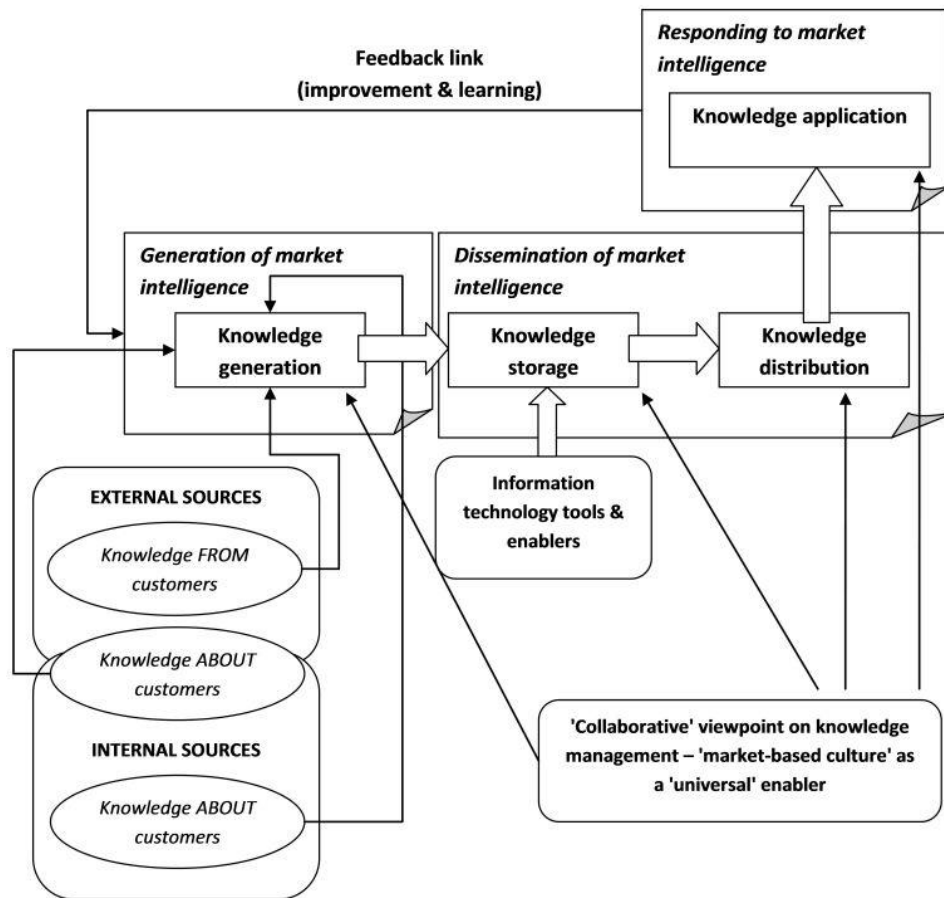


Figure 1. The proposed 'unified' model of knowledge management

5 Future research directions

In this article, we discuss novel developments in knowledge management coming from external sources of knowledge creation and propose a comprehensive theoretical model, which brings together multiple theoretical streams, especially those from the fields of marketing and management. Our main concern has been the fact that the knowledge management *per se* does not provide 'reality check' for the usefulness of knowledge assets being collected and accounted for as valuable basis for further action. In addition, there may be multiple mechanisms for collecting knowledge within the firm, especially in the field of marketing intelligence, which may be addressed by means of customer relationship management (CRM), market research, social media management, etc. Those

mechanisms may not be mutually coordinated, as to provide a consistent ‘unified picture’ of customers’ requirements and responses to actual products and processes. Human resource and leadership practices, leading to a culture of sharing and collaboration among employees, are also considered to be significant enablers of knowledge management, but could be overlooked in technology-focused knowledge management initiatives.

Two dimensions of knowledge management (‘technical’ and ‘collaborative’), as well as multifaceted character of research in this field and complexity of practical application of the knowledge management concept, require a sound integration of relevant marketing and management paradigms. We believe that the stages of ensuring organization’s market orientation should be equated to the fundamental activities of knowledge management (in its ‘technical’ dimension), while multiple enablers of the entire process (in its ‘collaborative’ dimension) could be merged into a single one - the market-oriented culture. The resulting model is, therefore, oriented to overcoming potential shortcomings of knowledge management by connecting it to the relevant customer-centric practices.

Such a conceptual model calls for further improvements and empirical verification. As to facilitate such a process, we have used the conventional marketing constructs, related to the understanding of the market orientation, in order to augment the existing knowledge management models/theories. Namely, these constructs can be easily measured and empirically validated by using well-accepted tools, such as MARKOR scale/questionnaire for market orientation (Kohli, Jaworski & Kumar, 1993).

6 Conclusion

We propose that the potential shortcomings of the knowledge management models in contemporary business settings can be addressed by integration of relevant marketing concepts and novel approaches to collecting customer-based knowledge. Based on such a proposition, this chapter develops a new conceptual model of knowledge management, which brings together relevant theories and practices from the fields of management and marketing.

From the viewpoint of knowledge utilization in contemporary corporate environment, theoretical contributions developed by considering both managerial, as well as marketing perspectives, are not a common place of the literature. This should serve as an encouragement for studies dealing with the issue of integrating additional perspectives into the existing knowledge management models. In such a context, our model may serve

as a sort of a 'rough sketch', which needs to be further empirically tested, especially regarding our hypotheses on: (a) existence of relationship(s) between the stages of the knowledge management cycle and the market intelligence activities and (b) functions of the customer-oriented organizational culture as a comprehensive enabler of knowledge management. We also hope that additional theoretical dimensions, especially those reaching into the business/marketing strategy, could be successfully integrated into the proposed model.

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The Impact of Social Media Activities on Divergent Thinking and Creativity – A study of Knowledge Workers in Germany

Oliver Mauroner *

Bauhaus University Weimar
Professor of Innovation- and Creativity Management
Helmholtzstraße 15, 99425 Weimar

Holger Breitenborn

Fraunhofer Institute Jena
Strategy and Marketing Department
Albert-Einstein-Str. 7, 07745 Jena

** Corresponding author*

Structured Abstract

Purpose – The purpose of this paper is to show how knowledge workers from research institutions use social media tools for networking, information search, and idea generation. This paper aims to examine how social media may enrich the practices of knowledge transfer, knowledge management and creativity.

Design/methodology/approach – On the basis of structured interviews with knowledge workers from universities and public funded research institutes in Germany, the sources of information and inspiration in the course of idea generation as well as the impact of social media on creative processes are analysed.

Findings – The paper shows that most interviewees, who are heavily involved in creative processes, confirmed the utilisation of variable social media tools. They primarily use social networks to endure relationships with business acquaintances, to keep in touch with colleagues, partners and friends, which can be seen is first step in getting access to their knowledge base. Although, the study could not show that social media is explicitly important for knowledge acquisition or idea generation.

Research limitations/implications – Further research should include large-scale surveys to analyse causalities of the minor importance of social media in knowledge-intensive work fields. Upcoming research involving knowledge workers from other technological areas could help extracting effects caused by specialisation or industry-related influences.

Originality/value – The authors present insights on work principles of knowledge workers whose primary tasks are to exploit knowledge and to implement ideas.

Key words – Creativity, knowledge workers, social media, idea generation

Paper type – Academic research paper

1. Introduction

External forces such as an increasing international competition, advances in technology, and other influences have escalated demands on all kinds of organizations to be innovative (Andron, 2013; Lawson & Samson, 2001). Therefore firms are pressured to innovate, to adapt and to use all types of knowledge available. Research shows that the diversity of knowledge is positively related to divergent thinking and, consequently, positively related to creativity (Williams, 2004). Thus, personal and situational factors that affect knowledge acquisition and divergent thinking, and might also influence the creative performance of organizations (Williams, 2004).

The emergence of social media technologies has dramatically changed the Internet. The term social media indicates mobile and web-based communication technologies that are typically used to connect people and communities, as well as to share, discuss, co-produce and modify user-generated content (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011; Lewis, 2010). Recently social media has been categorised into four main groups (Mao, 2014):

- Social networking tools and instant messengers such as Facebook, Skype, Tumblr and so forth.
- Tools for social publishing, social sharing, bookmarking, and collaborating, including tools like blogs, wikis, Twitter, Delicious, Flickr, Youtube, Picasa, GoogleDocs, Spreadsheets, Slideshare, Dropbox, Glify and so on.
- Social tools for content management as well as calendars, surveys, and polls such as Moodle or Edmodo.
- Virtual worlds and gaming environments such as SecondLife, WeeWorld, Webkinz and so forth.

In this study we define social media as applications that utilize web technologies and allow users to create and participate in communities through functions such as communicating, interacting, sharing, collaborating, and publishing. It is obvious that social media has generated new opportunities to create content and to provide and capture interdisciplinary knowledge, particularly regarding the existence of a wide variety of information (Leftheriotis & Giannakos, 2014). Different social media technologies, like social networkings, online forums, wikis, blogs, and microblogs are becoming a reliable platform for sharing information to target audiences in a contemporary manner (Osatuyi, 2013). In social media networks (e.g. Facebook, LinkedIn, MySpace, Google+, Xing) or

collaborative communities people share experiences and information, which pertain not only personal interests but also professional matters. Therefore a large number of professional forums and professional networks have evolved (e.g. ResearchGate, Academia, Mendeley).

Social media becomes more and more important for various types of organisations and in the near future it will probably be an indispensable building block in the innovation management process. By using social media applications, employees gain access to varied and diverse knowledge, which influence their propensity for original, independent, and unconventional thinking and problem solving (McCrae & Costa, 1997). Reconsidering that the link between openness to experience and divergent thinking is empirically tested (McCrae, 1987), it can be assumed that individuals who have access to diverse knowledge and diverse social networks tend to show divergent thinking and to be more creative (Williams, 2004). Social Media may enrich the practices of knowledge transfer, knowledge management and creativity in organisations (Luo, Zhang, & Duan, 2013).

Aim of the study is to get new insights on how the use of social media channels by knowledge workers affect creativity, idea generation and innovation management in organizations. We also want to understand what triggers knowledge workers to use social media for profession-related communication and knowledge exchange.

In section 2 we introduce related work and some theoretical viewpoints upon which this research is grounded. In section 3 we introduce the research approach and the methodology. In section 4 we present the empirical results. In closing, we discuss the outcomes of the study, and highlight the limitations and the implications that arise for researchers, practitioners, and executives.

2. Social media and work creativity

There is a lot of existing research on how social media is generally used in a professional or corporate environment (Kaplan & Haenlein, 2010). There have been studies on the values of using social media for work purpose (Leftheriotis & Giannakos, 2014). Many studies analyse a specific social media tool, e.g.: corporate community weblogs (Liao, Pan, Zhou, & Gan, 2012), micro-blogs in a corporate context (Riemer & Richter, 2010), social bookmarking (Millen, Feinberg, & Kerr, 2006), social networking

(DiMicco et al., 2008; Morris, Teevan, & Panovich, 2010; Skeels & Grudin, 2009), and enterprise wikis (Grudin & Poole, 2010).

In the following sections we will first discuss existing research and theories on social media for work purpose in general and we will then focus on knowledge workers, their sources of inspiration, and their social media use.

2.1. Social media for work purposes

Different social media channels are becoming integral parts of work environments. Expected advantages consist of maintaining external professional networks, creating and strengthening ties with colleagues, gathering professional information, and promoting knowledge sharing (Leftheriotis & Giannakos, 2014; Skeels & Grudin, 2009). Social media applications seem to have the potential to provide knowledge and communication, and to increase work performance as a consequence (Tsay, Dabbish, & Herbsleb, 2012). They offer peer-based communication and collaboration. Recent studies of user behaviour show that employees use internal social networking to build stronger bonds with their weak ties and even to reach out to employees they do not know (Leftheriotis & Giannakos, 2014). Thus, social media not only reinforce ties but also create new ones. Motivations in doing this include connecting on a personal level with coworkers, advancing their career with the company, and campaigning for their projects (DiMicco et al., 2008). Although the contribution of weak ties to productivity is difficult to prove, some authors anticipate a fast uptake of social networking applications by organisations (Skeels & Grudin, 2009).

Other studies argue that social media use at workplace may reduce productivity of employees due to the fact that they spend long periods of time online and chatting (GFI, 2011). Moreover some authors examine major potential risks and call attention to the fact that social media may be time-wasters and security traps (Turbana, Bollojub, & Liangc, 2011). Altogether, we still know very little on specific social media's impact on work principles and work performance.

2.2. Knowledge workers, their sources of inspiration, and social media usage

Research scientists from universities and non-university institutes are ideal types of the so-called knowledge workers. Scientists can be seen as specialists with the main task of creative performance, which may be defined as the use and combination of knowledge,

imagination, and skills to invent a novel process, product, procedure or idea (Amabile, 1997; Scott, 1995). Scientists primarily offer knowledge and creativity to their employers, partners, and customers. Therefore scientists need to manage knowledge and creativity as their strategic resources. In order to create new knowledge, researchers seek to combine and exchange information and know-how with colleagues and must often go outside the boundaries of their institutes to obtain the needed resources (McFadyen & Cannella, 2005). As knowledge creation is affected heavily by exchange with others, both within and outside the organisation, social media may enrich work practices. Although McFadyen and Cannella (2005) argue for a curvilinear effect between distance and knowledge, in that spatially close and distant exchange partner locations will have a greater effect on knowledge creation than middle-sizes distances.

Social media have dramatically changed the way how people work and interact socially and professionally, impacting scientific research in a number of way. The free and rapid flow of information, ideas and documents both requires and fosters new habits of collaboration among researchers (Rinaldi, 2014). Worldwide many scientists recognize the potentials of social media tools for visibility and constructive conversation . Science blogs for example have sprung up over the past few years. Pioneers like Christie Wilcox, a biologist from the university of Hawaii, argue that scientists have the responsibility to bring to the public the results of their studies and that blogs seem to be a straightforward method (Wilcox, 2012). Others see blogs and social networks as eligibly tools to reach a wide audience, which is seen as an integral part of science (Fenner). One of the most popular twittering scientists with more than 210,000 followers – the British physician Stephen Hawking (Hawking, 2014) – does not only tweet his research results but also expose parts of his personality to get stronger personal connection between his follower and himself (VanEpperen & Marincola, 2011).

Research scientists currently use social media for two primary reasons. The first reason is networking with colleagues, partners, and customers; the second reason is making results more visible to funders, policy makers, and even the public (Rinaldi, 2014). Social media helps to build dialogue and constructive conversation with the public, particularly about sensitive topics, like genetic engineering and stem cell research (Rinaldi, 2014). Therefore social media channels are bearers for communication strategies for universities and major scientific corporations.

From a theoretical perspective social influence plays an important role in the field of using information and communication technologies. Many studies have explored a significant effect of social influence on technology adoption in general (Olschewski, Renken, Bullinger, & Möslein, 2013). We assume that social media usage by knowledge workers and other employees is evidently influenced by role models and by the perceived organisational support. The former can be defined as the degree to which employees perceive that important colleagues use social media in their everyday work. The latter – perceived organisational support – can be defined in terms of the extent to which employees perceive encouragement, respect, and recognition from the organisation for those who use social media. Wilcox (2012) stated that scientists may feel a “need to be engaged in new media platforms because everyone else is already talking about their thoughts and feelings, having discussions about things they care about, and generally—as the name implies—being social.”

Beyond networking, visibility, and public dialogue, social media may also help in collecting information, gathering knowledge, and getting in conversation with customers and partners. As research scientists are always in search of knowledge and science-related news, social media may be an interesting source of information. Information sharing among individual researchers is assumed to be benefit-oriented (Osatuyi, 2013). According to social exchange theory people evaluate costs, time, and benefits before sharing information with others. Therefore social media could offer timesaving and cost-effective ways to get access to a wide range of different information in particular. Benefits anticipated by social media information exchange have been found to be the building of social capital and reputation (Constant, Sproull, & Kiesler, 1996). Osatuyi (2013) stated “sharing information socially also gives an intrinsic benefit to the provider by confirming their ability to provide information that is considered useful by the social network in which they belong”. This applies even if there is no personal connection between information provider and information seeker (Constant et al., 1996). Social media affects networking ability, which might have an impact on creativity and idea implementation. Moreover, social media activity can have an impact on the formation of domain relevant skills, which according to Amabile (1997) can be seen as an important factor associated with individual creative performance. Domain relevant skills include knowledge about the domain itself, technical skills required, and special domain-relevant “talent”.

Despite the evident pros of social media usage, information shared on social media sites face a credibility problem (Osatuyi, 2013). Therefore from a users perspective, verifying the information provider and the information itself is necessary and increases the costs of sharing information. Trust and authenticity issues might be reasons why some professional user groups still use social media very moderately. Many scientists show a critical scepticism and perceive mainstream social media sites (e.g. Facebook) as unprofessional platforms that firstly do not provide an environment conducive to productivity and secondly may even compromise serious research (VanEpperen & Marincola, 2011). Although, other authors state that social networking sites hold a huge potential for sharing information among scientists (Osatuyi, 2013).

Thus a high level of social media activities can have a positive impact knowledge worker's information base as well as on their ability to adapt existing knowledge. On the other hand habitually users of social media platforms need large time resources for their social media activities, which may shrink productivity, in particular when these activities are done during working hours. These assumptions indicate an ambiguous relationship between social media activity level and creativity of knowledge workers. Moreover, we assume that this relation is influenced by their personal characteristics (such as motivation) as well as the type and quality of social media interactions.

2.3. Research questions

Research scientists are prototypes of knowledge works. They need to combine different knowledge to solve challenging problems. Therefore, research scientists are permanently in search of new knowledge and up-to-date information on very interdisciplinary topics. Many authors state that most scientists use social media for networking and visibility (Rinaldi, 2014), but it is still not clear if and how social media usage enhanced the development of creative ideas. Moreover there is still a lack of knowledge on factors influencing social media usage in everyday work, like acceptance and organisational support. Therefore profound recommendations for practice and research cannot be given.

We seek to answer the following research questions through a qualitative study of knowledge workers employed in the scientific sector.

RQ1: To what extend do knowledge workers use social media?

RQ2: For what purposes do knowledge workers use social media?

- RQ3: Which opportunities and threats feel knowledge workers in connection with the use of social media?
- RQ4: What influences social media usage by knowledge workers?
- RQ5: Does social media usage have an impact on knowledge management and idea creation?

3. Research approach and methodology

To get more information about the use of social media for the purpose of knowledge creation and idea generation we undertake a case study among a specific sample of employees, namely research scientists from university and non-university institutions, which can be seen as prototypes of knowledge workers. In contrast to universities, non-university institutes are partly private-funded. They operate similar to private firms or private research companies because of a competitive environment.

The research study described in this paper used structured in-depth interviews to gather individual perceptions toward the idea generation and the use of social media sites for that purpose. Consequently, we collect and analyse information on individuals' creativity, sources of information and inspiration, as well as social media activities. Moreover, we collect information on the personality and the institutional affiliation of the scientists – university or non-university – which may have an influence on the impact of social media activities on personal creativity and work performance.

Participants were research scientists in the field of photonics from a university and a non-university institute in Germany ranging from 30 to 45 years of age. Due to the gender ratio of photonics research, most of the participants were males. Although the unfavourable gender ratio the photonics area of research is an appropriate test sector due to its interconnectedness with many other disciplines.

Up to the moment we conducted structured in-depth interviews with four research scientists. We plan to undertake more interviews with other research scientists to expand the database. In this respect we also plan to broaden out the scientific area, which currently is limited to the field of photonics. Therefore, we target to be able to present more profound results at the conference in June 2014.

The interview transcripts were subjected to a content analysis in order to systematically examine the qualitative data. Empirical categories were developed

concerning the emergence and development of ideas, social media experiences of knowledge workers, social media for profession-related communication and knowledge exchange, and the general conditions for social media usage for work purposes.

4. Results

4.1. Emergence and development of ideas

The results show that research scientists are knowledge workers because their main capital is knowledge. Their work is characterised by the primary task of project-based and non-routine problem solving, which need a combination of different knowledge. Interviewees spend a high amount of their time searching for new information. All interviewees have at least university graduation; half of them have a PhD, which shows that they all have a deep background in education.

All respondents state their high dependence on information technology. Even though, the sources of knowledge and the inspirations for new ideas differ. Main sources of information and inspiration are four: (i) the Internet especially search engines – e.g. Google, Google Scholar – and relevant websites, newsletters, newsfeeds, and magazines but also Wikipedia and different specific databases; (ii) direct (and e-mail) contact with colleagues and meetings with partners from industry and science; (iii) scientific conferences and congresses; (iv) requirements from industry and other partners, previous research results.

Several interviewees state that periodically occurring talks with question-and-answer session within the own organisation seem to be very inspiring. Thereby a wide range of knowledge evolves on what the colleagues are working on.

Apart from the Internet, daily newspapers, TV and radio programmes seem not to be noteworthy sources of knowledge and inspiration. Also patent specifications are of secondary importance as idea providers, given that interviewees look at patents not until a statement of a problem or an idea is on hand. The results also show that knowledge workers demand leeway for ideas and freedom of action to show the best results. Good ideas frequently appear outside the office, on business trips, on the way to work, and even during leisure time and sport activities. The following table summarises the main sources of information and inspiration.

Table 1: Sources of information and inspiration.

Internet	Direct conversations	Conferences
- Search engines	- Conversations with colleagues (at the office or at the break room)	- Knowledge on what others do
- Websites	- Presentations and question-and-answer sessions within own organisation	- Information can be combined with own work
- Newsletter, newsfeeds	- Conversations with partners from industry and science	- Sharing of interesting problems and challenges with others
- Wikipedia		
- Professional and scientific journals are widely read online and not as print versions		

In the following we show statements given by the interviewees relating to the sources of knowledge, inspiration, and ideas (interview number and age of the interviewee in parentheses).

Ideas result from requirements. Like when partners say what they need or want. First ideas often evolve in the course of the conversation. [...] Conferences and talks are good. There I get input. I think about it and sometimes I try to combine it with my own stuff. [...] I do sports; that clears my mind for ideas. (No. 1, 33 years)

Somehow ideas are result of previous projects. [...] Exchange with long-standing partners helps a lot. [...] Optics and photonics is a small sector, people know each other and relationships are often very long-lasting. It seems like a big family. This can be good and bad for idea exchange and for cooperation. (No. 2, 45 years)

There ... [at conferences] ... I pick up ideas and I ask myself how can we do this better with our own means. [...] I don't start with patents; I start with an idea or a problem. Patent language is not my much-loved language. (No. 3, 35 years)

Stimuli come from outside the institute; firms ask for solutions and we try to find them. [...] We need this external perspective to get new inspiration for our work. (No. 4, 32 years)

Knowledge workers not only have to collect information and to think by themselves, they also are involved in teams, have to communicate, to exchange knowledge, and to network with colleagues and partners for enhancing and refining ideas. Knowledge exchange happens both within and outside the organisation. Although department meetings seem improperly for substantial knowledge exchange but rather suited for organisational instructions. Interviewees prefer small groups of colleagues and partners

even though many of them recognise the value of one or two outsiders, which are not directly involved in the project.

Most of the time we meet for a coffee in the break room. That's always a good choice when you are at a loss. (No. 1, 33 years)

I know many people at the institute. I just go there and ask. Most of the time I get an answer, or at least a recommendation where to ask again. [...] Sometimes it's good to have some outsiders in the discussion; they open up new vistas and bring new ideas. (No. 2, 45 years)

Our group leader has the most part of customer relations. He supplies us with task and we try to solve and to implement. (No. 3, 35 years)

Large meetings of 30 people or more are too big. They are just to organise duties and responsibilities. [...] Once a while we meet groups from other disciplines like material science or chemistry; we tell them what we do and they tell us what they do. These kinds of meetings are very helpful to get inspirations for new projects. (No. 4, 32 years)

4.2. Social media experiences

Nearly all respondents state that they have personal experiences with social media to a certain amount. It can be confirmed that researchers generally use a variety of different tools. Moreover, it appears that a strict separation of private and work-related social media use is irrelevant for scientific researchers. The interviewees justify this behaviour with two main reasons. First of all social media are seen as one communication channel with same content and same rules of conduct due to the fact that often friends are colleagues or partners at the same time and some colleagues are close friends. Second, the interviewees state that many parallel social media profiles by one person might be tremendously time-consuming, inefficient, and with no added value for information chasing. Anyhow all interviewees keep in mind not to share any confidential information on social networking platforms such as Facebook, LinkedIn or ResearchGate. The respondents of the study are using all four main groups of social media (Mao, 2014):

- *Social networking tools and instant messengers:* All respondents have at least one profile on a social network, where Facebook and Xing (a German version comparable to LinkedIn) are the most common. Some respondents state a request for a corporate or enterprise social network (ESN), which work like Facebook or other social networks but are restricted to use by employees and protected by firewalls – in accordance with Jarrahi (2011). The interviewees argue that people could foster

connections with other members of the same organisation or strategic partners by creating online semi-public profiles (Leftheriotis & Giannakos, 2014).

- *Tools for social publishing, social sharing, bookmarking, and collaborating:* scientific researchers use predominantly blogs, wikis, social bookmarking, although the use of this kind of tools seems not to be very intensive. Some respondents use collaboration platforms frequently, in other cases administrators consider tools like Dropbox or GoogleDocs as security traps; consequently the use of collaboration platforms is restricted in these cases.
- *Social tools for content management and calendars:* Group-scheduling tools (e.g. doodle) are used frequently and very informally. This could be connected to the little amount of information, which is shared by such kind of tools. Moreover, some respondents have little experiences with platforms like Moodle, especially those who are engaged in university teaching. The interviewees do not use other tools.
- *Virtual worlds and gaming environments:* Virtual worlds do not attach any importance to the interviewees in both, private and profession-related circumstances. Indeed most of the respondents have heard about Second Life but do not fully understand the operating mode of virtual worlds.

In the following we show statements given by the interviewees relating to the use of social media applications.

A friend of mine moved to Florida. That's when I started using Facebook and Skype. He works in the same business and it's just good to see what he is doing. Most of the time it's not related to work. [...] Private or work, it does not make much of a difference for me. (No. 1, 33 years)

Google, Goolge Scholar and some newsletters – that's it. [...] I am on Facebook and on LinkedIn. My profile on LinkedIn is kind of abandoned; I arranged it for some international cooperation partners, but now this project is over. I used Xing at the time when I was looking for a job; now I just try to keep my profile up-to-date. (No. 2, 45 years)

I am on Facebook. I used to be sceptic but now I agree. It's nice to stay in contact with old friends; sometimes they also work in the same field. [...] I don't use Facebook for official business. Project-information has no right to be on Facebook. (No. 3, 35 years)

I'm also on ResearchGate, but just at the beginning, my track is not very long. But it looks interesting for me. (No. 4, 32 years)

Altogether the results show that knowledge workers use social media applications like any other professional guild members. They probably are worried about vulnerability and security issues much more than other users. Therefore it seems also that knowledge workers pay attention not to spread any or as little as possible of both personal data and confidential information on social media channels. An exception is probably made by social collaboration platforms such as GoogledDocs or Dropbox, given these tools are often seen as protected areas.

The results also show that the intensity of private and work-related use of social media applications seems to be related directly. The more and the manifold knowledge workers use social media for their private needs, the more intense and multifaceted is social media activity for work purposes. However the sample size is too little to draw conclusions on other influencing factors such as age, gender, and other demographical factors. Nevertheless a general tendency seems to be a negative relationship between age and social media activity. This could be also named as “digital native effect”, which could be noticed in the next years when more workers who where born after the introduction of digital technologies poor into executive positions. These workers have often been interacting with digital technologies from an early age and therefore probably a native understanding of social media.

4.3. Social media for profession-related communication and knowledge exchange

The interviews show some trends and commonalities with regard to the application of social media for knowledge management, idea generation, and other work-related issues. First of all, social media is understood as a natural tool for information search, especially when it is about particular information on specific technologies, processes, products, or applications. In this cases knowledge workers use newsletters, newsfeeds, blogs, as well sharing platforms such as Youtube, Slideshare, TED. Sometimes the numerous sources are brought together on one particular social media platform (e.g. Facebook). Especially young users appreciate the accessibility and the easy ways of forwarding and sharing information with colleagues.

Social network platforms are moderate popular among the respondent knowledge workers. This refers not to the simple question “yes or no” but to the nature and modality of application. Knowledge workers use profiles in social networks primarily to offer information to others and not to interact with others. The profiles are used as substitutes

for traditional offline business cards or as public accessible personal data sheets. By this means scientists try to improve the visibility of the own person, group, and research topic. The interviewees use predominantly Xing and ResearchGate for work-related purpose as well as Facebook for both work-related and private purpose. LinkedIn is known by all interviewees but not in use regularly since it is seen suitable for international partners and somehow inappropriate for national partners. One main reason for using social media platforms is to consolidate contacts made occasionally on conferences or business meetings. A social media relationship makes it easy to keep in touch on a long-term perspective with new “friends”, even if the persons change their employers or affiliations. Such weak relationships may shorten the restraints of contacting others with questions or even project proposals. Insofar social media contributes to crosslinking and interconnectedness of stakeholders, which is an essential requirement for co-creation and diversity of ideas. Some interviewees use advanced functionalities and create groups within a social network to provide well-arranged networks within the larger, more diverse social networks. Groups allow for closed or open access, invitation and joining by others outside the group. In some cases, social networking groups have become important to maintain a structure in ones personal social and professional life (e.g. study groups). The study shows some evidence that a small group with less than 8 people may also be used for work-related discussions.

In the following we show statements given by the interviewees on the profession-related use of social media.

It's just to keep the contact if people move to other places. (No. 1, 33 years)

I don't do much. It's just for information search. [...] I'm member of a Facebook group. There I get some news, like fairs and exhibitions. It could be used for recruitment, because the right people is there. (No. 2, 45 years)

Xing, Facebook, all that has little impact on my job. It would be more interesting if the whole organisation would be on; everybody with it's own profile. That could help to get in touch with more people. Maybe also with some other institutes, but then it's always a question of competition or not. (No. 3, 35 years)

On Facebook I have a closed group together with some friends. We are just four. On this place we talk and debate – sometimes also some professional issues. (No. 4, 32 years)

Within universities and research organisations the main application of social media with practical relevance still are public relations, marketing, and recruitment. Some

interviewees use their own private social media network to invite others to conferences and exhibitions, or to inform others about interesting job offers and contests.

4.4. General conditions for social media usage for work purposes

Results show that knowledge workers use social media for networking activities in their personal context and also in their institutional context. Regarding the general conditions for social media usage it is necessary to distinguish between an individual perspective and a more institutional perspective. From the individual perspective the results show that knowledge workers have many options to integrate social media activities in their work processes. However it seems that a professional and creativity-supporting handling of social media applications is not a normal case but makes an exception. Employees use social media mainly for self-profiling and information search and minimally for idea development and co-creation. Therefore it can be assumed that social media is only to a certain extent integral part of the everyday workflow of most knowledge workers.

From an institutional perspective it seems that degree of management level is negative related with social media activity. This of course could be also a question of age, but nonetheless it has an impact on the organisation. Directors, heads of departments, and heads of research groups seem to be very conservative with social media application. Interviewees state that top management does focus solely on offline networking. Workers have the feeling that top management does not appreciate social media activities; in fact social media is often seen as waste of time. Middle management instead uses some social media applications in a very passive way, such as profiles on research-related social networks (e.g. ResearchGate). However the results show that social media is not associated primarily with value generation but rather with security issues and time issues.

In the following we show statements given by the interviewees relating to the general conditions for social media applications.

My Boss does not use social media. However, there are no rules or guidelines for social media use. So we use dropbox quite often to share and collaborate. (No. 1, 33 years)

It's more an object of the younger colleagues. I know some people who do blogs or something alongside. But it's more for fun. It's always a question of time and one's own initiative. (No. 2, 45 years)

I would allege that our department chief is sceptical and does not see much benefit of social media applications. For him it's more like a waste of time or additional work with little added value. Otherwise we never gave it really a try. [...] Also the IT-department has some reservation due to the security issues. [...] We should try some internal applications. (No. 3, 35 years)

Facebook, Xing and all that does not play a big role. That's my opinion. Department head is very sceptic on it. My group leader is on ResearchGate with a nice publication list. It's like a digital publication list with some cross references. ResearchGate is accepted in our group, as well as Xing is. (No. 4, 32 years)

In university and non-university research institutes, which explicitly are hubs of knowledge work, social media is still considered as a “secondary theatre of war”. Social media activities are not appropriate actions to earn stripes in the professional career of most research scientists. However, all interviewees state that social media activities are widely accepted or at least tolerated by their group leaders, but in no way requested. Some social networking platforms with a focus on work-related use (e.g. LinkedIn, Xing, ResearchGate) are accepted while others (Facebook) are associated with fun, leisure, and pastime. Work groups to facilitate internal and sometimes external cooperation, however, use some social media services, e.g. tools like Dropbox or Skype. Altogether, the results indicate that managers and group leaders focus on security risks and time issues, and underestimate the prospects of social media usage to improve creativity and idea generation.

5. Conclusions

This exploratory study shows that social media is indeed an additional but nonetheless important element of knowledge work processes. The knowledge workers are completely aware of the importance and potentials of social media for their processes. However, some actors – Internet agencies, marketing offices – overestimate the current meaning of social media for knowledge work, whereas the knowledge workers themselves and their managers are often unable to utilize its full potential and to promote them. Therefore it is necessary to develop concepts for an integration, exploitation, and promotion of social media activities in creative and knowledge-based work environments.

Indeed it could be shown that knowledge workers use social media to gather information, get stimuli for research, exchange knowledge, and improve their ideas. Although it can be seen that there are a number of uncertainties associated with social media usage. The findings allow drawing some conclusions. First, social media activities are adequate to expand profession-related networks and to strengthen weak network ties. These activities, moreover, assure visibility, traceability, and relevance of single researchers, research groups and research topics.

To support creativity and innovation in organizations, managers of creative groups need to focus on providing individuals with opportunities to develop their networking skills (Baer, 2012; Ferris et al., 2007). In particular, networking and different types of social relationships gives people access not only to like-minded colleagues but also access to a wide range of different information. Therefore social media supports cooperation in an indirect way.

Second, the acceptance of social media technologies by supervisors and executives is an important issue to consider, due to the fact that knowledge workers often emulate their supervisors or other senior employees. Finally, the results provide evidence to support the claim that social media technologies are structurally different; hence they are used differently to convey different purposes. The findings from this study suggest that scientific and technology-related websites, newsletters, and blogs show a great potential for supporting creativity. In addition, social networking sites are used not only for profiling but also as pin of a personal social media framework, when people integrate blogs and newspapers to their personal social network account. A general tendency seems to be a negative relationship between the intensity and variety of social media activity on the one hand and the age of the users on the other hand. The expected “digital native effect” should provoke more workers who were born after the introduction of digital technologies to poor into managing positions.

Kietzmann et al. (2011) provided a honeycomb framework of seven social media building blocks: identity, conversations, sharing, presence, relationships, reputation, and groups. The building blocks are not considered as exclusive, nor do they all have to be present in a social media activity. However the blocks serve as constructs, which describe specific facets of social media user experience. The results of our study show that knowledge workers currently assign their priorities on four of the six building blocks: identity, presence, relationships, and reputation. The other blocks – conversations and

groups – require a better understanding of challenges and opportunities, and need more elaborated concepts how to integrate these blocks in a typical workday of knowledge workers.

Of course the study has some limitations. First of all it is reckoned that the results of exploratory research are not usually generalizable to the population at large. In particular, the restricted number of interviews strongly limits the generalizability of the results. Therefore we plan future research with a large sample. However, the results provide significant insight into how a small group of knowledge workers use different types of social media technologies. This could lead to the formulation of theories to model knowledge management and creativity on social media. Moreover this study was conducted in the photonics sector, an environment with unbalanced gender population, in favour of men. However, prior research has shown that women constitute an important part of social media users.

Since the study has its restrictions further research should continue investigation social media usage of employees for the purpose of information sharing, communication, and idea generation using a larger dataset. There are still a number of uncertainties associated with the use of social media sites for sharing information. The most important one seems to be the credibility of both, the information itself and the information source (Osatuyi, 2013). Therefore further studies should include additional aspects such as the necessity to provide means of verifying information and the costs of sharing information on social media sites.

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Limitless learning: An assessment of how a global firm leverage local knowledge through social media

Breunig, Karl Joachim

Oslo and Akershus University College of Applied Sciences
PO Box 4 St. Olavs Pl., 0130 Oslo, Norway

Structured Abstract

Purpose: This empirical paper assesses the ability to leverage learning within a globally dispersed project environment facilitated by the web 2.0 technology of wiki. Extant research on the knowledge transfer within multinational firms emphasise exchange between HQ and subsidiaries. In contrast, recent developments in organizational learning theory suggest that learning occur at multiple levels; organizational-, group- and individual level. In this paper we explore this tension by empirically exploring the research question: *How is social media utilized in the global organization in order to leverage local learning between dispersed individual experts?*

Design/methodology/approach: The study is based on an exploratory, in-depth single case study of the implementation of an internal wiki in an international professional service firm.

Originality/value: The paper extends earlier research and shows how an international knowledge based organization can utilize web 2.0 technologies to leverage knowledge and experiences from multiple geographically dispersed projects, and how the effects of wiki can be conceived at an organization-, practice- and content level.

Practical implications: The findings identify four determinants of the use of the wiki to leverage local learning within a globally dispersed project environment. First, the wiki must directly relate to the daily work carried out in the organizations projects by offering interactive and updated information concerning current project challenges. Second, the system must enable transparency in the daily project work so that on going activities can be searched. Third, the intention with the search is of lesser degree to identify encyclopaedic information than it is to offering visualization of individual competence and expertise, and fourth there needs to be a sort of quality assurance of the data posted at the wiki.

Keywords: Knowledge leveraging, multinational firm, organizational capabilities, social media, sustained competitiveness

Paper type: Academic Research Paper

1 Introduction

Since De Geus (1988) stated that “learning may be the only sustainable competitive advantage”, there has been an increasing acknowledgement of the fundamental importance of organizational knowledge to firms sustained prosperity (Barney, 1991; Grant, 1991; Petraf, 1993; Spender, 1996; Teece, Pisano, and Shuen, 1997). As an extension of the awareness of knowledge as critical to firms competitive advantage its capacity to effectively and efficiently developing and sharing knowledge have been addressed as determining. The nexus of leveraging knowledge is particularly important for knowledge based organizations such as Professional Service Firms (Løwendahl, 1997; Maister, 1993; von Nordenflycht, 2010). In fact, PSFs are pointed to as models for modern business, and it is assumed that increased knowledge about this type of organizations knowledge based value creation dynamics can highlight important aspects of both competitiveness and innovation based on knowledge intensity (Løwendahl, Revang, and Fosstenløyken, 2001; Pettigrew, Thomas, and Whittington, 2002). Professional service firms have traditionally been described as having a national scope and with partnership structure as the norm. However, recent empirical research on professional service firms indicate that these types of firms are more heterogeneous than originally expected (Malhotra and Morris, 2009). It is particularly evident that an increasing number of professional service firms are internationalizing and as they do they seek to reduce internal heterogeneity to maintain coherence in their international operations (Lovelock and Yip, 1996; Spar, 1997). An important element in achieving this is to professionalize the way knowledge is managed within the professional service firm, and these efforts to standardize offers particular challenges to professional service firms that often are dependent on a high degree of local responsiveness and customization in close client interaction to offer their services (Breunig, Kvålshaugen, and Hydle, 2014). Nevertheless, internationalizing professional service firms are simultaneously dependent on their ability to leverage their globally distributed resource base.

Recently technological developments have revolutionized how individuals communicate and share knowledge across boarder through social media. Social media are channels or platforms that utilize the internet to enable interaction between one or several users such as Facebook, LinkedIn, twitter, Google+, blogging, wikis, YouTube and crowd

sourcing to mention a few. Over 1,5 billion people world wide are currently members of various social networks (Chui, Manyika, Bughin, Dobbs, Roxburgh, Sarrazin og Westergren, 2012). The research on social technologies as applications that enable interaction between individuals have predominantly explored how social media affect the private sphere. However, increasingly there is an awareness of the benefits to organizations from the use and integration of social technology also into the work sphere. The utilization of social technology imply improved collaboration and communication, both internally and between organizations (Kiron, Palmer, Phillips, and Kruschwitz, 2012) and is suggested as a potential source of increased productivity of knowledge workers (Chui et al., 2012).

This empirical paper explores the use of social media in the leveraging of knowledge in one global professional service firm. The question addressed is *how is social media utilized in the global organization in order to leverage local learning between dispersed individual experts?* The paper is build up as follows. First, relevant theory on leveraging knowledge within international organization is addressed in relation to the merging body of research on social media. Second, the research method is presented along with a description of the single case of an international professional service firm. Third, the paper reveals the findings from a longitudinal study of the design and use of internal wiki system to leverage the learning between multiple local project environments. The conclusion offers a discussion of both the theoretical and practical contributions of this paper, and the perspectives it advances for future research.

2 Theory

International business theory purports that multinational firms outperform local domestic competitors due to their ability to learn in multiple locations and build organizational capabilities (Kogut and Zander, 1993). While, Kostova (1999) states that internal transfers of practices are important for all types of organizations, but for the MNC it is imperative because the primary competitive advantage compared to local incumbents is its superior knowledge, which can be utilized on scale in its subsidiaries worldwide. Thus, the reason multinational corporations exist is because they utilize knowledge from different locations to compete with local actors. Anderson et. al (2002) states that the subsidiary is a source of important new knowledge and that the HQ has a

specific role as coordination and distribution mechanism between subsidiaries and thus decides what and how much to transfer to the other subsidiaries. However, the assumption that the required organizational capabilities are equally distributed within one same firm does not consider knowledge boundaries (Carlile, 2002, 2004) and knowledge stickiness (Szulanski, 2003). Moreover, much theory on learning in organizations emphasize how learning often is local and individually shared in face-to-face relationships - such as in communities of practice (Brown and Duguid, 1991; Lave and Wenger, 1991). Crossan, Lane, and White (1999), integrating important insight from organizational learning theory and strategic management, suggests a multi-leveled framework where the learning process involve feed-forward and feed-backward linkages across individual intuiting, group interpretation and integration and institutionalization at the organizational level.

The framework offered by Crossan et al. (1999) thus contrast the main unit of analysis in international business theory as it emphasise the multileveled nature of international operations extended beyond the organizational level with its sub-units to also encompasses the individual and group levels. In the international business literature the multinational firm (MNC) is popularly portrayed as consisting of two major levels, the Headquarter and the subsidiary. Subsidiary units are the production units but with a varying degree of administrative and innovational responsibilities. Despite this organization level focus, Anderson et. al. (2002) also emphasize advantages through learning in individual relationships. They state that it is trough individual relationships the subsidiary absorbs new knowledge from the environment, and this will have a positive impact on its own market performance. In addition, Hansen (1999) addresses the quality of these relations within the MNC and the effect on the ability to transfer facilitated either through technology or individual interaction. Tsai and Ghoshal (1998) also emphasize that relations are important for transfer of knowledge. The HQ provides structures and a context with shared values for creation and development of social capital (Nahapiet and Ghoshal, 1998). The need for common values, shared language and familiar work practices can facilitate development of social capital, but most importantly is the ability to work together and learn for the same experiences. Hislop (2002) discuss the challenges faced when communicating and sharing knowledge via information technology and (McDermott, 2000) emphasize that information technology only can inspire but not deliver knowledge management. However, recent developments in social media promise

to provide a solution to knowledge sharing between geographically dispersed individuals in global organizations (Kaplan and Haenlein, 2010).

There are several suggestions to the various web 2.0 applications, services and technologies available. Synthesizing previous research, van Zyl (2009) suggest six main web 2.0 technologies; Web blogging, Wikis, social bookmarking, tagging, really simple syndications (RSS) and collaborative real time editor. Thus, in the MNC a fundamental prerequisite condition can be ICT transmission channels for cross-border collaboration (Gupta and Govindarajan, 2000). Recent research indicates that wikis, even more so than other social media tools, have afforded individuals the opportunity to collaborate while geographically dispersed relative to other knowledge management technologies (Levy, 2009; Papadopoulou, Stamatib, and Nopparuch, 2013; Razmerita, Kirchner, and Sudzina, 2009; Sultan, 2013). Previous studies addressed the challenges facing knowledge management solely aiming at codification strategy due to the distributed, tacit and sticky (Szulanski, 2003) characteristics of knowledge entailing personal involvement in the development, and sharing of valuable organizational knowledge (Michailova and Gupta, 2005) were individuals volunteer their knowledge and experience as user generated content (Shao, 2009). Moreover, empirical studies reports that hybrid knowledge strategies, combining elements of both codification and personalization of knowledge, in fact are more common in i.e. the software industry (Mukherji, 2005). With web 2.0 the internet is no longer static, but is used to communicate, participate and collaborate in the mutual editing of available information. Consequently web 2.0 is referred to as social media (Paroutis and Al Saleh, 2009). An example of web 2.0 is Wikipedia where several distributed individuals cooperate to produce and update information in contrast to established encyclopaedias where information was static and predetermined by a selected experts (Paroutis and Al Saleh, 2009). In the following chapter, the main focus will be on wikis. "A wiki is a web site that allows online collaboration by allowing multiple users to add, remove or edit content and changing content. It also allows linking among any number of pages." (van Zyl, 2009, p. 908).

3 Method

This single case (Yin, 1994) of this study is based on an in-depth qualitative exploration across several subsidiaries within one global firm. We deploy an explorative

inductive research design justified by the lack of unambiguous theory on the utilization of social media to leverage knowledge and experience within international professional service firms. Qualitative data are useful for generating theory when the existing theory contains inherent contradictions or is poorly investigated (Graebner, Martin, and Roundy, 2012). The firm was theoretically sampled (Eisenhardt and Graebner, 2007; Flyvbjerg, 2011) to enlighten issues related to the need to leverage knowledge between local learning situations to achieve globally shared organizational capabilities through the use of social media.

The research setting of this study is Servco. It provides global third part engineering services and has 18 offices in 11 different countries and across all the three globalization zones (Americas, Euro-Africa and Asia-Pacific). The chosen firm is a global engineering based professional service firm with highly educated technologically oriented individuals, accumulating experiences in projects across the globe and with a highly articulated need to leverage the experiences in globally shared organizational capabilities, and is thus deemed particularly relevant for this study. One service delivery can be performed to one client, by different experts at different places, depending on their knowledge, experience, availability, and costs. Servco tests, inspects, and certifies electrical products, machinery, installations, and systems. In order to offer these services worldwide the products are sent to the component experts who test the product in accordance with which market the product is to enter. That is, which international or national standards agreement the product has to comply with. Standards in this industry are documented in volumes of written material that describe the procedure for tests, as well as the acceptable intervals for different measures. Such standards need to be complied with in order to ensure that the products guarantee certain safety requirements to consumers. The international market for these types of services is highly competitive with respect to price sensitivity, speed of delivery, and expertise.

The case study employed a mixed-method approach (Denzin, 1970) consisting of semi-structured interviews, document and report studies (including internal documents, financial reports, presidential decisions, observations at presidential meetings, project plans, organizational and global bi-annual surveys), as well as participant observations. The study is part of a larger research collaboration where a total of 147 semi-structured interviews, lasting from one hour to two and a half hours, following the semi-structured interviewing convention (Robson, 2002, p. 228) have been conducted between 2003 and

2009. The main objective was to examine how the individuals conduct daily work, communicate with other colleagues, document experiences and search for knowledge within the global organization – with particular emphasis on how new ICT enabled their work practices. The interviews were taped and transcribed. The data collection was also supplemented beyond the interview context with document studies (i.e. from company surveys and internal reports), observations (i.e. visits to laboratories as well as participation in company meetings). Other secondary data sources such as project management procedures, standards, and reports to the clients observed through the ICT systems were especially beneficial. Of the 147 interviews, 35 interviews, have explicitly aimed at assessing the development and use of an internally initiated wiki project. The unit of analysis was intra-firm knowledge sharing practices through the wiki system.

In order to make sense of the data, the analysis progressed in several stages and involved a blend of inductive and deductive processes (Graebner et al., 2012). First, the data was coded in light of the research question and was thoroughly discussed between the researchers and summed up in PowerPoint format. The aim was to get a broad understanding of the general knowledge sharing practices and the particular use of the wiki system. Subsequently, the initial findings were summed up and presented to selected employees and managers in a workshop to validate the data's veracity and enhance the trustworthiness of the analysis (Lincoln and Guba, 1985). Finally, the findings were compared with extant theory in order to extend knowledge on the use of social media in leveraging learning experienced in multiple local project settings.

4 Findings

This study has assessed the cross-border knowledge sharing in the international professional service firm Servco when an internal wiki was introduced.

4.1 The Wiki and the organizational level

When the Wiki was launched management communicated how the system would fit in with the existing knowledge management policy for the Servco group and made it clear what the perceived benefits of the wiki system would be: “ *the top management at HQ was adamant that since we have several specialisations across locations, these would benefit from knowledge sharing tools going beyond emails or one-to-one communication*”

and “Small areas of expertise within different local offices needs more external knowledge sharing and learning possibilities from similar experts within the global organization”. Moreover, Management also pointed out that the competitiveness of the Servco group relied on effective and efficient utilization of its globally distributed resource base: “Need more common documents so that all laboratories have the same way to do things...quality systems, work instructions, test instructions...now each lab have their documents and procedures”.

The general impression is that there exist a positive attitude towards helping each other and sharing knowledge and that the organization would further benefit from increased knowledge sharing and collaboration between its subsidiaries: “Feel that the sharing of knowledge is very important and we need to improve that inside the Servco group, will work more efficient if knowledge sharing is effective”, and “Most people get something from something...each location have their specialisation...lets all participate..I will share something because I would learn something back as well...”. However, prior to the wiki launch there existed limited knowledge about the potential expertise offered at other subsidiaries within the group: “In my local office I know what everyone does..outside our office, I only know a couple of persons”, and “[Without transparency] you are missing the richness of the company...look at the experience.....we have about everyone having about 10 years experience...and some are not asked for sharing experience at all just doing their everyday work”.

There is also a general positive attitude towards the Wiki and most informants have visited the system. The wiki is well communicated; everyone knows about the initiative and applauds it. An illustrative quote concerning the attitude towards the implementation of the wiki system can be: “Prior to the wiki we did not have anything in common[...we all worked independently from each other...minimal contact.” In addition, several informants also express that there only exist a limited barrier to use the wiki system: “Exist a low technical barrier to use, but barriers to use are linked to post questions/answers “, and “The wiki system is easy to use, just 5 minutes introduction, then just to use the system”. Consequently, there is consensus regarding the need for an integrating knowledge and collaboration tool across the distributed project environments in Servco: “Servco has really done a good job spreading the resource base around, for instance, in San Diego the expertise is medical and in Dallas it is Telecommunication”.

One of the results from implementing the Wiki system is a sense of increased membership in a truly global organization as a consequence of the wiki system implementation, and the cherished benefits are improved presentations of local subsidiaries and people: *"Prior to the wiki we all worked independently from each other...we did not work together...minimal contact...did not deal with other offices...we did not have anything in common...not an annual event or something"* and *"Wiki – a common group thing...it would bring up our technical ability"*, and *"Presentations of people through the wiki increase could be extended with a global map, click China, get into China approval and find persons that I can contact – that would be useful"*.

4.2 The Wiki and the practice level

In general there is an awareness of the system and how critical it is that user driven content is generated from the start to ensure the success and utility of the system: *"One of those things...unless you use it, you want see the benefits of it"*. Prior to the implementation of the wiki email was the main tool for knowledge sharing: *"My email box is my database....have access many years back, remember and can look through and refer to that if there are questions"*. The use of wiki is motivated by the need of additional knowledge when conducting project tasks locally: *"When we cannot find answers locally, then we search wiki"*. Moreover, it is acknowledged that it is beneficial to use the wiki to respond to questions and answers across the different subsidiaries as it offers a greater transparency of the cross-unit knowledge and experience exchange than one-to-one interaction over mail, phone or Skype: *"I use wiki, it is new..., but it is good for technical issues to ask questions and everybody can see the question"*, and *"If someone post something I can see any changes made...kind of nice because there is one place to go to instead of emails"*.

The main use of the wiki is related to knowledge and experience exchange needs that originate in the daily conduct of project work, and is predominantly related to sharing technical information and experiences with different standards or client segments: *"Not in an active way, but I take a lot of information from wiki: directives, technical questions related to new rules, discussions etc"*. Originally, search for project related knowledge and experience starts locally and is extended to other subsidiaries if necessary. The contact with other subsidiaries have often been based on individual social networks where

contact have been made face-to-face or through email: *"I used to receive about 10-15 emails a week which I need to check for a clear or correct answer...I need to use an hour for each to be able to answer"* and *"Start by email...because of time differences ...very few cases over the phone"*. Locally, there are also formal arenas to share knowledge and experiences. There are local technical meetings on a weekly basis. However, most knowledge and experience exchange is conducted informally as part of small talk, part of mentoring/junior-senior learning or being part of daily work: *"Technically, we share more there and then when we are working on a project"*.

Thus, the knowledge and experience sharing is by-and-large linked to ongoing project activities and is mainly local. If there are exchanges across different subsidiaries it is because the project task requires coordination or clarification. The search for answers will always start locally before other international colleagues are involved: *"We use all the ways: First we try to answer our selves, then we ask local colleagues, then international colleagues"* and *"Ask the first and the best. Then call someone that might know."* However, many informants reveal how they do not necessarily search the wiki for ready-made answers but use the system to identify individual experts whom they then can contact directly, and if the interaction prove beneficial a short post at the wiki can explain the issues addressed: *"Many of the challenges we face in the projects are so complex and context specific that I will not find a ready made answer at the wiki or in any other internally available data base. What I use the company ICT systems for is to identify people in other offices with experience that might be beneficial to the challenge I face in my project. I then contact them directly, mostly over Skype. If the interaction provides a solution to my project I post what we did at the wiki for others reference later"*. However, finding and identifying people with relevant competence at other locations is not necessarily straight forward: *"There are many people involved in finding the right person/expertise"* and *"Questions are not necessarily targeted to the person in charge"*.

Informants express that the benefit of using the wiki is related to quality and available knowledge to ongoing project: *"The efficiency increases since we share knowledge. No one is holding back knowledge. That is bullshit. We all share. Always someone who shares"* and *"Knowledge sharing improves everyone"*. Furthermore, and in addition to direct search for project related knowledge and experiences, some informants also have pointed out that the system offers opportunities to increase individual learning: *"Others use it for knowledge sharing. I would use Wiki for learning something new about a new*

topic". Some informants also addressed more altruistic motives for engaging and spending time on knowledge and experience exchange over the wiki: "...only the good feeling you get from helping people". However, most of the informants addressed the importance of maintaining an reputation of individual expertise within their area: "It is important to have recognition" and "It is linked to own reputation".

The informants also express that the true utility of the wiki system is that the prior need for an internal social network diminish with the wiki, as there is a possibility to post questions and see if some one answers or refer any particular expert: "I gain network through asking colleagues if they know someone...now it is possible to post a question and see if a relevant resource offers its help or refers me to someone relevant". However, many informants still acknowledge the benefit of knowing people in person before they interact and exchange knowledge and experience over social media: "To know people, having met them...having made up an understanding of their competence when having met them physically". Some informants address the issue of incentives to generate content at the wiki: "A symbolic gesture from the organisation for knowledge sharing. To give a gift certificate (electronic shop etc)" for the knowledge sharer at each location" and "There are credits for inter office sales, but no compensation or incentive for talking an hour with someone from another office". However, several informants also point out that: "The main motivation for spending time posting stuff at the wiki is that my expertise gets recognized in other offices. This increases my possibilities and eligibility of participation in interesting projects within my area of expertise".

4.3 The Wiki and user driven content

Several informants address the essence of the wiki system as its ability to enable user driven content from local project experiences but in a way that is interactive and makes these experiences more transparent between the geographically dispersed experts of the Servco group. However, there is expressed concerns about the quality assurance of the information available at wiki system: "Need to be sure that the information is right and useful....should not lead to uncertainty...therefore items should be verified...", and "We would need someone responsible...going though (the content). Somebody could monitor the wiki...have some way to give approval stamp..". In spite of this worry some informants also point out that this worry was also present before the wiki system: "We

were sharing knowledge on wiki about IT...but the project responsible was worried about posting these questions...fear for misinterpretation...therefore preferring to answer this on email”, yet it is not the same to post a wiki post as response to a question than to address the complexities of a project problem verbally over the phone: “feel that it need to be Quality Assured, perfect before post on the web, not the same as a phone call.”

5 Discussion and Conclusion

This study has revealed the experiences with implementing an internal wiki in Servco, and addressed the research question: *how is social media utilized in the global organization in order to leverage local learning between dispersed individual experts?* The findings from the Servco case reveals how an international knowledge based organization can utilize web 2.0 technologies to leverage knowledge and experiences from multiple geographically dispersed projects. In the case of Servco the implementation of a company specific wiki enabled increased user driven content generation. The nature of the highly specialised projects offered by Servco entail that ready made and codified knowledge repositories are less useful to on going projects. However, the interactive format of the wiki enables increased transparency and visualisation of the expertise of different professionals at the globally dispersed locations The Wiki system is used mainly to document who knows what and as a source o identify people that can be approached directly for advice. The study thus reveals how web 2.0 technologies, such as wiki, can have a positive effect on the leveraging of learning between highly specialised and globally distributed knowledge workers within one firm.

The findings of the study show how the effects of wiki can be conceived at an organization-, practice- and content level. In particular the findings of the study identify four determinants of the use of the wiki to leverage local learning within a globally dispersed project environment. First, the wiki must directly relate to the daily work carried out in the organizations projects by offering interactive and updated information concerning current project challenges. Second, the system must enable transparency in the daily project work so that on going activities can be searched. Third, the intention with the search is of lesser degree to identify encyclopaedic information than it is to offering visualization of individual competence and expertise, and fourth there needs to be a sort of quality assurance of the data posted at the wiki.

Thus, the wiki should not be just another source of internal information but address questions and answers related to ongoing challenges faced when conducting projects. The benefit of the system is increased productivity despite employees investing time on publishing articles on the wiki. The main motivation is related to performing better in local projects by enabling the leveraging of knowledge and experience from other locations into the project. This is more important than incentives to create content on the wiki. If content and interaction through the wiki support the ongoing business this incentivizes the publication, and quality assurance of, the user driven content.

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Un-locking Intellectual Capital

Maria Serena Chiucchi *

Department of Management
Faculty of Economics "G. Fuà"
Università Politecnica delle Marche
Piazzale Martelli, 8 – 60121 Ancona (Italy)

John Dumay

Department of Accounting & Corporate Governance
Faculty of Business and Economics
Level 3, E4A Building, Room 329
Eastern Road, Macquarie University, NSW 2109 Australia

** Corresponding author*

Structured Abstract

Purpose – The purpose of this paper is to investigate how organizations work with IC when it enters the organization from an accounting or measurement perspective. More specifically the paper will investigate in depth the IC 'lock-in' process to accounting, which occurs when IC is introduced as a measurement practice in companies which are new to IC, and if and how IC can be 'un-locked' through a more strategic managerial approach, promoting IC management practices.

Design/methodology/approach – In this paper, the phenomenon of 'lock-in' is used to conduct a longitudinal analysis of the design and implementation of IC practices in an Italian firm which was initially a 'newcomer' to measuring and managing IC. The IC measurement system adopted by the company was developed using an interventionist research approach whereby one researcher was directly involved in designing and implementing the system. To interpret the case study we use Callon's 'four moments of translation' (Callon, 1986) which permits us to follow the actors in their construction and deconstruction of the IC concept and practices.

Originality/value – We show that when accounting for IC is the point of entrance into a firm new to IC, the firm remains, for a period of time, locked-in to measuring IC. However, firms can be freed from a narrow accounting perspective and over time allow more attention to be paid to the process of mobilizing IC, leading to management actions which are not possible while IC remains 'locked-in' to accounting. However, we also find that the 'lock-in' to measuring IC is not always detrimental because, at times, the 'lock-in' is necessary to allow actors to make sense of IC.

Practical implications – By understanding the lessons learnt from the case, other organizations who implement IC practices can become aware that the 'lock-in' phenomenon can take place and so, devise strategies to avoid the possible detrimental aspects of 'lock-in' and understand when it may be beneficial to do so. This can help

managers recognise that to be effective more attention needs to be paid to the process of managing and mobilizing IC.

Keywords – Intellectual Capital, IC Measurement and Reporting Systems, IC practices, Interventionist research, Case Study.

Paper type – Academic Research Paper

1 Introduction

Intellectual capital (IC) as an innovative management technology is a very relevant topic in theory and practice. Over the years, IC research has progressively changed its focus. While, at the beginning, it was predominantly orientated towards theory building and raising awareness, IC research has then turned the attention to gather evidence to justify the use of IC as a management technology (Guthrie *et al.*, 2012). Recently, a considerable number of scholars have suggested adopting a performative approach and orienting research in different directions, more specifically to analyze how IC works in organizations, how it manifests itself, and how people, processes and relationships are mobilized in relation to it (Cuganesan, 2005; Mouritsen, 2006; Cuganesan *et al.*, 2007; Dumay, 2009). Thus, a third stage of IC research has been identified using a critical approach, to study how organizations, understand, adapt and apply IC as a management technology (Guthrie *et al.*, 2012).

Some observations, which are worthy of note, can be drawn from recent studies that investigate how the organizations work with IC when it enters from the accounting perspective, to further measurement aims (Chaminade and Roberts, 2003; Cuganesan, 2005; Cuganesan *et al.*, 2007; Dumay, 2009). Chaminade and Roberts (2003), in particular, highlight that the point of entrance of an IC project, in companies that do not have previous experience with IC, has a strong influence on the development trajectories of the project. If accounting is the entrance point, then the focus will be on its measurement and little attention will be initially paid to IC management processes. Therefore a “lock-in” to the accounting domain takes place, whereby the actors’ attention will be predominantly orientated towards measurement issues instead of towards management issues. The authors point out that more benefits are obtained when a different point of entrance is used, specifically a strategic one.

Research conducted by Cuganesan *et al.* (2007) and Dumay and Rooney (2011b) shed further light on the IC ‘lock-in’ to accounting phenomenon. In studying the IC

'codification-ambiguity paradox', the authors show how IC ambiguity can help preventing a 'lock-in' phenomenon. IC ambiguity, in fact, allows managers to apply IC to their problems (Cuganesan *et al.*, 2007) and to achieve their individual goals (Dumay and Rooney, 2011b). These authors also call for further research to understand more in depth the role of IC ambiguity and how this ambiguity helps to mobilize IC practices rather than IC measures.

In keeping with the third stage of IC research, this paper attempts to respond to this call and to the call for performative research on IC, by investigating if it is possible for an organisation to initially implement and 'lock-in' IC accounting and measuring practices and subsequently 'un-lock' IC through a more strategic managerial approach. Thus, we hypothesise that if IC becomes 'locked-in' as an accounting framework, IC will get lost inside the organisation and only by 'un-locking' IC by way of allowing managers to use it to achieve individual goals within a strategic context will it ever be effectual. In order to explore this hypothesis we propose a longitudinal case study, our research site being an Italian utilities company which introduced an IC measurement and reporting system in 2004. Using Actor-network-Theory (ANT), we will follow the actors in their construction (lock-in) and de-construction (un-locking) of IC. The longitudinal analysis will be used to untangle the dynamics which are at the basis of the 'lock-in' to accounting phenomenon and of the un-locking of IC.

2 Literature review

Contemporary research into IC as an innovative management technology has taken a turn towards understanding IC in practice in what (Guthrie *et al.*, 2012) identify as the third stage of IC research. Originally, Petty and Guthrie (2000) outlined two stages associated with developing IC as a research field. The first stage efforts focused on raising awareness and understanding IC's potential of creating and managing a sustainable competitive advantage. The output of this research was the creation of frameworks and guidelines such as the Skandia framework (Skandia, 1994), and the MERITUM (2002) and Danish guidelines (Mouritsen *et al.*, 2003) and firmly establishing an IC discourse. Typically, early academic papers then argued that "intellectual capital is something significant and should be measured and reported", without referring to specific empirical research (Petty and Guthrie, 2000, p. 162).

In contrast, the second stage of IC research established IC as a legitimate management technology and gathered evidence to justify its use (Petty and Guthrie, 2000, pp. 155-6). This research focussed more on applying IC frameworks because of their potential value creation impacts including impacts including increasing profits and their impact upon capital markets. Unfortunately for the proponents of IC, this argument soon began to fall by the wayside as some of the earlier proponents and participants in the original development of IC as a management technology abandoned their initial enthusiasm for managing IC, e.g. Skandia (Dumay, 2008a). Thus, the espoused benefits of managing knowledge resources have often not been realised recognised in practice (O'Donnell *et al.*, 2006; Dumay, 2012).

Therefore the third stage of IC research emanates from the failure of IC to become entrenched as a management technology and “ is characterised by research that takes a critical examination of IC in practice” (Guthrie *et al.*, 2012). Thus, the origins of the third stage are based on reluctance of organisations to take up IC practices despite the evidence that managing IC had beneficial impacts causing some pundits to declare that IC was at a crossroads of relevance (Chatzkel, 2004; Marr and Chatzkel, 2004). Since then there has been an increasing interest in investigating how IC is utilised and taken up inside organizations especially when IC enters from the accounting perspective, that is to say for measurement aims, using a performative approach (Cuganesan, 2005; Mouritsen, 2006; Cuganesan *et al.*, 2007; Dumay, 2009). Thus, the third stage of research takes a critical look at how individual organisations understand, adapt and apply IC as a management technology, especially in organisations who are attempting to manage IC for the first time.

In keeping with the second stage of IC research Chaminade and Roberts (2003) investigated how IC entered into organisations. In their research they compared two different ostensive IC research projects, one in Spain and one in Sweden, aimed at introducing an “intellectual capital management system” into organisations (Chaminade and Roberts, 2003, p. 737). In their paper they highlight that the point of entrance of an IC for firms that do not have previous experience with IC, or newcomers as they call them, is particularly relevant for the development trajectories of the project. Thus, the objectives that drive an IC project and its champion, such as the desire to measure IC, define the vocabulary through which IC is introduced and influence the meaning attributed to IC

therefore affecting the way the organization develops its IC (Chaminade and Roberts, 2003, p. 743).

Chaminade and Roberts (2003, p. 747) also highlight that IC is a vague concept for IC newcomers and its meaning is built as they start experiencing IC practices. Thus, if accounting is the entrance point and the initial objective is to measure IC, then the focus will be on measuring IC and less on managing IC. Conversely, if IC is introduced with a strategic managerial intent, for example, to develop new practices for creating value through the exploitation of knowledge, then IC is used as a means of transforming IC resources rather than as a means for measuring IC. In the process firms aim to discover how value is created from IC and to reflect on how they can further influence its creation. However, Chaminade and Roberts (2003, p. 748) found that when IC enters an organization from the accounting perspective, a 'lock-in' to the accounting domain takes place. Therefore the organization is functionally locked in towards measuring IC rather than managing IC which can be detrimental because it can reduce the "potential for change and novel management actions".

These findings are similar to more contemporary studies of understanding the differences between the focus on measuring and managing IC. For example, Catasús *et al.* (2007, p. 505) found "that that the relationship between indicating and acting is not significant and that the introduction of mobilizing gives a better model fit". Similarly, Dumay and Rooney (2011a, p. 344) found that "that it is possible to effectively implement IC practices without necessarily needing concrete IC measures" because organisational measurement needs continually evolve depending on factors such as the bespoke characteristics of individual organisations; changing internal and external political, social and economic environments; and evolving business plans and strategies". Therefore, from a third stage IC research perspective it would be fruitful to investigate if it is possible for an organisation to initially implement and 'lock-in' IC accounting and measuring practices and subsequently 'un-lock' IC through a more strategic managerial approach. In this regard we are interested in investigating the process that leads to IC 'lock in' accounting as well as investigating the process of 'un-locking' IC.

Some recent research can help explain the 'lock-in' phenomenon. For example, Cuganesan *et al.* (2007, p. 906) highlight a "codification-ambiguity paradox" which limits the ability for the organisation to take-up IC practices. Thus, a highly codified system of measuring IC may well reduce the need for employees to make-sense of IC, but limits the

opportunities employees may have to become interested and to participate in IC practices. Thus, the take-up of IC within the organisation may be limited to those who are 'locked-in' to measuring and reporting IC. On the other hand, the ambiguity of IC allows for employees to connect with IC and to make-sense of it and allow them to apply management practices to "the problems that they perceive themselves facing" (Cuganesan *et al.*, 2007, p. 907) allowing for change and innovative management practices.

Dumay and Rooney (2011b), building on the "codification-ambiguity paradox" in relation to a controversy between the use of IC numbers and narratives, identified how the ambiguity of IC allowed both IC numbers and narratives to be used depending on the context of the problem managers were trying to solve, thus not privileging one over the other. More specifically they showed how the ambiguity of IC prevented a 'lock-in' of accounting numbers which allowed managers to achieve individual goals, rather than stick to a one size fits all measurement system. They concluded that the power of IC as a management technology is based on the ability of the concept of IC to entice people to act thus shifting IC from a *'principle'* to a *'practice'*.

While Dumay and Rooney (2011b) are silent on the power of the ambiguity of IC to help 'un-lock' IC they do propose that further research is needed to understand the ambiguity and how it helps to mobilise IC practices rather than IC measurements as they outline below:

"The challenge for social scientists, researchers and managers is to accept ambiguity where they find it, accepting the power of ambiguity as much or even more than the potential confusion it creates. Should IC be reduced to a 'black box' of codified measures on which researchers and practitioners agree it would make IC stagnant and inflexible."

Furthermore, they draw on Latour (1986, p. 264) to explain that "IC needs to be "negotiable, [...] practical and revisable" mirroring the nature of society as opposed to being a fixed framework to be applied in a consistent manner. Otherwise, it becomes lame and ineffectual" (Dumay and Rooney, 2011b). Thus, we hypothesise that if IC becomes 'locked-in' as an accounting framework, IC will get lost inside the organisation and only by 'un-locking' IC by way of allowing managers to use it to achieve individual goals within a strategic context will it ever be effectual. Thus, in order to explore this hypothesis we present a case study based on research into the implementation of an IC

measurement system at an Italian utilities company. Here we investigate how IC became ‘locked-in’ and how IC was subsequently ‘un-locked’.

3 Theory and research method

Drawing on previous literature we intend to explore further the IC ‘lock-in’ and the ‘un-locking’ phenomena and we will use Actor-Network Theory (ANT), specifically the four moments of translation as identified by Callon (1986): problematization, interessement, enrolment and mobilization.

Problematization is the phase in which an actor formulates a question (a problem) that other actors can be interested in taking up in order to achieve their specific interests. In other words, solving this problem serves as an *obligatory passage point* for the actors to reach their aims. The actor who formulates the question also determines the set of actors to be involved to form the network, defines their identities, their interests and problems as well as the links between them. In this way, this actor ‘speaks for the others’ and can be considered the centre of the network (Callon, 1986, p. 214).

In order to make the actors accept the proposed roles and, therefore, accept to ‘pass through’ an *obligatory passage point* to achieve their aims, the actor at the centre of the network uses a set of *interessement* devices. These devices are aimed at building a *consensus*, between each entity¹ and the centre of the network, around the proposed links. While doing this, the centre of the network attempts to undermine or break all possible links among the entities which could propose a different and competitive problematization. In fact, it is always possible, for an actor, to refuse to being integrated in the initial network, thus defining its identity and its interest in a different way (Callon, 1986, pp. 208-9).

The *interessement* is successful if the involved entities accept the proposed roles and aims, thus forming an alliance. In this case, it is said that *enrolment* occurs. On the contrary, the entities who dissent and do not accept the proposed transactions are not enrolled and do not take part in the network. It has to be highlighted that the alliance, once formed, is temporary, and all links need to be held in place and stabilised continuously. Therefore, the process of translation never ends. All in all, to translate means ‘to displace’ dispersed entities from where they originally are and, through a series

¹ Callon uses the term *entity* to refer to ‘parts’ of the network as opposed to ‘actors’ specifically.

of transformations, to mobilize them so that they form an alliance with other actors, and finally are reassembled at a certain place and point in time (Callon, 1986, p. 216).

As stated, the use of Callon's four moments of translation to interpret the story, as told in the next section, can help us understand the process of IC 'lock-into' accounting and how IC was 'un-locked' and transformed into management actions. The translation process permits us to follow the actors in their construction and deconstruction of the IC concept and, therefore, IC 'lock-in' and 'un-locking'. By understanding how and why the 'lock-in' occurs, and how 'un-locking' process develops can help prevent or lessen the detrimental aspects of the IC 'lock-in' to accounting phenomenon (Chaminade and Roberts, 2003) and help manager's recognise that to be effective more attention needs to be paid to the process of managing and mobilizing IC (Catasús *et al.*, 2007; Dumay and Rooney, 2011a).

In this paper, a case study analysis will be presented using an interpretive approach (Scapens, 1990; Ahrens and Dent., 1998; Denzin and Lincoln, 1998). The case study method is appropriate for our analysis because implementing a system for measuring and reporting IC means introducing a *new* accounting technology, with characteristics and an underlying logic which are *new* for the people involved. Therefore, this has an influence on them and on their way of perceiving the reality of the phenomenon under study. The interpretive case study based approach permits us to 'hear the voice' of the actors which is particularly suitable when ANT is used (Latour, 2005).

Consistent with the interpretive approach we have adopted a narrative approach to tell the *story* of IC 'lock-in' from an accounting perspective and its subsequent 'un-locking'. Along with our narrative, diagrams are provided to help visualize the links among the entities and to clarify aspects which are crucial when forming a network (Callon, 1986), thus supporting the use of a case study analysis (Miles and Huberman, 1984; Scapens, 2004). Additionally, we also need to understand the role and the aims of the actors involved in the project, thus it is important to focus attention also on the method used to conduct the actual research project and develop the story, replete with its characters and their roles. Most importantly, the role of the researcher in this story is central to its outcomes and is explored next.

The case study outlined in the next section was conducted using an interventionist research approach. This approach implies using a case study method whereby the researcher cooperates with the host organisation promoting solutions to actual problems

and contributing to theory, at the same time (Kasanen *et al.*, 1993; Lukka, 2000; Jönsson and Lukka, 2005; Dumay, 2010). As Jönsson & Lukka (2005, p. 4) explain:

In this sense interventionist research is field experimentation where the researcher, not having complete control over the design of the experiment, seeks to determine the experimental situation through observation, acts on that situation in concert with the host organization, observes process and outcome, and analyses findings in view of the relevant literature [...] In principle, interventionist research does not need to limit itself to applying the case method only, but in practice this appears to be the case.

In our story the researcher participated in three distinct phases:

- Phase 1 – from the middle of 2004 to July 2005: Designing, developing and implementing an IC measurement system leading to publishing an external IC Statement (ICS);
- Phase 2 – from late 2005 to the end of 2007: the company worked with IC;
- Phase 3 - from the beginning of 2008 to July 2008: a new ICS was written.

During the three phases a different mode of intervention was adopted. In the first phase, the case study research was conducted using a “strong” interventionist approach (Jönsson and Lukka, 2005, p. 23); more specifically, the constructive approach method was used. Therefore, one of the two researchers cooperated with the organizational actors to design and implement an “innovative construction” being an IC measurement and reporting system. This permitted developing insights into this change process, thus allowing the researcher to make both practical and theoretical contributions (see Kasanen *et al.*, 1993; Lukka, 2000; Jönsson and Lukka, 2005; Dumay, 2010). This construction of a IC measurement and reporting system had already been implemented by the researcher in another organization, therefore, the adoption by the company under analysis permitted her to refine the construction and to further test its usability (Kasanen *et al.*, 1993; Lukka, 2000).

During the ‘strong’ interventionist phase, the role of the researcher was that of a ‘member of the team’, so she was involved in decisions, in actions and was considered responsible for the achievement of the objective together with the organizational participants. Consistent with the interventionist approach, active participant observation is

the main 'research weapon' used; nevertheless data was also collected through interviews and reviewing internal documents (Jönsson and Lukka, 2005; Dumay, 2010).

Over this period, in situ active observation was carried out, therefore, the researcher actively took part in meetings with the company project leader, aimed at designing and implementing the system, at collecting and analysing the information on IC. Several meetings were attended and approximately 50 days were spent in working with the organizational actors for designing and implementing the model; moreover approximately 20 semi-structured interviews were conducted, with executive and practice managers. When managers accepted, interviews were tape recorded. When it was not possible, at least two research assistants were involved in the interviews in order to take notes and transcribe them. Notes, taken during the interviews and in the field, were revised, reworked, put in a more formal fashion and enriched, by the researcher, with aspects and impressions, which were considered to be important for the future analysis, but which it was impossible to write *in loco*, as soon as possible, preferably, within one day (Eisenhardt and Bourgeois III, 1988, p. 741; Scapens, 2004, p. 267).

The risk of 'going native' (Jönsson and Lukka, 2005, pp. 8-9) associated to interventionist research, was dealt with by establishing periods of absence from the company in order for the researcher to keep the 'research gaze' (Baxter and Chua, 1998, p. 77). Moreover situations in which the personal involvement was high were highlighted in the field notes, so as to pay more attention on them when analysing the empirical material collected. An exchange of reflections and ideas also occurred between the researcher and an assistant researcher (a PhD student), who cooperated in conducting interviews, collecting information and analysing company documents. As Atkinson and Shaffir (1998, pp. 57-8) explain these are problems to be addressed by qualitative researchers:

While the issues of researcher neutrality and research objectivity are salient problems in qualitative research, they exist in all forms of research, a fact overlooked when quantitative researchers criticize qualitative researchers for their seeming lack of objectivity [...] The challenge, then, is to recognize that problems of bias and neutrality are common to all research and to determine how to best deal with them.

In the second phase, from late 2005 to 2007, after the first design and implementation, the intervention mode was changed from 'strong' to 'modest' because this allowed the researcher to help the organisation learn how to use the IC it had just discovered (Jönsson, 1999, pp. 9-10). Here, the researcher stimulated the change process and the actors' reflection and articulation on latent ideas, in order to increase their 'awareness' about the actions undertaken and the reasons behind them. The interviews and the discussions were not aimed at telling the actors what they should do, instead they were aimed at understanding how actors were using IC information and to focus attention on what they were doing next. The most important research weapons, in this period, were interviews and talks concerning the 'critical aspects' of what was happening. The researcher provided her point of view on the changes that were occurring but were 'limited' to suggestions rather than strong interventions; therefore the changes which occurred were mainly under the organisation's control (Jönsson, 1999, p. 10) In the third phase, during 2008, the mode of intervention changed again into 'strong', when a new external ICS was designed and implemented¹.

Because this paper is not focused on the IC measurement and reporting system's characteristics, will have briefly illustrated the system used in Appendix 1. We also consider it useful to comprehend developing the IC system rather than critique or espouse its merits because we are concerned with how the notion of IC has been introduced, and how it influences the way IC has been internalised, interpreted and mobilized. As Callon (1986, p. 201) advocates:

...the observer must consider that the repertoire of categories which he uses, the entities which are mobilized, and the relationships between these are all topics for actors' discussions. Instead of imposing a pre-established grid of analysis upon these, the observer follows the actors in order to identify the manner in which these define and associate the different elements by which they build and explain their world.

Thus our story begins...

¹ For a more in-depth look at the different roles that a researcher can play in interventionist research such as 'expert', 'member of the team' and 'comrade', see Jönsson and Lukka, 2005: pp. 20-1.

4 The case study

The story of IC at Company B unfolds over a period of five years from 2004 to 2008. As indicated above, during this time IC developed over two distinct periods, from 2004-05 and 2005-08, each culminating in the production of an external ICS. In this section we will allow the story to unfold of how the entities of the network formed to initially ‘lock-in’ IC as measurement device and then how after the initial objectives of the network achieved the network was transformed, allowing IC to be ‘un-locked’. We will first describe the motivation behind Company B’s foray into measuring IC and then outline the story of IC in each of the subsequent stages. Then, in order to understand the story how IC became utilised in Company B we will follow initially the movements of a single actor, one of the authors of this paper who is an IC researcher, through the construction (‘lock-in’) and deconstruction (‘un-locking’) of IC using Callon’s (1986) four movements of translation. We will first follow them through the process of translation whereby other actors in the network are identified and how they interacted with the development of the first ICS. What follows after that we reveal later.

4.1 Why IC

Company B is a utilities company which manages services related to maintaining water supply (potability, wastewater treatment, sewers), providing energy resources (distribution and sale of natural gas and energy, energy savings, etc.), managing environmental services (waste collection and disposal, street cleaning, composting) and providing public lighting. As a medium-sized company it has 300 employees and its shareholders are 21 municipalities, all located in the northern and central Italy, where it operates. Over the last ten years Italian local public utilities have undergone radical changes caused by the progressive deregulation of traditional monopolies. This has created a competitive market for the supply of public utilities resulting in a push for these companies to take advantage of new growth opportunities.

In this context, company B is pursuing an internal growth strategy aimed at taking advantage of the existing synergies among its core businesses of water, energy and environmental services and exploiting its core competencies enabling entry into new markets such as renewable energy sources. It also is striving to improve the efficiency of

its organizational processes. These choices were by a desire by senior managers to maintain the company's culture consistent with its core value of "doing things well".

Over time we have tried to establish and perform a strategy coherent with our culture and our values. More specifically, we pay great attention to social values and, among these, to correct and fruitful relationships with suppliers, whether they are big or small-sized companies, public or private. Two key words guide our action: 'respect' and 'cooperation' with those we work with. This means a high respect for environmental laws, investments in the geographic area served by the company, cooperation with the stakeholders. We like to do things well which implies a strong attention to competencies, without forgetting the need to control costs and the need to always display ethical behaviour.

[Head of Human Resources, Information Technology and Quality Department (HRTIQD)]

In 2004, the Head of HRITQD took the initiative to launch a project for measuring and reporting IC. Besides the responsibilities related to establishing the strategies and the policies for developing the company's human resources and information technology, he was the person who had been in charge of developing the ISO 9001 quality system and had been one of the promoters and a passionate supporter of Company B's sustainability report. Having read some articles about IC, he began to think that measuring and reporting the company's IC could be the "natural development" of a process begun in the 1990s when the company progressively and explicitly decided to orient management attention towards its softer aspects.

For me measuring IC is both the apex and the new point of departure of the process of managing intangible assets that began in the Nineties when we decided to obtain a quality certification (ISO 9001). This journey reached another important stage a few years ago when we decided to produce a sustainability report. The IC statement should show what we have done, in the last few years, to develop the company personnel and our information system, to improve the knowledge management process, to try to fulfil our customer needs. The quality system implemented some years ago gave a boost to this; through the sustainability report we have disclosed how we

take care of our employees and our customers, but I have a feeling that with this report we can do more, both for improving the company management and the disclosure of information. Measuring IC should help me to show that all efforts made, in the last years, to develop the company information systems, the organizational structure and processes, to be clearer, the company incentive system, the competence measurement system and employees' competencies have yielded important results, have generated benefits for us and for the stakeholders.

[HRTIQD]

The aim of the head of HRITQD was also to publish an external ICS in order to complete the company's external reporting system complementing the financial and sustainability reports. He believed the synergetic use of these three documents could provide company and its stakeholders with a 360-degree view of how the organization utilised its financial, environmental and intangible resources linked to how Company B created value for its stakeholders.

4.2 Phase 1- Accounting for IC: 'locking-in' the ICS (2004-5)

Problematization

As Callon (1986, p. 203) outlines, the first moment of translation is problematization or how a researcher becomes indispensable. In this case the head of HRITQD heard about an IC measurement project one of this paper's authors, as an academic researcher, had carried out in another Italian company and in early 2004 contacted her. As a result, three meetings were organised between the researcher and the head of HRITQD. At first, there was the need to get acquainted with each other as the researcher wanted to understand the company's expectations and know more about its business and strategy whereas the head of HRITQD wanted to understand what it meant to measure and to report IC and if it could meet his expectations. He also wanted to know more about different ways of measuring IC and of the characteristics of the IC model designed by the researcher and used in the other company as he outlined in an early interview.

I want to make a conscious choice of the best way to measure the company's intellectual capital. I have heard about the possibility of

expressing IC value in one single financial measure. Is it possible? How can I understand which part of it is attributable to each intangible resource, to competencies for example?

[HRTIQD]

Afterwards, an abundant exchange of phone calls, e-mails and the forwarding of company documents followed. In return the author prepared Power point presentations on IC as well as *ad hoc* documents specifically prepared for clarifying the manager's doubts on IC measurement and reporting were produced. Initial documents and reports aimed at analysing company IC, on the basis of what emerged from the discussions and company documents, were written by the researcher. A further meeting with the project leader of the first company who was adopting the IC measurement model took place because the Head of the HRITQ department wanted to 'hear the voice' of somebody who had already undertaken a similar project. He wanted to be reassured about the possibility of successfully carrying out this kind of project considering time constraints and the availability of information needed for implementing an IC measurement system in Company B.

It is of the highest importance for us to end the project in one year; we have to be ready to publish the IC statement to supplement next year's Financial Statement. So, you see, there is not much time and we should not underestimate the fact that we usually use financial measures to control company performance, turnover, costs, investments... we have plenty of this information but I think it would be impossible for us to produce all the measures you need, I mean, I saw the ones the other company used and we do not have many of them and we cannot ask for the help of the controlling function, they are too busy.

[HRTIQD]

Thus, even though the head of HRITQ was satisfied that the first company was capable of measuring IC he was not sure Company B was able to. Thus, questions remained. Does Company B have enough information to measure IC? Do we have the resources to measure IC? Will our people co-operate and help us to measure IC? Can enough IC measures be found to justify an ICS?

From the company documents examined by the researcher it emerged that the overall company management control system was predominantly based on financial measures, thus confirming that view that overall company performance was driven by financial outcomes. However on a departmental level, such as the HRITQD and the departments which controlled the company's three prime business areas, there were local management control systems, which produced results which were, predominantly, of a non financial nature. For example, the produced figures on the number of clients and client satisfaction. Additionally, the existence of a well developed company-wide quality system as well as of the existence of a sustainability report supported the provision of data which could be useful for measuring IC. Thus the questions raised by the head of HRITQD were now ready to be answered.

The researcher and her PhD student working on the project offered their help in measuring IC that managers in the operational departments found difficult to discover given, of course, the availability of the necessary data. Thus, the researcher along with her PhD student through their analysis of company documents, their ability to measure IC and by providing an "IC measurement model" became the obligatory passage point (OPP) in the relationships they were building with the head of HRITQ. Thus the problematization became complete as the researchers became indispensable to the project because they held the knowledge about what IC was and how to measure it (see Callon, 1986, p. 204). Because the researcher plays the central role in the alliance she can be considered the head of the network, "the one who speaks for the others" (Callon 1986). In fact, she is the only one who had previous experience in measuring and reporting IC and thus without her presence the network would falter, therefore she has the ability to define the other actors who participate in the network. More specifically, she is able to define how the actors need to combine in order for the network to form. Thus the researcher defines the actors in our story as follows:

The head of HRITQD: this man is very satisfied with the results obtained through the implementation of a Quality Management System and the Sustainability Report, two projects under his control. This made him open and curious about the opportunities offered by new measurement and management technologies which could improve company management and disclosure. He was eager to explicitly show the results obtained through investing in people, technology, knowledge and understanding

customers. In addition, he thought that Company B needed to improve disclosure in a changing business environment.

The president of the board of directors: without the support of the president the project could not be implemented. It is through his symbolic support of the project that adds weight to the participation of the other departmental managers. In turn the president was interested in the economic benefits that measuring and reporting IC could provide. Additionally, the president trusted the head of HRITQD thus adding additional validity to the project.

Other department managers and their subordinates: the cooperation of the three heads of the operational departments and their employees are needed for the network as they are the gatekeepers of the data which is required to measure IC from their perspective. In turn they need to be convinced that it is worth their time and effort to participate and benefits will flow to them from their participation.

Intellectual capital: IC is the non-human actor in the network and is required because its concepts, frameworks and theories are essential to bind the network together. IC needs to impart itself on the network and help answer the questions of whether or not it can help communicate the value created as a result of measuring and managing it.

Apart from identifying the actors in the network the researcher identifies that each of the actors needs to come together through the OPP because no progress can be made towards communication the value of IC until it is measured and reported. Thus in order to accomplish the IC project, a 'holy alliance' (Callon, 1986, p. 206) was required to be formed with different actors at Company B: the researcher, the head of HRITQ, the president of the board of directors, other department managers and their employees, finally, a non-human actor, intellectual capital as outlined in Figure 1.

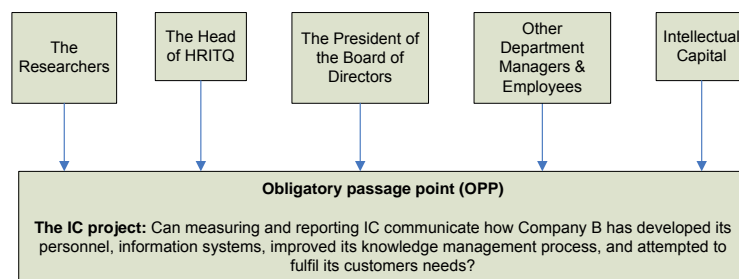


Figure 1: Establishment and linking of the Obligatory Passage Point (OPP)

This is not to say that all of the actors involved in the network were rallied around a common objective. In this sense the goals of each of the actors were different and so too were the challenges they faced in achieving their desired outcomes as outlined in Figure 2.

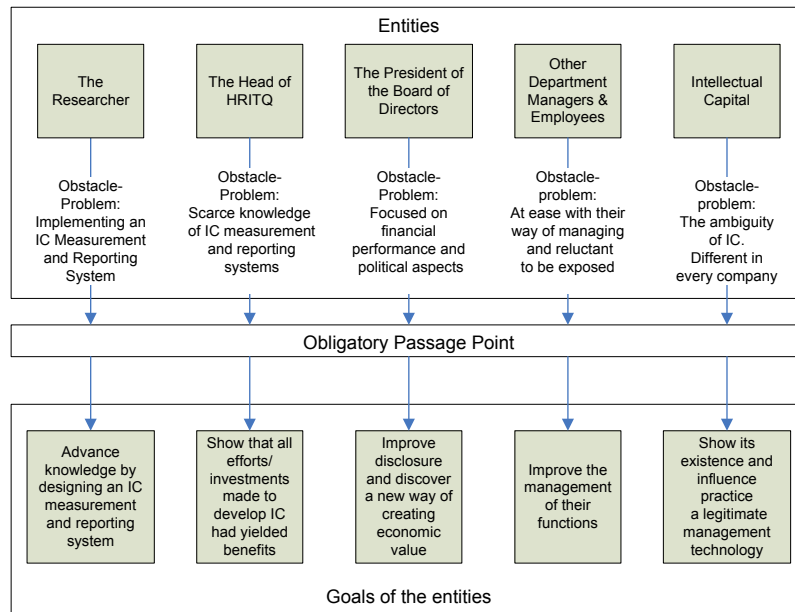


Figure 2: Obstacles and goals of the entities of the network

Interessement

The next moment of translation is interessement because at this stage the network has hypothetical qualities. As Callon (1986, p. 207) adeptly states:

At this point in our story, the entities identified and the relationships envisaged have not yet been tested. The scene is set for a series of trials of strength whose outcome will determine the solidity of our researcher's problematization.

Thus what we are interested in at this point is whether or not actors become part of the network or reject it. In reality this happens on a progressive basis through our interaction with actors, even though we, as does Callon (1986, pp. 207-8), recognise that the network, its problematizations and the identities of the obstacles and goals of each entity of the network are conjointly formed during action. Thus the purpose of the analysis is to understand how the network stabilises, or as in our case 'locks-in' an accounting for IC.

When the project officially started the Head of HRITQ Department decided to assume also the role of company project leader and to share the responsibility of accomplishing the project with the university researcher. So from this point we will call him PL in his new role.

In order to start the project, the PL decided that the support of the president of the board of directors had to be gained. It was the PL who illustrated the opportunity to him of using an ICS to complement the communication towards the stakeholders, showing all benefits related to IC disclosure, especially in light of the need to improve the quality of external communication for cooperating with new partners. As a result the president outlined his support for the project:

Communication transparency towards the stakeholders has dramatically gained importance in recent years. We had to follow new legislation, think of the 'Carta dei Servizi', but we have deliberately chosen to do more, we want to be as open as possible, using our web site, producing a Sustainability Report and using all useful devices. I am very proud of what we have done in the last few years and I think this is the right path to follow in the future.

[Company President]

Even though the president was the official sponsor of the project but in many interviews the other managers referred to the project as “the Head of HRITQ Department’s Project”. The project leader also pointed out the organizational effects of this situation. For instance, talking about the difficulty in involving other managers in the Project, he observed:

“Actually it is very difficult to involve people other than those who are in my Department in the project. I have realized that the possibility of including other people in the design and implementation of the system and in its use depends on the ‘organizational power’ of the project leader. In any case, we can continue even without the cooperation of some of the managers”.

[PL]

The PL was responsible for establishing strategies and policies concerning organization development, company personnel, information systems, quality assurance and security

systems. Being also the Head of the Department, the involvement of practice managers working in this area was relatively easy. Critical relationships such as those with customers, suppliers and technical municipal officers were controlled by managers belonging to other Departments. Therefore, in order to design and implement the IC measurement and reporting system, there was the need to obtain the cooperation of these managers.

I believe that the company, and mostly my colleagues, the other managers, could benefit from IC. We usually use financial measures to control our performance and these measures cannot grasp the real value of good relationships which have to be expressed in a different way.

[PL]

In order to involve company managers in the project, the researcher thought it would have been advisable to organize a company meeting so as to present the project and its aims. In the researcher's intention, this meeting should have been 'open to discussion' in order for the managers to express their opinions and doubts on the project. This would also help to 'clear the way' for further talks during the subsequent interviews. Since it was not possible to organize this kind of meeting, an announcement of the project, through the 'company newspaper', was done. At the same time, in order to gather information, the researcher spent some time in the company premises with the project leader. Being 'around' the offices gave her the opportunity to be introduced to other managers and, thus, to begin talking about the project. In the meanwhile, the project leader acted spontaneously as 'harbinger': he was enthusiastic about the project; therefore, he seized any opportunities to talk about it.

However, the most important opportunity to talk about the project and to interesse managers was offered by interviews. In order to 'prepare' them, the researcher followed two directions. She acquired knowledge about utility companies and their business, in general, and about company B, in particular, by reading several company documents, ranging from strategic plans, to internal managerial control reports, external reports, customer satisfaction analyses, and any other available documents.

The semi-structured interviews were organized as follows. First of all a presentation of the project (e.g. its characteristics, aims, steps, etc.) was provided using a power point file. During this presentation a more in depth illustration of the IC concept was given

(‘where’ IC can be ‘located’ within a company, with examples driven from a previous IC measurement project the researcher had been carried out and also specifically ‘built’ for company B). Attention was also focused on what the IC measurement project could be useful for (with examples driven from a previous IC measurement project the researcher had been carried out and also specifically ‘built’ for company B). Usually this was not a one-way talk and discussion was fostered. The interviewees were incited to intervene asking them questions such as “What do you think about it”? “Do you find similar problems/needs in your company?” Managers were also asked to talk about their activity, the way they managed the intangible resources under their responsibility, the way they managed knowledge and information.

When illustrating the project, managers were told that they would have been subsequently involved in establishing and in discussing all the elements which make up the IC measurement system: the intangible resources and activities selected as well as the indicators for monitoring them. The reason behind this was also explicitly stated: the system was supposed to help them to improve the management of their department/activities. After the interview an e-mail was sent to give a summary of the main issues which had been discussed and usually to ask for another interview aimed at analysing more in depth the critical issues which had emerged. Other e-mails and informal meetings usually followed the first interview to gather documents and information useful to support the analysis of the issues emerged during the first interview.

Enrolment

The enrolment of the managers was more difficult than anticipated in spite of the PL’s ‘belief’ that IC was beneficial, as the initial reaction of the majority of the other departmental managers was different.

I can give you all the documents you need; I can help you to accomplish your task in this way. I really believe that [the IC] project is very interesting and I am sure it would give you many hints for understanding human capital and managing knowledge. But, you see, I am very busy and I cannot participate further in the project.

[Head of ‘Business One’ Department]

I have all the information I need to do my job at best, if you want I can pass it on to you, no problem. Of course it cannot all be published in this new Sustainability Report.

[Practice Manager of 'Business Two' Department].

These managers essentially became 'external spectators' of the project and seemed not to see any utility in it, at least as far as their activity was concerned. The two reported sentences have also been chosen among others recurrent in the interviews because they show how IC was considered synonymous with Human Capital and a "task", or a concern, of the HRITQ department. Additionally, the ICS was being confused with the sustainability report and the confusion between the two of them was not cleared up, until the end of the project among these managers.

Even if the diffused sentiments among many top managers were similar to the ones reported above, other managers did get involved in the project as outlined below.

The relationships with the Municipalities, which are our shareholders and whose citizens are our clients, is very complex and thus very difficult to be monitored, almost impossible. There are the political representatives who judge the quality of how we plan and manage the services but what I really think is that the project could be useful for me to get information about the municipal technical officer's satisfaction. I need this information and you need it too because this relationship is crucial for the company. We can select a group of Technical Municipal Officers and draw up a questionnaire to be sent to them to gather information on their satisfaction and obtain suggestions to improve our operational activities. In this way I could gain information on specific issues which would really help me to manage the services, such as those related to managing the extension of the water system, to hook-ups to the system, to breaks in water mains, to waste collection and disposal, to urban hygiene.

[Top Manager responsible for the relationship with Technical Municipal Officers]

Therefore, this manager, "accepted the transaction", defining his identity and goals in the manner proposed by the researcher (Callon, 1986, p. 207) and thus was enrolled in the project. The latter got enrolled when he understood that the project could be an

opportunity to investigate the relationship with Technical Municipal Officers and get more information on company suppliers that offered their services directly to company clients. The quality of the services provided was a concern for this manager, and he associated IC to this practical concern.

Technical Municipal Officers are the Heads of the Municipal Technical Department responsible, on behalf of the township, for the technical aspects of the geographic area served by the company. In order to effectively carry out its activities, the company must, in fact, provide the information requested and follow the standards established in the service contract (e.g. maintenance checks on the condition of the gas and water lines) and it is the Heads of the Technical Municipal Department who are responsible for ensuring that the contract is fulfilled. In addition, said municipal officers are able to judge how well the company performs when technical problems arise, so their opinion influences that of municipalities as far as the technical aspects of the service provided are concerned. Therefore, the opinions expressed by the Heads of the Technical Municipal Department are held in high consideration by the municipalities, on the same level as those of the citizens-users of the company's services. Therefore, during the IC project, in order to monitor this relationship, a questionnaire was sent to them and information collected. This information proved to be important for the manager to show the aspects where the relationship had to be improved.

We have defined our 'organizational borders' in order to keep inside core competencies and activities and to give to our suppliers the management of non core activities. Thus, among the stakeholders, our suppliers are crucial to provide high quality services to our clients. The Heads of the Technical Municipal Department, in the questionnaires, showed a lower satisfaction as far as the parts of the services provided by our suppliers are concerned. On the contrary, the parts of the services directly provided by our employees got a higher evaluation. IC has given us a good hint! Thus we have just decided to take into consideration these bad aspects when we will 'structure' the contract for cooperating with these suppliers. We think that we must establish 'stable' relationships with these suppliers which is fundamental if we want to productively share with these companies our working methods, our procedures and moreover our values.[...] Productively because we cannot waste time in transferring our know how

with a company we are working with for, let's say, one year. It's contrary to IC, isn't it? Only in this way we think we can be sure to obtain a high quality service.

[PL]

Finally, the president of the board of directors was enrolled as well, being sensitive to the external communication issue and since he trusted the project leader. Therefore he gave his support to the project. During its deployment, he participated in the key-meetings such as the kick-off meeting with the Board of Directors, the meeting for presenting the IC external report to the Board of Directors as well as attending meetings where the ICS was presented to the wider community.

Mobilization

The initial project was completed in almost one year. During this period the company project leader and the researcher worked together in order to implement the IC measurement system. Many initiatives were launched connected to measuring IC resources, identifying activities establishing and calculating the necessary IC indicators. Some example are a thorough analysis of personnel competencies, a company climate survey, a satisfaction survey for the Head of the Municipal Technical Department, an analysis of the IT system supporting company's activities and interviews and a survey to assess IT user satisfaction. Besides the importance of the information gathered, these initiatives kept IC alive, throughout the company, including employees who were not actively enrolled in its implementation.

As part of measuring and mobilizing IC a number of internal documents on IC were written during this period culminating in the production of an internal and external ICS. Numbers, narrative and images were used in the ICSs to make sense of IC. In this regard, it is important to highlight that at the beginning of the project, the PL was interested essentially in measuring IC. From January 2004, when the PL and the researcher first met, to May 2004, when Company B decided to embark on the project, several meetings and phone calls occurred between the PL and the researcher and the latter examined many company documents. The PL was worried that the company did not have enough quantitative and qualitative data to be able present an ICS, therefore he asked the researcher to evaluate this potential problem.

As a result, a list of the indicators that were likely to be used to monitor the company IC was produced identifying which ones could be calculated. The PL was encouraged by the results obtained during this evaluation and decided to enter the project. At the end of the project, all the indicators initially listed were measured and some additional indicators were added which had been not considered in the initial list of indicators. What captures our attention is the proportion between numbers and words in the first ICS. The ICS is 100 pages long and contains 19167 words, 103 indicators and 5 images (excluding diagrams, tables or images that have exclusively an aesthetic function). Therefore narratives appear to have a relevant place in the ICS, more so than numbers. It is also important to highlight that the PL cooperated in writing some parts of the ICS, revised all the drafts. Yet, at the end of the project, he was able to use different technical devices to make sense of IC. He also designed the images used to connect software, process objectives and company value and to represent how employee satisfaction and IT diffusion influence company processes.

If we cannot show, using numbers, how the different software affects certain company objectives, processes and therefore company value, let's try to make it visible through pictures!

[PL]

Thus at the end of the project the usefulness of measuring IC began to be questioned, signalling the beginning of “un-locking” IC from accounting as the PL explained:

When the word ‘capital’ is attached to the adjective ‘intellectual’, an explosive cocktail is created. The word ‘capital’ is misleading because you think you have to give intangibles a monetary value or a non monetary one, but as precise as possible. Now I am sure that it is not necessary, that or it would be better not to use a single measure, you lose all the facets of the company IC, of all the actions undertaken to develop IC; you cannot work with it. At first you think that IC is something that has to be put in a balance sheet; then when you see all the possibilities you have to describe its nuances, a single monetary measure becomes so reductive. Of course, as the other project leader said, it depends on your aims. If you have to obtain a loan from a bank, then probably the measures will change.

4.3 Phase 2- Working with IC: ‘un-locking’ IC from accounting (2005-7)

After the ICS was completed, the cooperative work between the university researcher and the company officially came to a close. Nevertheless, the university researcher and the project leader kept in touch and on many occasions discussed and reflected on what had been accomplished. In fact, they both wrote articles and spoke at conferences about the project. Additionally, the university researcher was interested in knowing and understanding if and how the project was progressing, how the company was working with IC and if it was influencing human actions in any way. At the same time, the project leader was anxious to be kept updated on the innovations in IC measuring practices and was eager to discuss the choices made in managing IC.

Even if no ICS was written over the three years, IC was kept alive: enabled by the actors that participated in the first project through initiatives aimed at improving some of the critical aspects and gaps that came out during the process of measuring IC. For example, new policies for spreading knowledge throughout the company were launched which supplanted the previous ones based on knowledge databases which had proved not to be effective (see par. 4.4). Adding to this, since technical municipal officers had showed that Company B’s sub-contractors did not meet their expectations, more attention was paid by Company B in selecting them and in controlling their activities.

It has to be highlighted that, during these three years, IC was explicitly kept alive through narratives within internal company documents and reports. In several documents, written by the PL, many ‘traces’ of IC could be found where connections were explicitly made between IC or the ICS and the initiatives undertaken by the company. Two examples of this are provided next.

Identifying a new business partner

During this period, changes in Italian law made it necessary for the company to look for a new business partner, (a privately-owned company), to cooperate in managing the water and sewage service and its associated maintenance. The selection of a compatible working partner was a key issue because the company needed to guarantee its current high quality service standards as the PL explains:

The IC statement highlighted that the company’s good performance is the result of a peculiar mix of three key aspects: relationships with the stakeholders, organizational structure and processes and a deeply-rooted

company culture, which has to be preserved. Any changes, including the development of new partnerships, should occur without breakdowns in these areas and strong attention must continue to be paid to continuity in business and in values. Any changes should be shared and accepted by all company personnel. Therefore, we have tried to follow these directions when 'designing' cooperative relationships with partners. Our aim was to overcome the critical aspects that had emerged in the ICS.

With these objectives in mind, in establishing the criteria for evaluating the new partner, we have tried to establish two objectives. Evaluate the new partner's technical and organizational competencies. As for the latter, consistency with company values and capacity to integrate with it were considered of the outmost importance. Establish procedures that could favour the integration between the two of us before the start of the cooperation [...]

The deployment of the bid is characterized by maximum transparency, coherent with the accountability effort we put out in publishing the Sustainability and the Intellectual Capital Report.[...] Among the long list of documents available on the company web site there are also those devoted to very sensitive aspects, such as the intangible ones which are considered to be important. We believe that an in-depth knowledge of our company is an essential and invaluable step towards starting a fruitful cooperation.

[Part of the document prepared by PL for participating in a Quality Premium Competition in 2007]

Therefore, the compatibility of a business partner relied on the effective integration of competencies, processes and information, and not just technical and financial considerations. Thus, this led the company to include among the criteria used to select the new business partner intangible aspects, such as human capital policies, characteristics of their IT system, and their corporate culture. These, in essence, were introduced to compete or even complete more 'traditional' technical and financial criteria:

We have tried to make the prospective partner understand who we are and what we expect from him [...]

[The Company President]

“...we are a delicate organism and there are some elements that have to be considered when merging together: our employees, the way we manage them, the way knowledge is disseminated, the way we are used to doing our job. All in all, the IC statement should help our ‘Chieftain’ make the colonizers understand that we are not exactly cavemen”.

[PL]

The company’s criteria for choosing a potential business partner was novel, especially considering the company is operating in the public sector where the selection criteria and the evaluation methods must be made public. Normally, in this environment, aspects such as strategy, the organizational structure of the potential partner, proposals for integrating IT and human resources and corporate culture are generally buried in an undifferentiated and overall qualitative evaluation which is, at best, generic. Thus, through understanding the core intangibles holding the company together potentially a better fit between the company and a new business partner could be made.

Developing Human Capital Policies

Another example, regarding explicit connections made between the ICS and the initiatives undertaken by the company, concerns human capital policies. Interviews and data collected through the company climate survey, used for measuring Human Capital during the first IC project, had highlighted that some of the organizational projects undertaken were in stark contrast with company culture and were boycotted by personnel. In the first ICS it was observed that the employee incentive system, based on individual competencies, went against the strong group spirit which characterized, and still characterizes, company culture. Therefore, initiatives were undertaken to spread the logic of the new incentive systems, to openly discuss it with the employees and to question, if necessary, the choices made.

One of the most useful considerations brought up about IC is the following: personnel in our company have “bought in”, in a certain sense, through the

employment contract, a company where things are done well and where people get along and now they think that we are changing the terms of the contract. Any changes concerning these priorities create a strong resistance, the more deeply rooted the value the stronger the resistance.

[Part of a document prepared by the project leader for a company meeting
in 2006]

After reviewing company documents produced over the three years, it was evident that several initiatives had taken place to deal with this observation. For example, it was decided that anytime a new policy impacting on organizational and strategic aspects was launched, which potentially clashed with corporate culture, ‘ad hoc’ meetings had to be organized in order to illustrate these new policies in depth and to have open discussions with personnel.

In the company climate survey, “top-down communication” obtained lower results if compared to the other climate dimensions analyzed. These results have been traced back to the fact that the company’s employees are expert, competent and autonomous technicians and, as a consequence, managers usually let them self-manage. Sometimes this causes poor communication and it happens that information, especially when referred to the company’s future or to the recently introduced changes, is not spread. Considering this, starting from 2005, we have decided to launch some initiatives aimed at helping personnel to internalise the organizational changes that are in stark contrast with company culture. To this aim, for example, in 2006, managers organized meetings with employees in order to give information about the most important company commitment: the bid for choosing a new partner.

[Company B’s ICS 2007 – Human Capital – Actions undertaken to improve
HC]

After the end of the first project, the network did not collapse, but rather existed in a state of flux. This was because the problem around which all the entities had been enrolled had been ‘solved’ but while cooperating in reaching their common aim, something had happened affecting their activity afterwards. During the first stage the human entities had

become engaged to a new non-human entity previously unknown to the majority of them: IC. Before the project it was known intimately only by the researcher whereas, at the end of it, other entities in the network started to build a relationship with IC which continued to exist, at varying levels over the three years. After the end of the project, as we have illustrated, IC was mobilized through new initiatives. IC was also the reason why the PL and the researcher continued to meet, talk and discuss. The discussions revolved around the evolution of the IC project, progress in measuring IC and initiatives undertaken. The researcher, in particular, was interested in understanding if the initiatives were related to gaps highlighted by IC measurements, the IC report or if they were based on a higher awareness to IC and to knowledge developed during the project.

Additionally, the researcher was writing, articles about the IC project giving her opportunity to reflect upon the effects of the IC measurement and reporting system. Similarly, the PL wrote articles, prepared internal documents and made presentations about the project as well. These were exchanged with the researcher and provided the stimulus for their discussions. The PL was especially curious to know how IC theory was evolving and wanted to be updated on other projects the researcher was conducting. IC was also the protagonist of discussions between the PL and other company actors.

Thus, a state of flux existed because some of the 'old' associations between actors were broken and were replaced by 'new' associations between other actors being the company's managers, its employees, a new potential partner as they became interested in IC (see Callon, 1986, pp. 208-9). Therefore, after the completion of the project, the researcher was no longer at the centre of the network but all the entities were still bound together thanks to the continuing existence of IC through its mobilisation. This was evidenced in the production of scholarly articles, reports, presentations and of course the discourse between the researcher, PL and other actors. Thus the network transformed its associations over time rather than collapsing because the network had achieved its originally intended purpose. This allowed the potential for the network to be formally revived as we will discuss next.

4.4 Phase 3- IC re-‘locking-in’ ICS (2008)

Problematization

As stated earlier, from 2005 to 2007, the company B did not produce an internal or external ICS. It was only in 2008 that the PL decided it was time to write a new ICS.

The initiatives that originated from the first IC internal report were so numerous and demanding, just to give some examples, the revision of all questionnaires regarding stakeholder satisfaction, the design of a model for measuring the prospective partner’s IC, that we decided to concentrate on them instead of publishing a new external IC statement.

[PL]

In order to write a new external ICS, the project leader decided to again ask the assistance of the university researcher. Similar to the first phase, a question concerning whether Company B was able to report its IC arose. Therefore, before embarking on this new IC measuring and reporting project, a ‘recognition process’ was undertaken by the researcher.

I am not sure we can write another company IC statement. Over these last three years we have not produced all the information that was in the previous report so it would be impossible to make a comparison as far as many IC aspects are concerned. Moreover, many things have changed and probably the new report would contain aspects and that did not appear in the first one and vice versa. I know we can use narratives and images but, you see, the numbers will be few, perhaps too few. The initiatives undertaken are many but numbers referred to them are scarce.

[PL]

Upon first analysis, it became evident that the network had not collapsed but rather had remained in a state of flux and that the relations among the actors had undergone a process of transformation. The associations developed during the first phase, in fact, triggered new events and initiatives and as a result actors did things which were unexpected and which caused the transformation of the network itself. For example, new personnel policies were launched, new sub-contractors controls were introduced and new selection criteria for a business partner was adopted. As a result, during the second phase,

some associations were reinforced such as the one between the PL and the researcher and some others were established such as the ones between IC and the other actors in the network. Similarly, the seeds to create new associations were planted. In fact, the introduction of new criteria to select business partners made the company think of the IC elements involved in this relationship and business partners were 'forced' to reflect upon their IC to respond to Company B's requests. Concomitantly, some relationships became disassociated such as the one between the researcher and the Top Managers because of the lack of strong intervention.

During the second phase, the network had also been kept alive due to non social means other than the ICS (Latour 1986: p.37). In fact, even though the ICS had not been produced at company level, locally in individual departments, specific IC indicators continued to be systematically produced. For example, since the competence system was under revision, it was not possible to use its information to calculate the competence level. Therefore, in the HRITQ Department a lot of other useful information on employees was calculated which could be used to signify changes in employee competencies.

After the 'recognition phase' was completed, the researcher produced a report to illustrate the information gathered and provide a rough index for the new ICS. This report together with the discussions with the university researcher 'convinced' the PL to publish a new external ICS. The PL also expressed the aim to use the external ICS to report the actions undertaken over the three years to improve IC and, more importantly in his eyes, to enrich the communication towards a potential business partner.

In order to write the new ICS a new strong intervention by the researcher was needed because the actors had to be reassociated again around a problematization related to accounting for IC. As in the first phase, the researcher became an obligatory passage point (OPP) and became indispensable as she held the knowledge about how to report IC, through numbers and narrative, taking into consideration information which could be useful for a potential partner. In order to accomplish this project the 'old' alliance was revitalized (Figure 3). The active presence of the researcher was necessary to complete the network and, at the same time, while some of the 'old' entities remained (the Head of HRITQD, the president of the board of directors and IC), new entities entered the network (the manager who was in charge of innovative services related to new sources of energy and the one who managed the door-to-door recyclable refuse collection) and others left it

(the manager who managed the relationships with Technical Municipal Officers). A new external entity entered too: the potential cooperative partner.

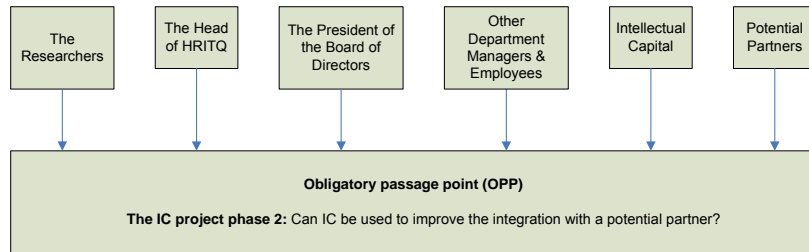


Figure 3: Entities in the network (second IC project)

The ‘old’ network, after being in a state of flux, was gradually revitalized around another problematization: “Can IC be used to improve the integration with a potential partner?” In this way, IC, which had been freed from accounting during the second phase and which had acquired a different identity because of changing associations, was again locked into accounting. This is because any potential business partner is likely to be “new” to IC, therefore he needs to understand what IC is, where it can be found and what does it have to do with the company. The potential partner is in front of an IC black-box and needs to explore it to see its shape, contents and inner workings. Similarly, any associations with new actors must also be locked into accounting for IC.

As in the first phase, it was the university researcher who defined the entities, their identities and their aims (Figure 4). Here we will comment only on the potential partner since the description of the other actors, provided during the analysis of the first phase, can be extended to this phase as well. The potential partner is required in the network because all information on IC has to be reported taking into consideration their information needs and the aspects Company B wants to disclose explicitly to them. The potential partner is, in fact, the most important ICS ‘reader’. Moreover the potential partner needs the information in the ICS since, in order to participate in the new partner selection process, they have to provide similar information. The main obstacle here is the likelihood that any potential business partner would have had little if no interest in IC until considering going into business with the company.

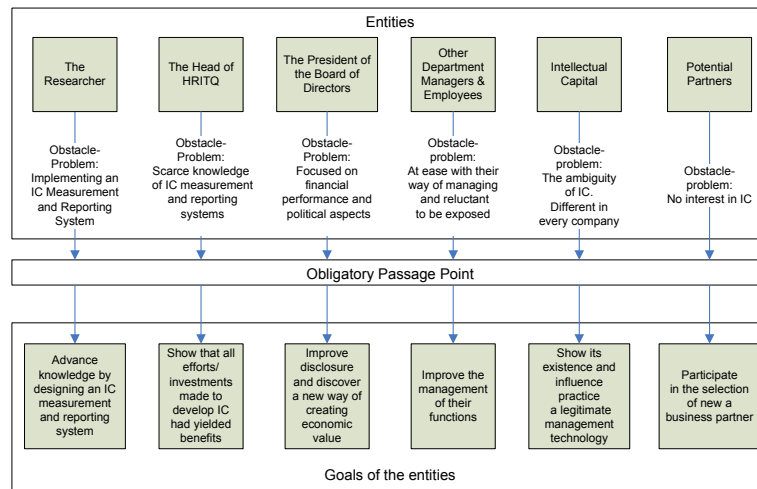


Figure 4: Entities, goals and obstacles in the network (second IC project)

Interessement and enrolment

In order to involve the actors in the network the researcher used the same means that she had been using during the first phase such as interviews, talks and *ad hoc* documents to illustrate the project and its aims. The controversy concerning whether IC is a valid management technology was kept alive, as specified, all during the first phase of the project. Those who were enrolled in the first phase recognized the validity of IC but the support for it was temporary and IC was put to the test. Therefore IC continued to be questioned after completing the first project was over and the PL attempted to show its validity and tried to spread it throughout the company, proposing it as a solution to practical concerns not only in regard to HR policies but also to wider company policies. For instance, the use of IC based criteria to ‘evaluate’ a potential partner is proof that top management recognized the importance of IC in managing relations, un-locking it from accounting concerns. Therefore, supporters enacted IC in material practices, using it as a solution to practical concerns; detractors refused to consider in-acting IC.

When the new ICS project was launched, the controversy, too, was revitalized. Some of the ‘old’ supporters of IC (the Head of HRITQD and the Company President) were easily interested and enrolled in the network since they could see the benefits obtained from their past experience. The top Manager responsible for the relationship with Technical Municipal Officers decided, on the contrary, not to take part in the new project:

I got useful information from the previous project but, I am sorry, I have many things to do and I do not have enough time to participate in the new project. All in all, I got all the information I need and I am still working to improve the relationships in the direction shown by the questionnaire.

The 'old' IC detractors refused to participate in the project continuing not to see any advantages in it.

Ah yes, I remember the presentation of the statement you made some years ago, it was 2004 or 2005, wasn't it? It was interesting [...] I guess it was useful for managing HR, the Head of HRITQD always mentions it but, believe me, it is really of no help to me, and my job is different. I am satisfied with my stuff.

[A Company Department Manager]

Nevertheless, two new managers were enrolled in the project, the one who managed the innovative services related to new sources of energy and the one who managed the door-to-door recyclable refuse collection. The researcher, with the help of the PL, tried to interesse them showing that the way they managed the services under their responsibility was a clear example of how the company used its competencies and knowledge as levers to provide effective and efficient services. This offered an opportunity to these managers to show to the company and to external stakeholder's activities and the actions undertaken using a different perspective. This different perspective 'fascinated' them and they got enrolled into the network.

I cannot affect company turnover that much but I can influence company costs. During the last years I have been making many cost savings, especially when it comes to launch the door-to-door waste collection but, I mean, it is difficult to express them in monetary terms. So if I can use numbers and if I can comment on them, then the project can help me in making the others understand what I did for the company.

[The manager responsible for the door-to-door recyclable waste collection]

In order to interesse the potential partner, for participating in the bid the company asked them to provide information referring not only to its technical resources but also to its organizational structure, management systems and strategy. All of these aspects were then

further broken down into their most important elements and characteristics and were evaluated on the “completeness” of the information provided and on how compatible it was with the company. “Completeness” refers to the fact that, when providing the information, the partner did not overlook any points dealt with in the ICS and, thus, it refers to how well the potential partner could integrate with Company B. For instance, in looking at the potential partner’s capacity to manage and control its own relational and human capital, the use of personnel management systems based on human competencies along with results of employee climate surveys, and measures of customer and supplier satisfaction were evaluated. Aspects such as the formalization of the procedures or the existence of coordinating organizational positions were also scrutinised. The potential partner was also asked to suggest ways to integrate its own services, competence, information systems and personnel management policies with Company B’s ones (Chiucchi, 2008). Therefore the potential partner needed to understand Company B’s IC before it could disclose its own IC and, in order to provide information referring to its IC, the potential partner needed to read and understand Company B’s ICS.

Mobilization

All the actors enrolled were mobilized and displaced in the new ICS. Moreover all of them, except the business partner, were directly involved in producing the second ICS. In the process they were interviewed and helped identify the intangible resources and activities under their control and provide the indicators for monitoring them. They also provided information useful to calculate the indicators and where possible, they calculated indicators themselves. Frequently, since the numbers available to disclose a certain intangible were scarce (e.g. the customer satisfaction measures of the door-to-door recyclable waste collection and the renewable energy businesses) they produced narratives in order to ‘describe’ it as well as the activities performed.

Many of the initiatives undertaken over the previous three years continued to be documented in the new ICS making an explicit connection with past IC measurements. Connections between IC and all entities involved in the network are also described.

I believe that the continuity between the two IC statements can be guaranteed by showing the initiatives undertaken to face the critical aspects that had emerged in the first IC project. This would also justify

why, in the new report, new IC aspects arise and others disappear or are given less importance.

[PL]

For instance, in the new ICS, it is made evident how the ‘old’ policy adopted for structuring and spreading information throughout the company, which was based on creating and using databases, changed over the three years. In fact, the IC indicators measuring the use of knowledge databases, which were a preferred means for spreading knowledge, showed how the databases were actually not used very much. On the contrary, the climate survey had highlighted that direct and informal exchange of information and of personal experience and expertise within small working groups was the most appreciated and useful means for sharing knowledge. Therefore, the use of databases was circumscribed only to very specific cases, for example when knowledge was referred to innovative services.

Structuring information through databases has been kept only with reference to specific situations, for example those related to structuring basic information useful to new-entry employees or those related to very innovative activities that need to be systematized. Next year, for instance, we are going to realize a knowledge management database aimed at structuring information related to renewable sources of energy. Knowledge in this area is ‘under construction’ and is possessed by very few people, therefore we think that knowledge structuration can speed its diffusion and its use in order to increase the personnel competences.

[Company B’s ICS 2007 – Human Capital – Actions undertaken to improve
HC]

Furthermore, narratives were used intentionally instead of numbers because narratives were considered to be more appropriate to show the connections among intangibles which had been activated by the company managers (see Dumay, 2008b). For example, the first ICS contained a list of ‘excellent employee competencies’ which were supposed to be exploited to create and sell new services and which were considered, in 2004, a fundamental lever in the company’s growth strategy. Seventy ‘excellent competencies’ were identified, ranging from technical (e.g. designing water and gas distribution systems,

remote controlling these systems) to managerial ones (e.g. implementing a quality assurance system). The ICS gave the stimulus to identify and monitor the critical aspects of these competencies. Their analysis showed that they pertained to a single or, at any rate, very few individuals within the company. Since it was considered vital that these competencies and the knowledge upon which they are based were shared, the ICS identified the number of employees who possessed “excellent” competencies, their years of experience, and the number of employees trained in these competencies.

The ‘excellent competencies’ are constantly revealed throughout the ICS 2004: when illustrating company strategy, when reporting about human capital and describing the employees’ competencies, when showing how organizational structure is influenced by the strategy and how, in turn, it influences the strategy.

Company B possesses excellent competencies and the organizational analysis, the aptitude to reflect upon our capacities, has increased the consciousness of the possibilities to ‘exploit’ them not only in order to carry out activities in an efficient and effective way, but also as a source of future profits. This is the reason why the company has decided to ‘sell’ its own competencies. In this sense, we have decided to organize in a better way the exploitation of these competencies and to ‘protect’ and ‘preserve’ them through technical instructions, procedures and software. In this way we allow them to become structured within the organization, to become a ‘settled’ wealth and we avoid the risk that they be constrained in individuals’ tacit knowledge.

[Company B’s ICS 2004 – Organizational Capital – Organizational Structure]

Over three years, the Marketing Director decided to narrow down accounting for only some of them, in order not to waste people’s energy and focus on those that seemed to offer a higher monetary benefit.

Nowadays, the number of excellent competencies is 60 and they have decreased by 14% [...] actually we decided to focus only on some of them. We have continued to invest also on the others but predominantly for internal aims, since they contribute to deploy activities in an efficient and effective way.

[Company B's ICS 2007 – Human Capital – Excellent competencies as a
source of innovation]

Therefore very few indicators related to excellent competencies were provided in the new ICS: the distributions (in percentage) of excellent competencies among company departments and the number of employees who possess the “excellent competencies”. In the new ICS, instead of just numbers, narratives showed how some of these competencies were mobilized over the past three years, to provide new services, for example, those related to renewable sources of energy. The narratives highlight how knowledge and competencies were shared and spread among employees, how employees organized their work and which relationships were activated in order to generate and sell these new services.

For some years now Company B has studied, designed and developed innovative solutions to produce energy from renewable sources such as solar photovoltaic, biogas from waste and solar water heating.

Among the ‘excellent competencies’ identified in 2004, three of them were strictly connected to renewable sources of energy. The attention paid to their development brought about, on the one hand, an increase in the level of these competencies and, on the other hand, their diversification.

Company organization was used as a lever to promote these competencies’ development. Employees who possess these competencies were ‘located’ in the same Department in order to promote knowledge sharing through a socialization process and through people interaction in small groups (which the company employees explicitly indicated as their preferred way for sharing knowledge). Since these competencies are used to provide services related to the ‘core’ business and since they are possessed only by a few people, the company is now planning to structure of the relevant information through a database (which will use Wikipedia’s logic).

[Company B's ICS 2007 – Relational Capital – The relationship with the
clients of services related to renewable sources of energy]

When describing the new services provided by the company, narratives are used to illustrate how the company developed these new services by combining human, organizational and relational capital. For instance, in the new ICS, narratives are used in

combination with numbers to show how traditional services, for example the collection of waste, were re-organized within the company to create new services, in this case the door-to-door collection of differentiated recyclable waste. The new services were developed using information on clients available in databases, the competencies of employees and a strong, cooperative relationship with a supplier. An extract from the ICS explains the situation:

The implementation of a door to door service to carry out the differentiated collection of waste is a clear example of how the company has exploited its IC in order to create a virtuous circle leading to value creation. The increase in the collection of differentiated waste from 38% to 76% is a proof of this.

Before analysing the quality of the relationship with door-to door service clients using the information gathered through a customer satisfaction questionnaire, it is interesting to present how the company built the relationship with the clients of the door-to-door service. An intense interaction between human, organizational and relational capital was activated which led, in a short time, to develop and provide a new service ('new' for the company).

The clients of the door-to-door service are a part of the clients of the waste collection service already provided to the "X" by Company B. Over the years, the latter has developed a strong relationship with them and has collected data which proved to be very useful to carry out the door-to-door collection of waste in an effective and efficient way. The good results achieved, in fact, are due to the already existing good relationships with clients as well as to the company capacity to create innovation.

[Company B's ICS 2007 – Relational Capital – The relationship with clients of the door-to-door waste collection]

In synthesis, all entities are represented in the ICS through numbers and narrative. Compared to the 'old' ICS, narratives play a more significant role (see Table 1) and this also shows that, gradually, the lack of quantitative data and the scarcity of comparative information, which was a major concern for the project leader before starting the project, became less important in his eyes.

Table 1: Content differences between the 2005 and 2008 ICSs

Number of Indicators	2005	2008	Variation
Human Capital	23	13	-43.48%
Organizational Capital	41	26	-36.59%
Relational Capital	25	26	4.00%
Activities	14	10	-28.57%
	2005	2008	Variation
Number of words	19167	23952	24.96%

5 Discussion and Conclusions

The motivation of this paper was to investigate in depth both the IC ‘lock-in’ to accounting phenomenon, which occurs when IC is introduced as a measurement practice in companies which are new to IC, and if and how an ‘un-locking’ process can occur. A longitudinal case study concerning the design and implementation of an intellectual capital measurement and reporting system was proposed in order to analyse the above-mentioned processes. The case analysis covers a period of four years, from 2004 to 2008. Following the movements of the actors, using the four moments of translation proposed by Callon (1986), we found that during the first part of the project, IC was progressively ‘locked-in’ to accounting. Therefore, the project allowed IC to manifest itself but a ‘lock-in’ phenomenon to the accounting domain occurred, thus limiting the initial impact introducing IC can have in a company. This can be considered ‘a natural consequence’ of the project undertaken, for its aim after all was to measure and to report IC.

In order to understand how IC was un-locked, we borrow again from the theoretical framework proposed by Callon (1986). The author argues that each entity of a network is the result of the association which links it to the actor who defines the problematization and who succeeds in disassociating it from the other actors who try to give it another definition (Callon, 1986, p. 208). This is what happened in the project illustrated: the researcher built devices to interesse other actors and defined their identities according to her goal of measuring IC. This made it possible to produce the ICS.

At the same time, it is worth noting that the association between the researcher and IC seems fragile, loosely-knit, and presents some peculiarities which, in our opinion, deserve attention in order to understand the ‘un-locking’ process. Thus, the seeds of the un-locking process were planted while the lock into accounting was developing. When IC entered Company B and became part of the network, it entered as a “new” and ambiguous expression, like an “empty” black-box. It needed to be ‘introduced’ and thus to favour its ‘entrance’, the researcher provided a definition of IC, based on the tripartite model of Human, Structural and Relational Capital, and provided examples of its composition and measurement. These identified typical intangible resources, activities and indicator types. We could say that the vase was given a shape but it still had to be filled.

The interestment devices used to enrol the actors and the specific process used to design the measurement system proved to be particularly effective for the actors to make sense of IC. In fact, during the design of the measurement system, actors were involved in reflecting upon the company strategy and its key success factors and in translating them into a strategy for developing IC. In this way, IC progressively gained relevance as a protagonist of the company strategy and of everyday work as well.

Gradually the other actors became acquainted with IC since they were made to think of what were the key intangible resources under their control and of what they did and could do to improve them. Therefore, identifying and measuring intangible resources and understanding how they were created and developed boosted IC as a sensemaking process. At the end of this “journey” the IC vase had been filled with IC measurements. This does not mean that IC would remain stable: the vase was neither full nor its contents stable. Thus, the expression “Intellectual Capital” combined with the process of measuring IC introduced a new way of interpreting the reality and, slowly, IC gained its identity. Measuring IC proved to be a powerful tool for making sense of IC.

Originally IC had been introduced exclusively for measurement aims therefore as a concept able to provide different lenses through which observe the company performance. As stated before, when the researcher introduced IC, a tripartite model was used in order to spread over the idea of IC as a common system. The ultimate aim was to write up an exhaustive ICS. The list of the company intangible resources (see table 1 in the appendix), which was written up by the researcher after the first interviews and approved by the PL, comprises a wide range of company intangible resources. They were all measured and accompanied by narrative in the ICS but the concept of IC getting around

Company B was less ubiquitous than the researcher and the PL had expected because IC was associated predominantly to HR and IT issues and only marginally to the relationships with the stakeholders.

Another aspect we stress is how IC entered as ‘vague expression’ and gradually built relations with the other actors making them do unintended things. Therefore IC behaved as a ‘mediator’ and not as an ‘intermediary’¹. During the interessement, enrolment and the mobilization phases, in a *crescendo*, each actor built its own meaning of IC. In other words, IC was ‘made free’ to be attached to other entities’ concerns and this created the conditions for its freedom and for the un-locking process. Therefore, the interessement devices used by the researcher to involve the actors in the network and the cooperative process used to design the IC measurement system favoured the engagement of each actor with IC. Thus, IC gradually gained an identity and, as the project progressed, the seeds to create an association between IC and the entities were sown and began to grow and to bear fruit. Gradually the engagement between IC and the other entities became stronger, so much stronger, that once the project was over, the network entered a state of flux whereby the association between IC and actors was established and continued to evolve: here IC was allowed to re-enforce associations with the other actors gradually transforming and modifying the meanings it carried. In this way IC was ‘un-locked’ from a strict accounting domain and allowed actors do previously unexpected things. This was enacted in several ways: through a new incentive policy, through new criteria to be used in selecting a new business partner, through new personnel policies.

Did IC stop being accounted for completely during this period? No, even though an ICS was not produced for three years IC inscriptions continued to be made, although predominantly in a narrative fashion. In this way IC was kept alive. All these means proved to be fundamental to sustaining the existence of the network. In this regard, Latour states “... that groups have to be made and remade anew through some other non-social means, and that there is never a grouping that can sustain its existence without some keeping up” (Latour, 1986: p. 37).

¹ “An intermediary, in my vocabulary, is what transforms meanings or force without transformation: defining its input is enough to define its outputs. For all practical purposes, an intermediary can be taken not only as a black box, but as a black box counting for one, even if it is internally made of many parts. Mediators, on the other hand, cannot be counted as just one; they might count for one, for nothing, for several, or for infinity”. (Latour 2005: 39).

If we look at the initiatives and events triggered by the association of IC and the other actors during the second phase, we see that the ‘un-locking’ process, was enabled predominantly by the Head of the HRITQD, that is to say the actor who was convinced of the utility of IC as a management technology, so convinced that, when the new ICS was produced, he suggested focusing the attention on the actions undertaken to improve IC that derived from what emerged in the previous ICS. When the second ICS project was launched, IC was again briefly ‘locked-in’ to accounting so that new entities in the network could make sense of IC before understanding how they could use it. For example, in the third phase, the network was revitalized in order to disclose IC with specific reference to a potential business partner and to foster the integration with this entity. IC was involved in the network for measuring and communicating Company B’s aims and this is the reason why we say that ‘IC was locked again into accounting’. But the new network, which was formed, was different from the previous one and so too the subsequent ‘lock-in’ to accounting. Therefore, the translation process was revived which required ‘lock-in’ to the accounting domain in order to develop interestment from the actors as well as the subsequent concomitant process to free IC from the accounting domain.

In order to explain these differences, we borrow from Lewin’s (1947, p. 32) three stage change process. Lewin advocates that in order to make a desired change it is necessary, first of all, to ‘unfreeze’ social habits, to break them by overcoming forces that constitute a resistance to change. Once a practice has been unfrozen, the practice moves to a new level and finally the changed process is frozen. Unfreezing the present practice and freezing to the new practice implies various problems. When freezing a new practice, the permanency of the new practice can be problematic and there is a risk that it is temporary. “Since any level [practice] is determined by a force field, permanency implies that the new force field is made relatively secure against change (Lewin, 1947, p. 35).”

In the first phase the introduction of IC in the company brought about a change in the accounting domain. The ICS changed managerial and external communication aims, being a new way of measuring and reporting company performance. Therefore IC and its frameworks and theories were used for accounting aims and IC was ‘locked-in’ to accounting. Therefore a new social habit was developed which broke the existing custom of focusing managerial attention and the company’s measurement and reporting systems, away from the predominant financial aspects of company performance. However, this

new social habit applied to only some managers because strong resistance to change was experienced. As illustrated earlier in the first and second phase of the project, in order to ‘unfreeze the previous custom’ the researcher used interestment devices such, as talks, chats, interviews and examples of measuring IC drawn from her previous experience to addressing individual actors concerns, in an attempt to diminish existing financial accounting habits and to strengthen accounting for IC. The use of individual interestment devices instead of group ones could have, in part, influenced the resistance to change, since they are ‘weaker’ than group devices. According to Lewin (1947. p.34),

“If the resistance to change depends partly on the value of the group standard for the individual, the resistance to change should be diminished if one uses a procedure which diminishes the strength of the value of the group standard or which changes the level that is perceived by the individual as having social value. [...] it is usually easier to change individuals formed into a group than to change any one of them separately”.

At the end of the first phase, some of the entities enrolled, namely the Head of HRITQD, the president of the board of directors, the manager that managed the relationships with technical municipal officers had strengthen their association with IC, had built their own meaning of IC and had begun to autonomously use IC information in order to develop actions aimed at its improvement. After the completion of the project, they also used IC for aims which were other than accounting aims. Thus, IC was un-locked (or unfrozen) from accounting and locked into management practice.

When the network was revitalized, the remaining entities who participated in the first phase already knew what it meant to measure IC and built their own meaning of IC. This permitted the network to reactivate and re-lock IC into accounting, but at a different level. Their autonomous production and use of IC information to foster activities based on IC and, more importantly, mobilizing IC over the three years permitted to refreeze IC and the habit to report on it to a new ‘different’ level.

By ‘different’ we do not mean higher or lower but the ICS was focused on different aspects, not merely on IC measures but predominantly on the actions to improve IC that had been undertaken over the three years. Thus in the ICS, more room was given to narratives in order to show how new services were the result of the connectivity between intangibles. Additionally, the new entities enrolled, for example, the managers in charge

of innovative services related to new energy sources and the door-to-door recyclable waste collection, were pushed to think beyond measuring IC, to reflect and illustrate how they used IC to implement their strategies. Therefore, the new IC 'lock-in' was shorter and fleeting and only required to help the new entities make sense of IC.

The network changed as new entities entered and others left, altering the balance between IC and traditional accounting practice. The latter remained in force because of the resistance to change offered by some managers. During the second phase, resistance to change remained among those who did not participate in the first ICS project. Unexpectedly, the manager who managed relationships with Technical Municipal Officers, who was enrolled in the first network decided not to participate even though he found IC useful. For him, the change of the accounting habit was temporary, yet the impact of IC was maintained since he claimed that "All in all, I got all the information I need and I am still working to improve..." Thus, mobilizing IC does not need to replace accounting, nor should accounting supplant mobilizing IC, rather they can coexist.

From an ANT perspective, our paper contributes to the use of ANT by showing how the translation process is continual and not staged. The network formed during the first phase, in fact, did not collapse at the end of the first stage as many would expect after the initial aim of producing the ICS was achieved. Rather, it continued to survive but "in a state of flux" since the associations among the actors, developed during the first phase changed. Some actors built a direct and strong association with IC, and IC played also a pivotal role in building associations between human actors such as the PL and the researcher while others became disassociated such as researcher and some of the other managers who had been involved in the project. Therefore the network continually evolved and never stabilized if not temporarily around a new problematization. It was in relation to a new problematization, thus, that the network was revived as new associations were developed, as new actors became interested (a business partner) as others returned to the network (the Company President) and others definitely abandoned it (the Top Manager responsible for the relationship with Technical Municipal Officers). In this evolution a crucial role is played by inscriptions on IC which were fundamental not only in keeping IC alive but contributed also to build its identity.

In essence our main conclusion and contribution of this paper is that our analysis is contrary to our hypothesis and in some way contrary to the findings of Chaminade and Roberts (2003) in that we challenge the notion "that a dominant accounting perspective

can lead to an excessive focus on measurement issues and little attention to management processes.” On the contrary we believe the evidence from our case study shows how at times a dominant focus on accounting for IC is necessary, especially to allow newcomers to take stock of and make sense of IC. The analogy is much like comparing accounting versus managing IC to the concept of the chicken and the egg: What comes first? In our view, for some newcomers to IC such as Company B, it was essential to take stock of IC by measuring IC thus locking-in IC to accounting so those enrolled in the network could relate IC to their day to day challenges. Once this was done IC was free to be un-locked. In this case the egg is accounting for IC and the chicken is the mobilization of IC.

We suggest that our findings contrast those of Chaminade and Roberts (2003) because of the longitudinal nature of our project. In the case of Chaminade and Roberts (2003) the timeframe was shorter and involved only one iteration of the introduction of IC into a number of companies. In our case we can see how IC evolved over time and changed according to the challenges faced by the company and its managers. This highlights the power of measuring IC as a sense-making device which, when combined with IC narratives is necessary for mobilizing IC as Dumay and Rooney (2011a, p. 352) allude to :

...measures ... help make sense of whether or not [a company] is improving their IC. But these are not concrete measures and may not need to be used again... This is not because the measures are not useful, but because ... reporting needs evolve based on the bespoke nature of its business, political expectations and changing business plans.

Our research also contributes to the understanding of the ‘un-locking’ process by highlighting that, in order for IC to be unlocked from accounting, the way the actors in the network are enrolled, interested and mobilized is of the utmost importance. More specifically, the way the measurement system is designed and implemented plays a pivotal role. In fact, the seeds for unlocking IC are planted during the lock-in process. The case findings show that measuring and reporting IC can be powerful tools for the actors to make sense of IC but as long as IC behaves as a mediator and the head of the network accepts to build a loosely-knit association with IC while letting IC reinforce its relations with the other actors.

This finding refines what Callon observes. As already stated, the author advocates that, in order for the network to be formed, it is necessary that the actor who defines the problematization succeeds in disassociating each actor from the others who try to provide another definition (Callon, 1986, p. 208). The case finding shows that even if this is of the utmost importance for the entities to be enrolled, then, when the alliance is formed, it is necessary that each actor be made free to associate with IC and build his own meaning of IC. This allows IC to gain an autonomous existence and to survive afterwards if the alliance is temporarily or permanently broken. In this way IC can live beyond the network.

At the same time, the paper contributes to the extant literature by showing the importance interessement devices, such as interviews, meetings and talks, have in order for IC to be freed from accounting. In the case under analysis, these devices permitted the researcher create an association between IC and each of the actors involved in the network since each actor had the opportunity to internalise the concept and attach their own meaning to it.

We also note that the procedure the researcher used to make the managers more familiar with IC expression and with the measurement and management issues related, called for their direct involvement in designing the IC system. This process was utilized to lessen the effects connected to what Dumay (2009, p. 205) refers to as the “accountingisation of IC” whereby ‘accountants’ apply accounting solutions to the management challenges they face in an attempt “to make the intangible tangible”. Therefore, the Italian language and the accounting vocabulary with which the project had entered the company could have acted as a barrier to participation. The accounting like expressions such as “*IC Statement*” and “*IC measurement system*”, that the researcher and the company project leader frequently used, entered the managerial vocabulary and thus IC was initially and instinctively attached to accounting concerns by the majority of the managers.

By considering the lessons learnt from the case, taking into consideration the above-mentioned barriers to the involvement of managers in the project as well as the importance of some of the interessement devices used in order to free IC, other organizations, which implement IC practices, can be made aware that the ‘lock-in’ phenomenon can take place and devise strategies to avoid the possible detrimental aspects of ‘lock-in’ and allow IC to be un-locked. More specifically, it is also important for managers to understand that an initial “lock-in” to accounting may be necessary as a

crucial first step in implementing IC management practices as taking stock of the company's IC can act as a sensemaking device and help enrol actors into the network of entities so IC can be mobilized. While it may be true that more can be achieved through mobilizing IC (Chaminade and Roberts, 2003; Catasús *et al.*, 2007; Dumay and Rooney, 2011a) our findings suggest that measuring IC at strategic points in time like the beginning of an IC implementation or when a major strategic change in direction is required may be advantageous, because from time to time we need to take stock of the IC journey and reflect on what has been accomplished and what needs to be done.

The implications for future research are based on our earlier discussion of the performative approach to IC research. In this paper we have exemplified how research into the practice of IC can deliver insights into the actual interplay of IC within the organisation. The problem, as we see it, with more ostensive research into IC is that the findings are generalised to be applicable for all organisations rather than understanding how IC works in specific contexts.

We also want to highlight the role of academic researchers in understanding how IC works inside organisations especially when we examine how deeply involved (or not) a researcher can become in the research. As highlighted in our paper the researcher initially took a strong interventionist approach to developing IC in Company B. This is because when introducing new concepts such as IC into organisation we cannot expect a sufficient number of managers to be "educated" in managing IC. As one of our colleagues suggested IC suffers from the problem of proliferation in practice: "In [my country] I find it's not being practiced by managers far as much as it's being *preached* by us academics". Thus, we argue the future of IC research and practice relies on academics getting out of their "Ivory Towers" their hands dirty with practice. This research project and other recently published IC research (Dumay, 2010; 2011; Dumay and Rooney, 2011a) shows how this can be done successfully without compromising academic integrity. While some more modernist approaches to qualitative research may argue against our view we argue that more interventionist approaches are necessary to help create IC believers who *practice what is being preached* alongside the preacher.

To conclude, the limitations of our study are also highlighted. Our study is limited to the one Italian company studied and thus our results may not be generalized directly to other organizations. It also has been influenced by the active involvement and interventions of one of the two IC researchers. Therefore, the resultant practices will have in part been

influenced by the researcher and by the model and the process used in order to design and implement an IC measurement and reporting system.

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Appendix 1

The purpose of the appendix is to present a brief description of the Intellectual capital measurement and reporting system developed by the researchers and adopted by the company. The IC measurement and reporting model adopted by the company was designed in 2001/2002, after a careful analysis of existing literature and taking into account the “state of the art” (Edvinsson and Malone, 1997; Sveiby, 1997; Meritum Project, 2002; Mouritsen *et al.*, 2003), which had gained considerable support at the time and opportunities for further research were still open. The adopted IC measurement framework composed of a system of indicators and a narrative which is used to interpret them. The logic underlying the system maintains that there are *intangible resources* which are influenced by *management activities* as outlined in Figure 5.

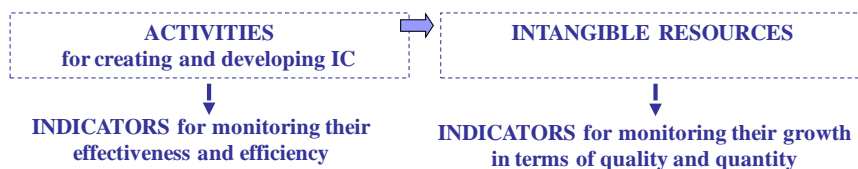


Figure 5: The researcher's IC measurement framework

The model is based on the premise that intangible resources represent a potential to create value available to the company. In order to increase this potential it is necessary to manage intangible resources by performing activities that would determine their creation, development and improvement. Intangible resources are intentionally specified as representing a potential to create value because value creation occurs through the interaction of intangible resources and other company resources within organizational processes and operations in the search for organizational excellence. Through this interaction, products and services are created and if they meet customer needs and translate into income, economic value is created.

Keeping in mind that measurement systems are firm specific, just as intellectual capital is, some “rule of thumb” phases to be followed were identified in order to design and implement an IC measurement and reporting system. Specifically, these phases are:

1. *Formulation of the company mission and of the strategy and identification of the key success factors* - This is a preliminary phase, essential for the development of the

rest of the project. By making explicit the company strategy and the key success factors, and by talking about them through *focus-groups*, the managers (and the researcher) improve their awareness of the importance of IC in order to build a competitive advantage.

2. *'Translation' of company strategy into a strategy for creating and developing the company Intellectual Capital* - During this phase, managers are requested to analyse in depth what they do in order to develop company intangible resources. This phase and the first one are essential to begin to identify the company intangible resources and activities as well as the dimensions to be monitored (quality, timeliness, etc).
3. *Mapping of the critical intangible resources* – The intangible resources to be monitored are identified by taking as a point of reference the 'traditional' IC tripartite model: human, organizational and relational capital. It has to be noted that the abovementioned IC categories are used in the mapping phase as a point of reference in order to help managers reflect upon where IC is located. After the intangible resource identification has been accomplished, the concept of category is abandoned and the focus turns to the interactions among resources through the managerial activities. The latter allow for the creation, the development, the transformation and the improvement of company intangible resources;
4. *Identification of actions for the creation and development of intangible resources* – As far as the activities are concerned, they are not referred to the categories because this would be misleading; from a normative perspective, reflecting upon them is considered to be useful for managers since this pushes them to think in terms of connectivity.
5. *Establishment of the indicators for measuring the quality and quantity of intangible resources* - In particular, these indicators are an expression of the intangible resource flows which occurred over a certain period (in terms of, for example, "rate of development" or "rate of renewal" of resources such as competencies, structured knowledge, etc.).
6. *Establishment of the indicators for measuring the effectiveness and the efficiency of the activities undertaken for creating and developing intangible resources*- efficiency can be monitored through measures referred to activities' costs or with non-financial indicators (e.g. for training activities, the per-capita cost and the per-capita hours can be calculated). Effectiveness can be measured in terms of

punctuality, reliability, perceived utility, timeliness, etc. (e.g. for training activities, effectiveness can be monitored by the growth/decline rate of employees' potential or of competencies measured after the activity takes place).

The process illustrated must be considered a rough guideline, because in reality the phases overlap. This process is in fact iterative, since the maps of intangible resources and activities, together with the chosen indicators are fine-tuned and if necessary changed, as the understanding of a company's IC progresses.

Thus to illustrate Company B's IC we outline below the IC measurement system developed. First the researchers developed a map of company intangible resources (Table 2) and a map of development activities (Table 3). From there, a list of predominantly non-financial indicators was developed to express the growth or decline of intangible resources and the efficiency and effectiveness of the management activities (Table 4).

Table 2: The list of company intangible resources (First Phase)

HUMAN CAPITAL	ORGANIZATIONAL CAPITAL	RELATIONAL CAPITAL
<ul style="list-style-type: none"> ▪ Competencies <ul style="list-style-type: none"> – basic – managerial – excellent – ad hoc ▪ Loyalty ▪ Quality of the workplace relationships: <ul style="list-style-type: none"> – Motivation – Trust – Responsibility – Top-down and horizontal communication – Aptitude for teamwork – Alignment with strategy – Involvement in decisions 	<ul style="list-style-type: none"> ▪ Information system ▪ Software and databases ▪ Strategic software and database ▪ Procedure ▪ Manuals ▪ Product catalogues ▪ Patents ▪ Organizational processes and structure 	<ul style="list-style-type: none"> ▪ Relationships with utility customers (methane-gas, water supply and maintenance and environmental services) ▪ Relationships with the technical municipal officers ▪ Relationships with new service customers ▪ Relationships with the companies which bring organic waste to the composting facilities ▪ Relationships with non-shareholder municipalities ▪ Relationships with the Local authorities (ATO, AEEG, ARPA, USL), the provincial and the regional offices ▪ Relationships with other organizations (artisan associations, cooperatives, etc.) ▪ Relationships with suppliers ▪ Relationships with trade unions and associations ▪ Relationships with educational institutions

Table 3: Examples of activities and indicators of efficiency and effectiveness

ACTIVITIES	INDICATORS
Training activities (broken down according to objective; for example, managerial, excellent competencies, etc.) -	- Number of hours per capita - Cost per capita - Satisfaction level of learners ...
On-the-job-training activities for managerial competencies	- Number of hours per individual in training - Cost per capita
Problem solving activities	- Frequency of departmental meetings
Activities to improve and update software	- Number of hours per software and average cost - Average frequency of up-dating
Activities to convert individual software packages into official company software	- Number of hours to "officialise" software and average cost
Activities geared to knowledge structuring (procedures, databases, etc.)	- Number of hours to structure procedures/databases

Table 4: Some of the intellectual performance indicators (First Phase)

HUMAN CAPITAL	ORGANIZATIONAL CAPITAL	RELATIONAL CAPITAL
<p>General data</p> <ul style="list-style-type: none"> - Employees' average age - % Male employees - % Female Employees - Education - Years of seniority - % Employees with more than two years of seniority - ... <p>Competencies</p> <ul style="list-style-type: none"> - Managerial competence level - Years' experience in excellent competencies - Number of people who own excellent competencies - Number of people being trained in excellent competencies - <p>Loyalty</p> <ul style="list-style-type: none"> - Turnover index broken down by cause - % of newly hired employees - ... <p>Workplace relationships</p> <ul style="list-style-type: none"> - Quality level of the workplace relationships (expressed on a numerical scale of 1 to 5) - ... 	<p>Information system</p> <p>Infrastructure</p> <ul style="list-style-type: none"> - % of network with CDN, HDSL, wireless, or fibre optics technology - ... <p>Software</p> <ul style="list-style-type: none"> - % of significant IT needs being met - Level of satisfaction - Number of individual/number of official software packages - Average software age - Average age of software's latest version - ... <p>Databases and Procedures</p> <ul style="list-style-type: none"> - Number of databases - Average monthly access rate - Number of procedures for new services - Degree of up-datedness of the total quality procedures - ... <p>Organizational structure</p> <ul style="list-style-type: none"> - Number of new positions created - Number of coordinating positions - Number of working groups - ... 	<p>General data</p> <ul style="list-style-type: none"> - % newspaper articles with positive, negative or neutral opinion <p>Relationships with utility customers</p> <ul style="list-style-type: none"> - Average service profit margin - % Service commitment met - Level of satisfaction - ... <p>Relationships with new service customers</p> <ul style="list-style-type: none"> - New services turnover - Rate of customer loyalty - Number of new services - ... <p>Relationships with technical municipal Officers</p> <ul style="list-style-type: none"> - Level of satisfaction - ... <p>Relationships with Suppliers</p> <ul style="list-style-type: none"> - Supplier turnover - Average costs per supplier - ... <p>Relationships with educational institutions</p> <ul style="list-style-type: none"> - Number of interns - ...

A fuzzy logic expert system for the measurement of Intellectual Capital in strategic alliances

Andrea Venturelli*, Giovanni Mastroleo

Department of Management, Economics, Mathematics and Statistics
University of Salento
Via per Monteroni – 73100 Lecce (Le) Italy

Stefania Veltri

Department of Business administration
University of Calabria
via Pietro Bucci - 87036 Arcavacata di Rende (CS) Italy

** Corresponding author*

Structured Abstract

Purpose - The aim of this study is to propose a method to measure Intellectual Capital (IC) in firms involved in strategic alliances, an area that has received scant attention in the literature, as existing research is focused mainly on organizational level mainly and increasingly on macro-level unit such as regions or nations. There are very few works at the meso-level, (i.e. alliances, clusters), and the paper aims to fill this void, by providing researchers and practitioners with a tool capable of combining measurement and management aims, developed at organizational level with the active participation of the researchers.

Design/methodology/approach – The method of analysis is based on a model formalized through a fuzzy expert system (FES). The FES are able to merge the capabilities of an expert system to simulate the decision-making process with the vagueness typical of human reasoning, maintaining the ability to still have a numeric value as a response. Its construction requires the participation of experts, whose knowledge of the problem is accumulated in the form of blocks of rules. These features make it possible to formalize the decision-making process related to the IC valuation, handling qualitative and quantitative variables, and exploring the cognitive mechanisms underlying this process.

Originality/value – To the best of our knowledge, IC literature lacks methods expressly designed to measure the incremental value of IC originating from collaboration among firms. We think also that fuzzy logic methodology, recently applied in empirical work designed to evaluate IC, represents a reliable methodology because of the “fuzzy” nature of IC. This study contributes to the broadening of the research community’s understanding regarding the alternative measurement of IC created within strategic alliances. From a measurement perspective, the results may be regarded as valuable proof that IC performance within strategic alliances can be measured quantitatively.

Practical implications – The outcome of the application is a system designed to measure the intangible performance deriving from participation in a strategic alliance. On the

management side, the possibility of retracing the determinants of different IC intermediate indicators composing the final IC index allows strategic alliances managers to use this information for decision-making purposes.

Keywords – Fuzzy logic; Intellectual Capital; Strategic Alliances; Performance Measurement

Paper type – Academic Research Paper

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1. Introduction

In today's knowledge-based economy, intangible assets are seen as elements essential to value creation in companies and, hence, to the economic wealth of nations (Cañibano et al, 2000; Lev, 2001; Martín-de-Castro et al, 2011). Consequently, measuring, managing and reporting intellectual capital (IC) is becoming an increasingly more critical issue.

The definition of IC accepted in the paper is that IC is a dynamic, firm- and context-specific system of intangible-knowledge-based resources and activities, which is key to a firm's competitive advantage (Meritum, 2002; Veltri, 2011).

IC research has mainly focused on individual companies, and, to a smaller extent on macro-level units such as regions or nations (Bontis, 2004). The research at meso-level (i.e. regional clusters, strategic alliances, etc), appears to be scant, with few IC works focused on it (Hervas Oliver and Dalmau Porta, 2008), and papers focused mainly on the theoretical aspect of relationships between IC and strategic alliances (Pöyönen and Smedlund, 2004).

This research gap presents an opportunity to scholars and constitutes the purpose of this study. In detail, the main aim of the study is to propose a method to measure Intellectual Capital (IC) in firms involved in strategic alliances, able to deal with the complexity of IC theme in a network of firms.

We can define a strategic alliance as an alliance in which independent organizations share the benefits of partnership and participate continuously in one or more key strategic areas such as product design, production, marketing, distribution, technology (Arend and Amit, 2005; Gulati, 1998). Alliances can take many forms, ranging from simple agreements with no equity ties to more formal arrangements involving equity ownership

and shared managerial control over joint activities (Chan et al., 1997; Gulati, 1998; Gulati et al., 2000; Elmuti and Khawala, 2001; Todeva and Knoke, 2005) and evolves within time (Marafioti et al., 2013; Castro et al., 2013).

This study focuses on non-equity alliances, in detail on an Italian network agreement, PIB (*Progetto Impresa Business*) involving seven manufacturing firms located in the Lecco province, in the northern region of Lombardy.

The IC is investigated from the perspective of the single firm embedded in the network agreement (Gretzinger and Royer, 2014), the “3C Catene srl”. The aim is to measure how much of the intellectual capital produced by the PIB network is attributable to the individual company “3C Catene srl”.

The paper combines both qualitative and quantitative methodologies. Qualitative data are collected through the tools of semi-structured interview questionnaire to the management of the selected case study (Qu and Dumay, 2011). The qualitative data, interpreted through the theoretical lens of the researchers, become the input of a model formalized through a fuzzy expert system (FES), aimed to measure the IC created and developed by the firm belonging to the network agreement. A FES has been chosen for its ability to merge the capabilities of an expert system to simulate the decision-making process with the vagueness typical of human reasoning, still maintaining the ability to return a numeric value as a response (Zadeh, 1965). Its features allow us to formalize the decision-making process related to the IC valuation handling qualitative and quantitative variables and exploring the cognitive mechanisms underlying this process (Magni et al., 2002; Magni et al., 2006).

The paper contributes threefold to the literature. Firstly, it address the strong call for IC research at organizational level, a bottom-up, performative and critical research typical of IC third stage research (Guthrie et al. 2012; Dumay and Garanina, 2013; Alcaniz et al., 2011; Mouritsen, 2006). Secondly, employing a fuzzy logic methodology, scarcely used in IC research (Bobzura et al. 2007; Zandi and Tavana, 2010; Veltri et al., 2012), it combines the intuition and experience of experts (management view) with the formal rigour of a logic system (measurement view). Thirdly, it sheds light of one of the main relevant new strategic theme of alliance literature, that is the knowledge dimension of networks and its links with competitive success (Baum et al. 2000; Dyer and Nobeoka, 2000; Gupta and Govindarajan, 2000).

The originality of the paper resides in applying a model formalized through a FES for measuring the IC of firms belonging to a network. IC literature lacks of methods expressively designed to measure the incremental value of IC originating from a collaboration among firms and, at the best of our knowledge, this is the first research exploring the possibility to use a FES system to deal with the complexity of creating and developing IC in networks.

The main findings of the paper have implications for both theoretical and empirical community. Theoretically, this study contributes to broadening of the research community's understanding regarding the alternative measurement of IC created within strategic alliances. From a measurement perspective, the results may be regarded as valuable proof that IC performance within strategic alliances can be measured quantitatively. On the management side, instead, the possibility of retracing the determinants of the different IC intermediate indicators composing the final IC index allows managers to use this information for decision-making purposes.

The remainder of this paper is organized as follows. Section 2 briefly discusses the literature informing the methodology and thus providing a context within which is developed the research framework. Section 3 illustrates the research framework lying behind the choice of FES method and the criteria that drove to the selection of the Italian firm belonging to a network agreement to which apply the FES method. Section 4 provide a detailed illustration of the FES model developed ad hoc for the research and applied to the selected firm. Section 5 analyzes the main findings of the paper, while Section 6 concludes the paper.

2. Literature review

Strategic alliances among organizations have grown dramatically during the past two decades (Arendt and Amit, 2005) and are supposed to grow in the next future (Elmuti and Khatawala, 2001). A vast literature on strategic alliances and networks has thus emerged in fields such as economics, management, sociology, and organization theory (Kim and Vonortas, 2014), with much of the research focused on the implications of strategic alliances and networks on the performance of firms engaging in such relationship (Gulati et al., 2000; Kale et al., 2002; Lee, 2007; Chan et al., 1997; Lin et al., 2009; Lee et al., 2001; Lavie et al., 2012).

We embed our research into a stream of literature that links value creation in networks to underlying resources (Hervas-Oliver & Albors-Garrigos, 2007; Tallman et al., 2004; Gretzinger and Royer, 2014). We thus take a resource-based view (RBV) perspective (Wernerfelt, 1984; Barney, 1991), or, better, its evolved version IC based view (ICBV).

From RBV perspective, networks may hold a variety of advantages for their members in the form of access to valuable shared and non-shared resources (Das and Teng, 2000; Lavie, 2006). Applying the RBV to networks, the necessary bundle of resources and capabilities are thus internal to the network but external to any single firm (Marafioti et al, 2013)¹.

On the intangible content and cognitive character of the inter-firm relationships focused subsequent studies of the knowledge-based view (Foss, 1996; Grant, 1996; Conner & Prahalad, 1996; Teece et al., 1997; Curado and Bontis, 2006), that assign the predominant role in explaining firm performance variations to the possibility for firms belonging to network to access knowledge potentially able to generate advantages for the single firm and the whole aggregate (Grant and Baden-Fuller, 2004; Dyer and Singh, 1998; Inkpen, 1996; Della Corte and Sciarelli, 2011). Several studies adopt a knowledge-based view approach in studying network of firms, such as Kale et al. (2000), Inkpen and Tsang (2005), Colins and Hitt (2006), Welbourne and Pardo-del- Val (2009), Liu et al. (2010), Gretzinger and Royer (2014).

The IC-based view (ICBV) is the ultimate evolution of the RBV, claiming that firm ICV represents one specific aspect of the more general RBV, in that it more narrowly considers three resources that have been theoretically linked to a firm's competitive advantage (Reed et al., 2007; Martin-de-Castro et al., 2012). Specifically, ICBV deals solely with knowledge that is created by and stored in a firm's three capital components; i.e., in its people (human capital), social relationships (relational capital), and information technology systems and processes (organizational capital) (Edvinsson and Malone, 1997).

Several studies adopt an ICBV approach in studying network of firms, such as Das et al. (2003), Schiuma et al. (2005), Hervas Oliver and Dalmau Porta (2006), Allee (2008); Solitander and Tidström (2010), Peng (2011), Joia and Malheiros (2009), Chang et al. (2008).

¹ *There is an important difference between alliances and networks, though which does not always come out sharp in the literature (Kim and Vonortas, 2014). This difference has to do with the extent of relationships: an alliance involves two or more partners working together on a single project whereas a network is made up of a collection of relationships (formal alliances or other relationships) that binds a group of organizations together (Dyer and Singh, 1998).*

In our study we argue that the embedded instability and uncertainty associated with alliances make strong demands on IC. Because IC represents an organizationally embedded competency that is valuable in managing uncertain situations, we argue that IC should have a positive influence on the management of alliances (Chang et al., 2008). In other words, firms with better IC should realize greater gains from inter-firm collaboration.

Following thus an IC perspective, we need to clarify which conceptualization of IC we accept and, above all, how we posit towards the measurement problems of IC within networks of firms (Bitcici et al., 2012). As regards the first issue, we define IC as is the dynamic, firm- and context-specific systems of intangible-knowledge-based resources and activities, at the base of a firm's competitive advantage (Meritum, 2002; Veltri, 2011). This implies that we do not believe that IC has a set of fundamental properties that exist prior to any interactions carried out by organizational actors and that IC is a value per-se, instead, following the performative approach under the third wave IC research, we believe that IC is part of a configuration of knowledge management and, consequently, it is firm- and context-specific and it is dynamic by nature. However, the issue of measurement remains relevant even in the third stage of the IC research, characterized by critical and performative analysis of IC in action (Mouritsen, 2006; Guthrie et al, 2012) even if, under this approach, IC measurement, managing and reporting models should be developed for a specific situation (Dumay and Garanina, 2013; Murthy and Mouritsen, 2011; Chenall et al., 2010).

Several papers dealt with IC measurement issue in networks, with the aim to produce an IC index (Chen et al., 2004; Grimaldi et al., 2013; Hervas Oliver J.L. and Dalmau Porta, 2006), but no study used a FES model to measure IC, except Veltri et al. (2012).

In the paper, our starting points are the scorecard measurement approach, and in detail from the advanced scorecard methods, that look for quantitative and qualitative indicators able to measure intangible resources and activities², but the IC indicators are integrated in

² *Methods for IC measurement can be classified in four basic categories (Sveiby, 2010): (1) Market capitalisation; (2) Return on Asset; (3) Direct Intellectual Capital; and (4) Scorecard. The first three models belong to the measurement perspective, as they focus on the financial side of measurement and the monetary value of intangible assets, whereas scorecard approaches belong to the management perspective. They look for quantitative and qualitative indicators able to measure intangible resources and activities and aim at showing the role of IC in a firm's value creation (Chiucchi, 2004; Veltri, 2007). It is important to highlight that scorecard methods have evolved from pioneering IC measurement and management models (Edvinsson & Malone, 1997; Sveiby, 1997) to advanced ones (Meritum report, 2002; DMSTI, 2003). The advanced models adopt the evolved notion of IC as a dynamic system on intangible resources based on knowledge. These models focus their attention on the interactions between the IC items, at the basis of the organization's value creation, and on intangible activities which are essential in the production and development of intangible resources. The assumption behind*

a FES model that return an IC index from the aggregation of three main indices, related to human capital (HC), organizational capital (OC) and relational capital (RC).

Our main research hypothesis in the paper that a FES model is able to address all the issues underlined in the literature review section, i.e. , it is able to combine measurement (FES has the formal rigour of a logic system) and management perspectives (FES combines the intuition and experience of the experts) by developing an IC index. FES technique is able to give a ‘numeric’ measurement of an organization IC still taking into consideration the fuzzy nature of IC (‘O Donnell, 2006), and its firm- and context-specific nature. Moreover it is able to deal with the dynamic nature of IC and with the potential of value of IC, all relevant features that should be taken into consideration by researchers who deal with the IC measurement issue³.

Next following sections illustrate the research framework (Section 3) and the features of the ad hoc FES model developed for this paper (Section 4).

3. Research framework

This section aims to illustrate the research framework. After having analysed in the previous section the theoretical perspectives that drove our research, this section focuses on the methods chosen to address our research hypothesis. The research uses both qualitative and quantitative methods. First of all, we rely on the qualitative methods of the case study, as we adopt a firm-level perspective, then the data needed as inputs for the FES model has been collected through the qualitative tool of the semi-structured interview and of the questionnaire, and interpreted by researchers in the light of interpretivist approach⁴.

On the basis of the qualitative data, researchers act as experts (content expert) and, together with an expert of the FES models (methodology expert), worked on developing an ad hoc FES quantitative model.

Yin (2003) suggests the case study method as a useful approach when “how” and “why” questions are addressed and the researchers do not have control over events. For analysing the selected case study the following data sources have been used: expert

these models is that the measurement of IC is necessary for the management of knowledge and their main aim is to identify the paths of an organization's value creation based on knowledge (Veltri et al., 2012).

³ *IC is a concept in evolution, which undergoes change over time and which must be constantly understood and interpreted (Kianto, 2007; Giuliani, 2009). In order to create value, IC subcategories have to interact with each other and with tangible resources, developing vague, not univocal interactions (Chiucchi, 2004) and, above all, IC can create but also destroy value (De Santis and Giuliani, 2013).*

⁴ *In the light of interpretivism, sociological phenomena cannot simply be observed but must also be interpreted by the researcher. This means that there is not one absolute reality, but rather different possibilities are generated by the perspective adopted to interpret the facts (Crotty, 1998; Ryan et al., 2002).*

interviews, newspaper articles, information about the network agreement and network actors from the internet in general as well as from the homepage of the selected network agreement cluster. The aim was a data triangulation, which gives us a rich set of data as the basis for analysing deeply the case study (Yin, 2012). By the triangulation of data from different sources we aimed for internal validity of the finding. So far, some in-depth semi-structured interviews with the general manager of the selected organization. The semi-structured interview was chosen as a method for collecting qualitative data because of its high degree of flexibility and because it offers the opportunity to address themes that come to light during the interviews, allowing the enhancement of the understanding of the motivations that drove the interviewee's actions as well as his/her interpretation of the reality (Qu and Dumay, 2011). The interviews took place in a face to face setting and based on a semi-structured questionnaire with the focus on the role of IC for the firm belonging to the PIB network agreement. Then a closed questionnaire has been prepared and made available on web resources (Crotty, 1998). The authors have analyzed the data separately in a first step, before they compared and discussed them. By this procedure consensual validity has been reached.

In summary, the reason for choosing a case-study approach is that a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2003). Especially IC in network has so many different manifestations, and the choice to focus on a single case study respect the mandates of the third wave IC research, according to which, to produce outcomes useful to advance IC knowledge, IC research should no focus on general and theoretical models, instead it should focus on IC management practices and ad hoc, focused models (Dumay and Garanina, 2013). Our aim of this study is to come to a suitable tool to conceptualize and measure IC in the reality of the firm network agreement. The findings should serve to come to first pragmatic implications for the investigated network (i.e. the IC measurement) but also help us to further elaborate our theoretical resource-oriented perspective on IC based competitive advantage realization in clusters. When this is achieved further empirical investigations are planned to follow with more interviews, as well as other ways of data collection.

In this study, we explore the role of IC for a firm belonging to a network using a sample of non-equity strategic alliances. Instead of joint ventures, we have chosen non-equity, contractual strategic alliances as contractual alliances are likely to involve greater

risks and uncertainty than joint ventures. Since IC and experience are expected to be more important when the transactions involve greater risks and uncertainty, we believe the influence of IC and experience will be stronger in non-equity alliances than in joint ventures.

In detail, we adopt a firm-level perspective (Gretzinger and Royer, 2014) and we choose to focus on a firm belonging to an Italian network agreement, the 3C Catene srl, belonging to the PIB network, localized in province of Lecco, in the northern Lombardy region in the Italian territory. The reasons why to focus on an Italian network agreement, disciplined by the Law 33/2009, are several.

Firstly, Italian networks are governed by a flexible legislation; network agreements can be supply chains, dyadic relations etc, so they are a good proxy for analyzing the complex theme of strategic partnerships. Secondly, network agreements are a form of strategic alliance largely used for intangible purposes (Caputo et al., 2014).

Moreover, we selected a domestic network, i.e. a network in the Italian context because of it is a context in which cooperation between companies is particularly relevant, as the economy is mainly driven by SMEs (Marafioti et al., 2013).

In particular, the choice of PIB network was not random, in the sense that the strategic objective stated in the network contract (drawn up on 26 September 2011) is to increase innovative capacity and competitiveness in the companies' markets through the creation of highly innovative products and services.

The seven companies in the PIB network operate in the manufacturing sector and are, moreover, joint holders of a product patent; the form of integration in the network is of a horizontal nature.

Next section illustrates the main features that drive us to choose a FES model to measure IC in a network of firms, and illustrates the FES model created ad hoc for measuring IC in the Italian PIB network agreement.

4. The fuzzy logic methodology

This work is based on the analysis of a model formalized through a fuzzy expert system (FES). A FES model is an information system based on an algorithm that creates aggregated evaluation of a multi-criteria problem. Behaviours and decisions are encoded in blocks of rules, and processed through a fuzzy logic inference engine. The FES are able to merge the capabilities of an expert system to simulate the decision-making process with

the vagueness typical of human reasoning, which is present in fuzzy logic (Magni et al., 2002; Magni et al., 2006).

The model has been used for a number of advantages: first of all, the use of a model improves the description of the benefits of belonging to a network and increases the ease of understanding and implementation of the problem, but it also has the capacity for having a numeric value as a response, although not all data are quantitative; the model allows to manage a large number of inputs, and through the use of intermediate variables it increases clarity simplifying the design of the entire system.

Its construction requires the participation of experts, whose knowledge of the problem is accumulated in the form of blocks of rules. These features meet the needs of the proposed methodology: to formalize and automate the decision-making process relating to the valuation of intellectual capital, handling qualitative and quantitative variables, exploring the cognitive mechanisms underlying this process, reducing the distortions often found in the real decision-making context.

Based on the identified elements (input variables, intermediate and blocks of rules) and the material available, the implementation of the system has been divided into the following phases:

- [1] focus group with experts to define the inputs and conditions for the aggregation of intermediate variables;
- [2] layout of the model (decision tree);
- [3] definition of the range of variables and blocks of rules;
- [4] trial processing and optimization;
- [5] analysis of the final output.

The main structure of the model is based on the aggregation of the three main components of human capital (HC), structural capital (SC) and relational capital (RC).

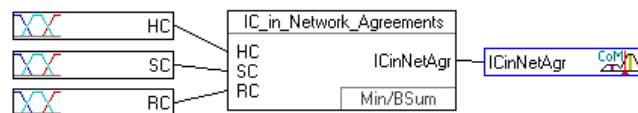


Figure 1 – Main structure of the FES model

The construction of the model is modular; evaluation is developed according to later stages (similar to the decision-making process of the experts). From the input variables through the intermediate variables and blocks of rules you reach your final output.

The design of a FES is the first and most important step of the study. With the help of a panel of experts a modular system has been selected, consisting of three assessment areas. Starting from the final evaluation “ICinNetAgr” and disaggregating the evaluation according to the main factors, you get to output of the three subcategories HC, RC and SC. All the knowledge needed to design and build the system components (variables and elements for their evaluation, blocks of rules and weights for aggregation) is 'pulled' by the experts using various techniques of investigation. In this paper we have used Focus Group with discussions partially structured.

Going beyond, you break down the areas of assessment elements in ever more specific ones, until you get to the input. From a mathematical point of view, the connection between the set of the n input variables and the output may be represented by a function f of n independent variables $x_i, i= 1, 2, \dots, n$, affecting the dependent variable y (intermediate variable), so that $y = f(x_1, x_2, \dots, x_n)$.

Each value assumed by an input must be translated into a fuzzy number. This occurs in the input variables. For example, the variable “M_ExpOnTC” (Marketing expenditures / Total costs), is composed of three sets (Low, Medium, High) that evaluate the degree of membership (between 0 and 1) of the terms Low, Medium and High, of the percentage indicated on the abscissa. To this value (2 %) a membership equal to 0.75 is attributed at the term Medium and a membership equal to 0.25 at the term High. This means that a value equal to 2% is more considered by experts High than Medium.

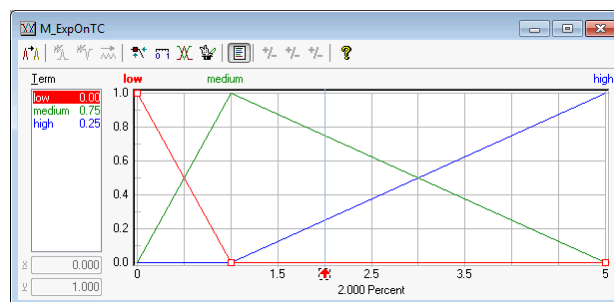


Figure 2 – The input variable: “M_ExpOnTC”

All the variables that are not initial drivers are called intermediate variables. They are not, from the beginning, directly measurable, but provide an indication of the intermediate evaluation under the modularity of FES. Each subsystem has its own specific development required both for the structure and for the compilation of the blocks of rules. In a Rule Block you assess the levels of the input variables to provide an assessment of the intermediate variable, which is the output of the block. For example, in block of the intermediate variable “Contract”

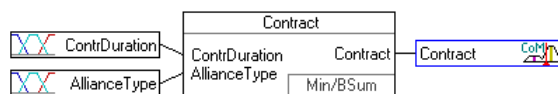


Figure 3 – Block of the intermediate variable “Contract”

two inputs are valued according to the rules given in Table 1,

Table 1 – Rule Block for the intermediate variable “Contract”

#	IF		THEN	
	ContrDuration	AllianceType	DoS	Contract
1	low	low	1.00	low
2	low	medium	1.00	low
3	low	high	1.00	medium_low
4	medium	low	1.00	low
5	medium	medium	1.00	medium_low
6	medium	high	1.00	medium_high
7	high	low	1.00	medium_low
8	high	medium	1.00	medium_high
9	high	high	1.00	high

to obtain an assessment of the variable Contract.

Figures and tables below show the structure and the variables that make up the subcategories.

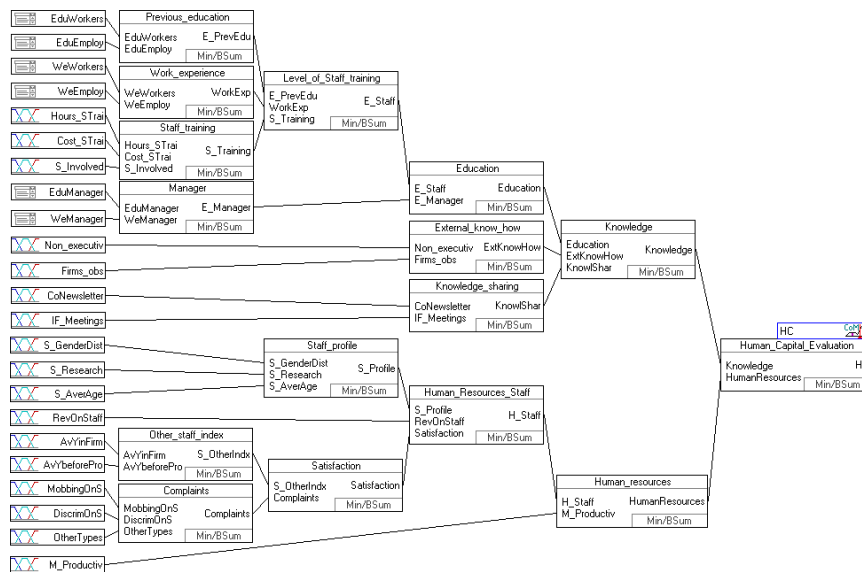


Figure 4 – Structure of Human Capital subcategory

The HC System is based on the evaluation of two large areas: the level of knowledge, understood both as level of education and as ability to perform well on their own work, and human resources, evaluated through the profile and the staff satisfaction and through an index of the productivity of managers. The System is constructed by aggregating 23 inputs through 16 blocks of rules, to get 15 intermediate variables, and final evaluation (the HC output).

Table 2 – List of abbreviations: input of HC system

Label	Input
AvYbeforePro	Average years before professional growth
AvYinFirm	Average years in the firm
CoNewsletter	Company newsletter
Cost_STrai	Cost of staff training
DiscrimOnS	Discrimination complaints / tot staff
EduEmploy	Level of education of the employees
EduManager	M_Previous education
EduWorkers	Level of education of the workers
Firms_obs	Firms of other business sectors
Hours_STrai	Hours of staff training
IF_Meetings	Inter-functional meetings
M_Productiv	Productivity: Revenue / manager
MobbingOnS	Mobbing complaints / tot staff
Non_executiv	Non-executives
OtherTypes	Other types
RevOnStaff	Revenue/staff
S_AverAge	Average age of staff

S_GenderDist	Staff gender distribution
S_Involved	% of staff involved
S_Research	% research staff
WeEmploy	Work experience of employees
WeManager	Work experience in the business sector
WeWorkers	Work experience of workers

Table 3 – List of abbreviations: intermediate variables of HC system

<i>Label</i>	<i>Intermediate variable</i>
Complaints	Complaints
E_Manager	Manager - Level of training of managers
E_PrevEdu	E_Previous education
E_Staff	Level of staff training
Education	Education
ExtKnowHow	External know-how
H_Staff	Staff
HumanResources	Human resources
Knowledge	Knowledge
KnowlShar	Knowledge sharing
S_OtherIndx	Other staff index
S_Profile	Staff profile
S_Training	Staff training
Satisfaction	Satisfaction
WorkExp	Work experience

The evaluation of the RC is made by combining the assessment of Market and Network areas with the input “SupStability” (stability of suppliers). This input was initially the result of the aggregation of other variables; after further discussion with experts, it was considered sufficient to assess the number of years of relationship with key suppliers and simplify the model. The input is evaluated at equal weight with the other two intermediate variables. The System is constructed by aggregating 21 input through 14 blocks of rules, to get 13 intermediate variables and the RC output.

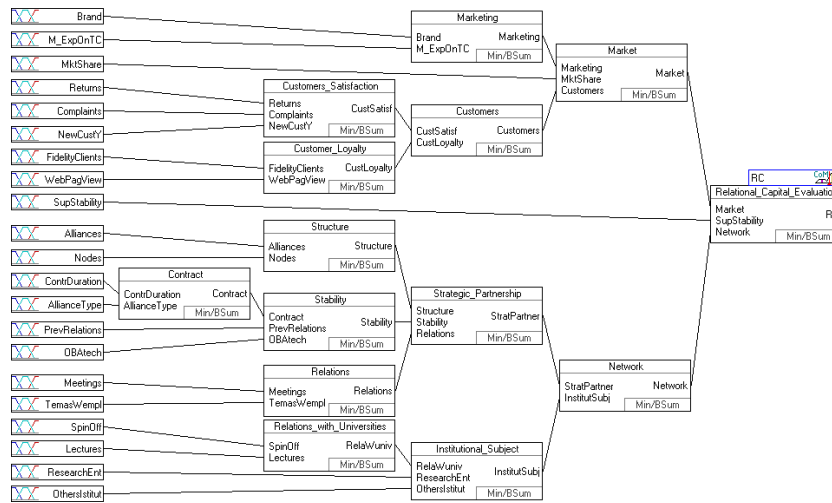


Figure 5 – Structure of Relational Capital subcategory

Table 4 – List of abbreviation: input of RC system

<i>Label</i>	<i>Input</i>
Alliances	N° of alliances
AllianceType	Alliance Type
Brand	Brand
Complaints	Total Complaints / total revenues
ContrDuration	Contract duration
FidelityClients	% Fidelity clients
Lectures	Lectures at scientific conference
M_ExpOnTC	Marketing expenditures / Total costs
Meetings	Meetings between managers of nodes
MktShare	Market share
NewCustY	% new customers for year
Nodes	N° of nodes
OBAttech	Use of OBA techniques
OthersIstitut	Relations with other istitutional subjects
PrevRelations	Previous relations
ResearchEnt	Relations with research entities
Returns	Total Returns / total revenues
SpinOff	Spin off in Uniersities
SupStability	Supplier stability
TemasWempl	Temas with employees of different firms
WebPagView	Web page views

Table 5 – List of abbreviation: intermediate variables of RC system

<i>Label</i>	<i>Intermediate variable</i>
Contract	Contract
CustLoyalty	Customer loyalty
Customers	Customers
CustSatisf	Customers satisfaction
InstitutSubj	Institutional subjects

Market	Market
Marketing	Marketing
Network	Network
Relations	Relations
RelaWuniv	Relations with universities
Stability	Stability
StratPartner	Strategic partnerships
Structure	Structure

The output of the SC System is essentially an assessment of the Research area. Except for the input “Patents”, all the inputs of this system are indices that are constructed by combining information provided by the questionnaire with values that can be derived from the financial statements, and needed to have a measure of the commitment and achievements in the field of innovation. The evaluation of SC System is obtained by comparing the result of the substructure Research, composed of 11 inputs, with the index (the twelfth input) that compares the amount of investment in IT to the total of investments. The aggregation is done through 8 blocks of rules and 7 intermediate variables.

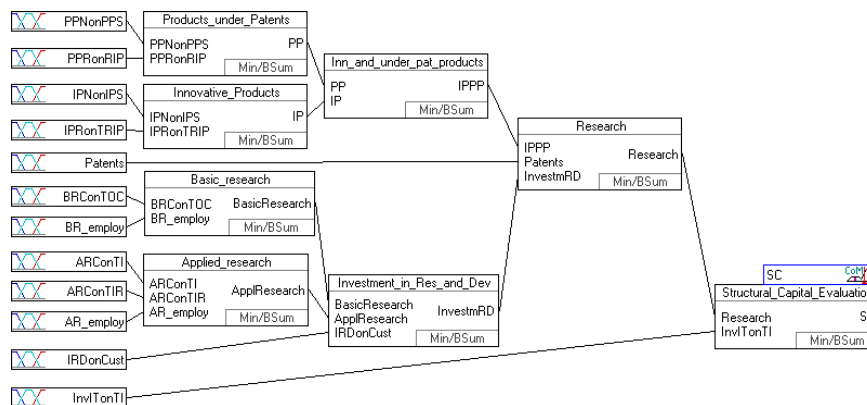


Figure 6 – Structure of Structural Capital subcategory

Table 6 – List of abbreviation: input of SC system

Label	Input
AR_employ	% Employees in applied research
ARConTI	cost of applied research / total investment
ARConTIR	cost of applied research / total investment in research
BR_employ	% Employees in basic research
BRConTOC	Cost of basic research / total operating costst
InvITonTI	Investments in IT / Total investments
IPNonIPS	IPN number of innovative products sold / IPS innovative products sold
IPRonTRIP	IPR patented products revenue / TRIP Total revenues invoiced products

IRDonCust	Investment in R&D / N° of customers
Patents	Patents
PPNonPPS	PPN number of patented products sold /PPS patented products sold
PPRonRIP	PPR patented products revenue / RIP revenues invoiced products

Table 7 – List of abbreviation: intermediate variables of SC system

<i>Label</i>	<i>Intermediate variable</i>
ApplResearch	Applied research
BasicResearch	Basic research
InvestmRD	Investments in R&D
IP	Innovative products
IPPP	Innovative products and products under patents
PP	Products under patents
Research	Research

5. Results and discussion

The output from the system created makes it possible to classify the values for the contribution of IC in the individual companies to the network, but not to assign absolute data values.

The final results produced by the system are displayed in the table 8.

Table 8 – Final results

1° level int. Var.	1° level int. Var.	HC System	input	1° level int. Var.	1° level int. Var.	RC System	input	1° level int. Var.	SC System	output
Human Resources	Knowledge	HC_02	SupStability	Market	Network	RC_02	InvITonTI	Research	SC_02	ICinNetAgr
1,00	0,28	70,31	very high	0,68	0,45	76,13	very low	0,14	0,11	52,68

The main result, measuring the contribution made to IC formation in the PIB network by the firm that is the subject of this study, 3C Catene s.r.l., is the figure of 52.68 out of 100 given in the last column. This is an extremely positive result for the company although quantifying the real contribution made will not be possible until the relevant data has also been collected from the other firms in the network, at which point comparisons of the respective IC contributions may be made.

The final figure is the result of the aggregation of the values for the HC (70.31), RC (76.13) and SC (0.11) systems.

These values are in turn derived from the aggregation of intermediate variables and input as reported in the table.

In particular, as regards HC, the relevant contribution in terms of the specific experience of the staff is worth noting.

As regards RC, it is worth noting the significant contribution of the stable relationship with suppliers and of the high market share.

In contrast with these positive results is the poor result in terms of SC, which is essentially due to the very low-level contribution made by intermediate variables connected with research. This is understandable, in the sense that the company intends to increase its research and development activities through the PIB network, the objective of which – as mentioned above – is concerned with product innovation.

6. Conclusions

The main aim of this study was to find an alternative method for measuring the comprehensive IC index of an organisation, able to combine the management and measurement views, qualitative and quantitative data, to reflect the newest concepts of IC and to consider the ‘vague’ interactions between IC variables and categories.

We have shown that an FES model can address all of these issues. The model presented in the article, designed ad hoc for the Italian PIB network agreement, is a pilot model which, like all measurement and management systems that deal with knowledge-based processes, faces the methodological problem of measuring ‘soft’, nonphysical processes and outputs. Further corroboration within the other network of firms, in Italy and abroad, are therefore needed.

The presented model applied to the PIB Italian network represents a good reference for other realities, as it is flexible enough for individual adaptations and adjustments.

Once that phase is completed, it will in fact be possible to apply the model, with a minimum of modifications, to other, vertically integrated types of Italian network where the strategic objectives are not the expansion of research and development activities but the promotion of a shared brand, the protection of the environment, the exploitation and acquisition of patents, etc..

The main advantage of the IC score developed through a FES model is undoubtedly that it returns a reliable IC index, based on its inner features.

FES combines the measurement and management perspectives, allowing codification of human knowledge in the form of a mathematical algorithm. Moreover, it is easy to understand and implement, as it derives from a heuristic approach based on logical implications (‘if-then’ rules), so even those not expert in mathematics can easily understand the formal applications and hence can support the implementation of a FES.

A FES model can handle a high number of value drivers, simplifying the design of the whole system, thus reducing its complexity and intelligibility: the system is modular, therefore not explosive, since we run it from branch to trunk.

Moreover, FES is an extremely flexible model, as it is possible to introduce several value drivers and change the rules connecting drivers and intermediate variables at any time and is a transparent model, as the experts involved put their experience and knowledge into the building of FES and their choices are transparent, visible and manifest at any given step.

In this way, their opinions are subject to debate and eventual change if not accepted by the majority of involved researchers .

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The model of intellectual capital evaluation and disclosure in financial statements

Agne Ramanauskaite

Department of Finance and Accounting
Vilnius University, Kaunas Faculty of Humanities
Muitines 8, LT-44280 Kaunas, Lithuania

Structured Abstract

Purpose – According to the current accounting standards, only a minor part of intellectual capital is presented in financial statements as it usually fails to satisfy one of the criteria of asset recognition in accounting, namely, reliable evaluation. Consequently, stakeholders obtain only a part of the data about an enterprise and its activity, which directly impacts the decisions they are committing to. Considering this, the scientific issue has been formulated and dealt with in this paper: *how to present information on the intellectual capital of an enterprise in financial statements?* Therefore the purpose of this paper is to develop a model of intellectual capital evaluation and its disclosure in financial statements of an enterprise.

Design/methodology/approach – When outlining a solution, this paper strives to concentrate on: 1) *pragmatism* in order to avoid overly extensive, complicated and subjective systems of intellectual capital valuation; 2) *quantitative monetary* expression of results thus providing opportunities for comparisons; and 3) intellectual capital accounting and accountability *integrated* into the current system of financial accounting. When analyzing methods of intellectual capital valuation suggested in academic works in terms of their theoretical and practical aspects, the methods of synthesis, grouping, systemization, descriptive and comparative analysis were being employed. When developing a model of intellectual capital evaluation and its disclosure in financial statements, deduction, synthesis, comparison and modeling methods were being applied.

Originality/value – Various methods of the evaluation of the intellectual capital suggested in academic works have been researched. On the grounds of possibilities of their integration into the system of financial accounting, a generalized scheme of the classification of these methods has been drafted. A generalized list of classification of intellectual capital valuation methods revealing similarities of some methods due to their attribution to the same groups in different classifications has been drawn as well.

Practical implications – The model of intellectual capital evaluation and disclosure in financial statements has been developed, theoretically motivated and empirically verified. Taking into consideration the successful application, this model is suggested to supplement the current financial statements and to regulate the duty of enterprises to include the data on the intellectual capital. As a result, development and filling out of additional reports would be avoided; meanwhile, stakeholders would obtain more data for taking investment decisions.

Keywords – Intellectual capital; Valuation methods; Financial evaluation; Disclosure.

Paper type – Practical Paper.

1 Introduction

Habitually enterprises disclose the results of their activity to stakeholders by presenting financial statements. The information, the form of its presentation, the minimal extent and the type of the presented information in the statements are regulated and are mandatory for each and every enterprise operating in a specific legal environment. This way, stakeholders may compare different enterprises by considering various financial indices, and well-grounded investment decisions may be taken. However, due to the rapid development of economy and the spread of business processes, the information presented in financial statements becomes restricted and incapable of satisfying the increasing needs of stakeholders.

Recently, it has been complicated to take well-grounded investment decisions solely on the grounds of the information presented in financial statements of enterprises as the intellectual capital has been gaining ever more prominent importance due to its ability of creating added value. However, only a minor part of the intellectual capital is reflected in financial statements of enterprises as it frequently fails to satisfy one of the key criteria of asset recognition in accounting, namely, the reliable evaluation. As a result, the major part of the intellectual capital is not valued nor is it disclosed to stakeholders due to the indefiniteness and the intangibility typical of this type of capital. Consequently, stakeholders obtain only a part of the data about an enterprise and its activity, which directly impacts the decisions they are committing to. That is why the interest of the participants of the market towards this type of information has been increasing lately together with the need for novel methods of evaluation allowing enterprises to establish the values of the intellectual capital and/ or its constituent parts. The disclosure on intellectual capital of an enterprise is particularly important in today's competitive environment and gives both internal and external advantages. First, enterprises will be stimulated to analyse and develop their intellectual capital. Second, stakeholders will receive more data on sustainability and growth potential of an enterprise as well as its ability to create added value while the values calculated with the help of the same methodology would provide conditions for comparisons of different enterprises. To sum up, the multiplicity of methods of intellectual capital valuation and the absence of established regulations concerning the presentation of the data on the intellectual capital of an enterprise to stakeholders requires further investigation in this field.

It should be noted that this research deals with physically intangible capital which has no definite price tag and is impossible to calculate. In order to provide the most precise estimate of this capital, most researches concentrate on the accumulation of the intellectual capital from the management point of view; as a result, the suggested models are extensive and complicated while their result is usually qualitative and not always possible to compare. The Author of the paper having generalized on previously conducted researches and taking foreign experience in this field as a background strives to derive a model of intellectual capital evaluation which would allow to value the intellectual capital of an enterprise in monetary units and would not be hard to apply in practice. Besides, it would be easy to integrate into the current system of financial accounting thus avoiding a separate accounting system for the intellectual capital as well as drafting and presentation of additional reports. Consequently, the selection of this trend in the paper partly limits the precision of the obtained results.

2 Intellectual capital and its disclosure

The concept and structure of the intellectual capital have been researched by Lev (2001), Daum (2003), Lev et al. (2003), Andriessen (2004), Saez et al. (2007), Abeysekera (2008), Fitz-enz (2009), etc. The issue has also been investigated in various contexts: when dealing with the significance of the intellectual capital regarding the development of an enterprise (Engstrom et al., 2003; Dubra, 2010, etc.), when analyzing the disclosure of information on the intellectual capital of an enterprise (Abeysekera and Guthrie, 2004b; Ordonez de Pablos, 2005; Campbell and Rahman, 2010; Mention, 2011; Husin, 2012; Wagiciengo and Belal, 2012, etc.), when investigating specialized reports on the intellectual capital (Campos and Ordonez de Pablos, 2007; Marr, 2008, etc.), when seeking to establish the relationship between the social responsibility of an enterprise and its intellectual capital (Pedrini, 2007; Yaghoubi et al., 2010, etc.), when exploring opportunities of valuation of this capital (Borneman et al., 1999; Bontis, 2002a; Sedlacek and Konecny, 2009, etc.) for both external and internal (Chen et al., 2004; Borneman and Alwert, 2010, etc.) purposes, when comparing it with the intangible assets (Kuzmina, 2008) or when evaluating opportunities for its audit (Abeysekera, 2001), etc. In spite of the high numbers of conducted researches, there is no uniform opinion regarding the term for 'intellectual capital'. A number of terms have been used to refer to this capital, e.g. "intellectual capital", "intangible capital", "intangible assets", "knowledge-based assets",

“knowledge capital”, “organization intellectual capital”, “intangibles”, “intangible resource”, “invisible resource”, “information assets”, “human capital”, “hidden value”, “organizational capacity” as well as many other synonyms. There is neither systematic interpretation nor any consistent agreement regarding the structure of the intellectual capital. The interpretation of the intellectual capital in specific academic works is manifested by the strife to outline its various constituent parts (usually as many as possible) and by attempts to define the difference between the intellectual capital and intangible assets when comparing it to other types of capital or when merely designing a new definition of the intellectual capital. To sum up, various academic works provide different reasoning which further complicates subsequent academic research in this field.

When analyzing the concept of the intellectual capital, it is usually claimed that there is no universal agreement in the field of social sciences regarding the general definition of the intellectual capital. This is a consequence of the concept being mostly used in contexts of sciences of economics, management, law and sociology. As a result, various interpretations are possible (Taljunaite, 2010). If interpretations of the concept of the intellectual capital in academic works are compared, several trends may be singled out:

- 1) strife to enumerate various (and, if possible, all) the structural parts of the intellectual capital and avoidance to define the intellectual capital in its entirety (Bontis, 2002a; Vaskeliene, 2003; Andriessen, 2004; Goh and Lim, 2004; Bareisis, 2004; Hitchner, 2006; Fitz-enz, 2009);
- 2) presentation of the difference between the intellectual capital and intangible assets in order to define qualities typical of the explored type of capital (Lilly and Reed, 2004);
- 3) comparison between the intellectual capital and other types of capital (Borneman et al., 1999; Lev, 2001; Vaskeliene, 2003);
- 4) strife to produce a new definition of the intellectual capital (Daum, 2003; Palumickaite and Matuzeviciute, 2007; Palumickaite, 2008).

The variety of definitions of the intellectual capital in academic works has been investigated by a number of scholars. The results of the conducted researches (Engstrom et al., 2003; Westnes, 2005) showed that 1) there is no universally accepted definition of the intellectual capital; 2) the concept of value creation is often mentioned, which shows that if the intellectual capital does not create any added value to the enterprise in any way

it is useless; and 3) most definitions employ the same key words: knowledge, skills, know-how, experiences, intangible assets, information, processes, and value creation.

The variety of ways of splitting the intellectual capital into constituent parts (components or smaller parts – elements) in academic works leads to complications in terms of comparison testified in multiple researches. Their results show that the division of the intellectual capital into three *components* – human, organizational and relational – is the most widely accepted (Borneman et al., 1999; Engstrom et al., 2003; Westnes, 2005; Saez et al., 2007, etc.).

According to Bontis (2002a), Daum (2003), Vaskeliene (2003), Hitchner (2006), Saez et al. (2007), Fitz-enz (2009), Dubra (2010), Giziene and Simanaviciene (2012), the *human capital* is realized as the entirety of the knowledge, skills, education, experience, talent, innovativeness, competence, motivation, loyalty, creativity, ability to perform the task and to deal with the arising issues, leadership, business initiative, management and idea generation when going for new products possessed and exhibited by the staff of an enterprise. This capital is denoted by inability of being owned by an enterprise. It is claimed that this capital is one of the key and most influential resources of an enterprise in the competitive fight as the ability of an enterprise to compete in a market depends on the knowledge and skills possessed by its staff, i.e. on the efficiency of the human capital.

According to Bontis (2002a), Daum (2003), Vaskeliene (2003), Hitchner (2006) and Saez et al. (2007), the *organizational capital* is conceived as the organizational and financial structure of the organization, its strategic processes, technologies, procedures, process documentation, risk assessment methodology, software, systems, application of information technologies, databases (e.g. ones covering information on the market and its clients), patents, trademarks, methods of sales management, communication systems and all other organizational opportunities maintaining the productivity of the staff and facilitating their cooperation. It also includes the value of the enterprise, its culture and philosophy. It may be claimed that the organizational capital covers those technologies, methodologies and processes which allow the enterprise to operate. In other words, these are the things which remain at the enterprise after a working day when the staff have left. Differently from the human capital, this capital may belong to the enterprise and thus it may be possessed. This capital is considered to be the second most important capital at an enterprise after the human capital.

According to Bontis (2002a), Daum (2003), Vaskeliene (2003), Saez et al. (2007) and Fitz-enz (2009), the *relational capital* is treated as the awareness of the enterprise, its brand awareness, image, ability to operate in a network and to fulfill the orders it wins, supply channels, longterm contracts, license and franchise agreements and relationships with external entities constituting the marketing of the enterprise and its commercial abilities. External entities in this context represent clients/ consumers, business partners, suppliers and regulating institutions.

Various academic works mention different *elements* of the intellectual capital. Having systemized the elements on the grounds of their classifications provided by Abeysekera (2008), Campbell and Rahman (2010), Mention (2011), Husin (2012), Wagiciengo and Belal (2012), the Author of the paper systemizes these classifications and provides the following scheme of the structure of the intellectual capital (Figure 1).

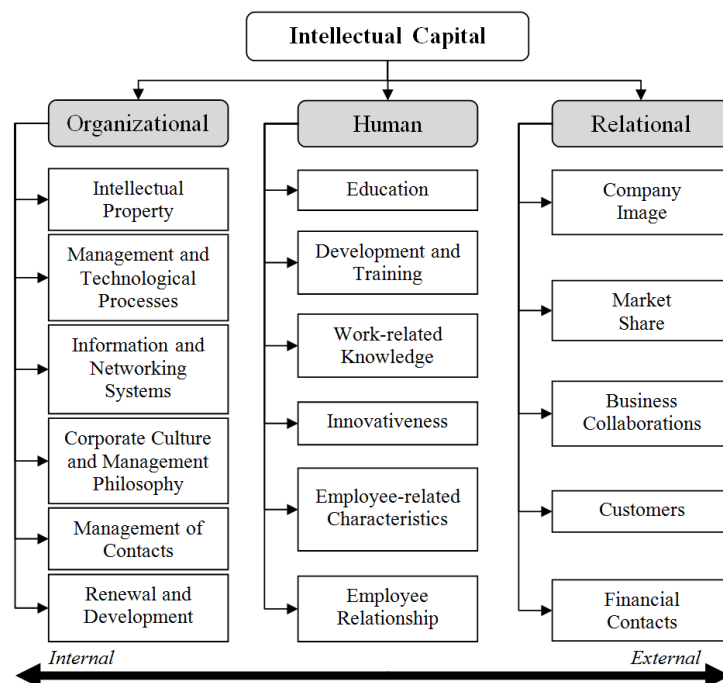


Figure 1. Scheme of the structure of the intellectual capital

Finally, on the grounds of the conducted analysis of the concept of the intellectual capital, the Author of the paper provides a definition of the intellectual capital and claims that the intellectual capital is the resources created in, purchased by or maintained by the enterprise which has no tangible form and together with the material and financial capital

of the enterprise helps to create the added value. The intellectual capital may be divided into minor constituent parts – components and elements. This definition strives to highlight that:

- 1) the intellectual capital has no tangible form (or this form is not predominant);
- 2) the intellectual capital may be purchased, created or merely maintained within an enterprise irrespectively of the property rights (e.g. the human capital cannot belong to an enterprise yet the enterprise may invest into it or use other methods of its involvement into the process of value creation);
- 3) the intellectual capital is divided into three components: the human capital, the organizational capital and the relational capital which considering the needs and the specificity of the enterprise may be split into further constituent parts – elements;
- 4) the intellectual capital or its components cannot operate independently *per se*: they only operate all and together and only together with other resources of the enterprise will the value creation be possible in the future.

In the last decade, an increase has been observed in the investigation of the trends concerning the presentation of information on the intellectual capital in financial and other annual statements (Standfield, 2005; Fitz-enz, 2009, etc.). Even though the requirements of contemporary financial accounting and accountability ignore the phenomenon of the intellectual capital (Lilly and Reed, 2004; Marr, 2008, etc.) yet enterprises conceive it as an important value-creating object in the enterprise (Van der Meer-Kooistra and Zijlstra, 2001; Westnes, 2005, etc.). Apart from the financial statements aimed at stakeholders, enterprises undertake the initiative to present additional information on their intellectual capital (Bontis, 2002b; April et al., 2003; Abeysekera and Guthrie, 2004a; Goh and Lim, 2004; Abeysekera and Guthrie, 2005; Campbell and Rahman, 2009; Ismail, 2009; Saad and Salleh, 2009; Rashid, 2010, etc.). Nevertheless, the specific culture within an enterprise, its type of activity and the attitude of the management condition differences in terms of the ways of the valuation, interpretation and disclosure of the intellectual capital. This leads to the absence of the possibility of comparison of the data. Even though the issue is recognized in a number of academic works, there is no uniform solution for dealing with it.

A number of authors (Borneman et al., 1999; Van der Meer-Kooistra and Zijlstra, 2001; Hitchner, 2006; Ismail, 2008; Fitz-enz, 2009; Mackevicius and Jarmalaite, 2011; Uziene, 2012, etc.) emphasize the limitedness of financial statements and indicate the main differences of the statements and the employed systems of the presentation of intellectual capital-related information (Table 1) obstructing the presentation of the intellectual capital-related information together with the annual financial statements.

Table 1. Key differences in the presentation of financial statements and information on the intellectual capital

Features	Financial Statements	Intellectual Capital Reporting
1. Valuation Methodology	Monetary expression, fixed amount	Expressed in indicators, fixed features
2. Target Group	Shareholders, investors, other interested parties	Stakeholders covering both internal and stakeholders
3. Disclosure	Full disclosure	Selected information
4. Decision support	External	Internal
5. Time perspective	Historic (past-oriented)	Forecast (future-oriented)
6. Validity / Standards	High	Low
7. Extent of the employed data	Only the data which may be reliably evaluated	Any possible quantitative and qualitative evaluations
8. Attitude to the intellectual capital	Consequence of future actions (i.e. the data which will be the grounds of producing accounting data in the future)	Condition of value creation
9. Degree of availability	Unlimited for the owner	Harder to access while the information is only inside the heads of the staff or in such ephemeral phenomena as the chemistry of the organization, its innovativeness or business culture

With the growth of importance of the intellectual capital in the market, the interest of external and internal information users in being presented more data on the intellectual capital of an enterprise was growing as well. This fact has been researched by numerous scholars (Bontis, 2002b; April et al., 2003; Abeysekera and Guthrie, 2004a, 2004b; Goh and Lim, 2004; Abeysekera and Guthrie, 2005; Ordonez de Pablos, 2005; Campos and Ordonez de Pablos, 2007; Vaskeliene and Selepen, 2008; Campbell and Rahman, 2009; Saad and Salleh, 2009; Rashid, 2010, etc.). Having produced generalizations on the results of the research, it is possible to state that:

- 1) considering the needs of information users, enterprises present increasingly more information on the intellectual capital in their financial or other annual statements, i.e. they cover its specific components and elements;

- 2) when disclosing various intellectual capital-related information, enterprises avoid the usage of the term “intellectual capital”;
- 3) enterprises see the human capital as the most important type and it is covered in statements most of all (however, in some countries the relational capital predominates);
- 4) the predominant form of presentation of data on the intellectual capital is qualitative, e.g. diagrams, photos, texts, tables without any numbers;
- 5) enterprises of different countries provide different amount, type, sequence and form of information; this stems from different levels of country development and different requirements set by governments in the fields of politics, social structure and economics;
- 6) enterprises lack a systematic methodology and guidelines for presentation of the intellectual capital.

Consequently, the voluntarily presented data is different and hard to compare which is a core drawback faced by stakeholders when evaluating enterprises and comparing them. According to Van der Meer-Kooistra and Zijlstra (2001), Marr (2008) and Lakis (2008), presentation of information to stakeholders sets specific requirements: 1) information users want to be able to compare data about different enterprises; 2) they expect the presented information to be reliable, objective and containing protection from the involvement of subjective data; as a result, the quality of information must be possible to verify by independent auditors. Even though the need for public presentation of information on the intellectual capital is known and universally understood, there are no universally accepted and established principles of presentation of this data.

3 Methods of intellectual capital valuation

Numerous scholars have been researching methods suitable for valuation of the intellectual capital as well as their advantages and drawbacks (Skyrme and Amidon, 1998; Bukh et al., 2001; Ratnatunga, 2002; Rodov and Leliaert, 2002; Andriessen, 2004; Kannan and Aulbur, 2004; Firer, 2005; Kasselmann, 2006; Van den Berg, 2007; Fragouli, 2010, etc.); however, no uniform opinion regarding the way of conducting the valuation of the intellectual capital of an enterprise has been reached yet. A wide variety of works suggest approximately sixty different valuation methods, some of which are purely theoretical while others are actually applied in enterprises of various types; there are

methods based on traditional financial theories as well. In order to systemize the multiplicity of methods for the valuation of the intellectual capital, authors group them (Bouteiller, 2002; Lev et al., 2003; Muller, 2004; Sitar and Vasic, 2004; Rodriguez-Castellanos et al., 2007; Tan et al., 2007; Jurczak, 2008; Kuzmina, 2008; Sveiby, 2010; Salman ir Mahamad, 2012, etc.); however, even in this field there is no uniform agreement as different criteria of classification are applied or different methods of intellectual capital valuation are analyzed and grouped in these works. There is no research which could cover and generalize the whole spectrum of methods applicable for intellectual capital valuation as well as their theoretical and practical peculiarities, which complicates further researches in this field.

Having conducted a research and considered all the classification aspects of intellectual capital valuation methods presented in academic works, a generalized scheme of classification of these methods has been developed (Figure 2). It has been discovered that methods of intellectual capital valuation may be classified on the grounds of four criteria and divided into groups accordingly.

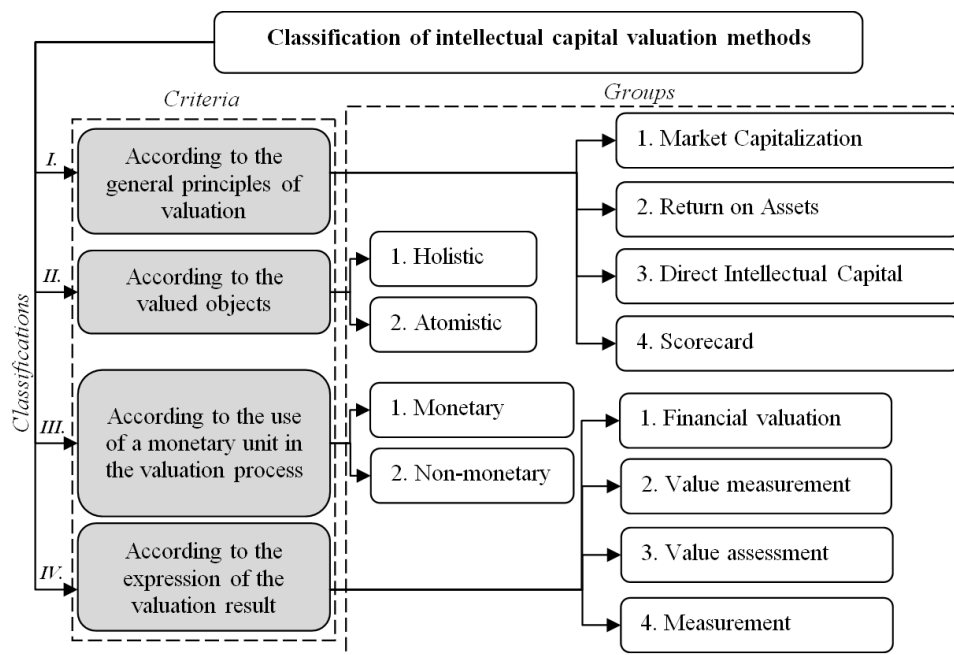


Figure 2. Scheme of classification of intellectual capital valuation methods

According to the first classification, most methods are assigned to the 'scorecard' group, i.e. the intellectual capital is valued without employing monetary units but rather

by attributing indices or indicators to its specific components. This is corroborated by the number of methods presented in the ‘atomistic’ group of the second classification, i.e. most methods treat the intellectual capital not as an entirety but rather deal with its specific components. In the third classification, the number of methods attributed to either group is more or less equal; yet, in the process of valuation, the majority of methods do not use this unit of measurement. According to the fourth classification, most methods are assigned to the group of ‘financial valuation’ methods; however, considering the fact that this classification has been researched the least of all in academic works it is possible to claim that this field has not been adequately explored yet and that these results shall impact the generalizing conclusions to the least extent.

When summarizing the obtained results it is possible to claim that most methods of intellectual capital valuation are based on scorecard, they tend to assess specific components of the intellectual capital and do not employ monetary units in the process of valuation; as a result, the expression of the valuation result is non-monetary, i.e. it is qualitative and presented as text or quantitative and presented as an index.

Considering the aim of the paper, the Author restricts the research in the field of intellectual capital valuation methods and further researches only those *evaluation* methods which allow the evaluation of the entirety of the intellectual capital of an enterprise (i.e. the *holistic* methods) and/ or the establishment of the enterprise value in monetary expression (i.e. *financial valuation* methods) by applying corresponding general principles of valuation (*market capitalization*, *return on assets* or *direct intellectual capital* methods) and a monetary unit of measurement in the process of valuation (i.e. *monetary* methods). In order to achieve this objective, 19 methods applicable to these groups have been selected for further research.

The conducted analysis of the theoretical and practical aspects of the selected methods in academic works contributes to a more precise classification (Table 2). The Author also supplements the Table with the column “Applicability in financial accounting” where “+” stands for the method being suitable for the evaluation of the intellectual capital and its disclosure in financial statements thus complementing the methods applied in financial accounting; “+/-” means that the method may be applied while “-” indicates that the method is unsuitable and cannot be applied.

Table 2. Methods of intellectual capital *evaluation* and a revised classification

No.	Classification Group Method	I.				II.		III.		IV.			Applicability in financial accounting	
		Market Capitalization	Return on Assets	Direct Intellectual Capital	Scorecard	Holistic	Atomistic	Monetary	Non-monetary	Financial valuation	Value measurement	Value assessment		Measurement
1	Market to book value / Market to book ratio (MTBV / MTBR)	X				X		X		X				+
2	Tobin's q (Tq)	X				X		X		X				+/-
3	Calculated intangible value (CIV)		X			X		X		X				+
4	Intellectual capital index				X	X			X		X			-
5	Technology broker (sometimes referred to as Intellectual capital audit)			X			X	X		X				-
6	Economic value added (EVA)		X			X		X		X				+/-
7	Market value added (MVA)	X				X		X		X				+
8	Value added intellectual capital coefficient		X			X		X		X				-
9	Total value creation			X			X	X		X				-
10	The value explorer / Weightless wealth tool kit (TVE / WWKT)		X			X		X		X				+
11	Citation-weighted patents			X			X		X				X	-
12	Knowledge capital earnings (KCE)		X			X		X		X				+/-
13	Accounting for the future		X			X		X		X				-
14	Investor's assigned market value (IAMV)	X				X		X		X				+/-
15	Human resource (costing &) accounting			X			X	X		X				-
16	Intellectual assets valuation			X			X	X		X				-
17	Inclusive value (sometimes referred to as valuation) methodology			X			X	X			X			-
18	Human resource statement			X			X	X		X				-
19	Financial method of intangible assets measurement (FiMIAM)	X				X		X		X				+

The analysis of the results presented in Table 2 leads to two groups corresponding to the aim of the paper and applicable in financial accounting being singled out (Table 3). Having conducted a synthesis of Group A methods, the Author concludes and emphasizes that these methods typically exhibit the subjectivity of a valuator as a part of the data employed in the process of valuation is forecast-based. Besides, lack of use of average data is not eliminated. Furthermore, the rate of return of specific capital groups and their indirect calculations applicable in the process of valuation remain unclear. It is possible to claim that no variable in this calculation process is precise, and their establishment is inseparable from the factor of subjectivity thus depriving one of an opportunity of comparing the obtained results among themselves. Consequently, in relation with the aim of the paper, the Author rejects these methods.

Table 3. Classification of intellectual capital *evaluation* methods corresponding to the aim of the paper

Group	Methods assigned	Features
A	CIV EVA TVE / WWKT KCE	These are financial valuation methods allowing to calculate the total value of the intellectual capital of an enterprise (holistic methods) in monetary units (monetary methods), and the calculations are based on the <i>evaluation of the return on assets</i> .
B	MTBV/MTBR Tq MVA IAMV FiMIAM	These are methods of financial valuation allowing to calculate the total value of the intellectual capital of an enterprise (holistic methods) in monetary units (monetary methods), and the calculations are based on the <i>capitalization of market value</i> . Consequently, these methods may be applied only for the enterprises whose market value may be established reliably.

Having conducted a synthesis of Group B methods, the Author concludes and claims that the usage of market value in the process of valuation helps one avoid the valuator subjectivity-related disadvantages; this value is precise and possible to establish at any given moment. It measures an enterprise as an entirety by covering both identifiable and unidentifiable objects of the capital as well as the liabilities of the enterprise. The comparison of this value with its book value simply and plainly reveals whether the enterprise possesses any capital which is not presented in its financial statements. It should be highlighted that before establishing the balance value of an enterprise it is useful to check whether the values of the assets and liabilities of the enterprise are similar to their fair values (as the standards of accounting require).

One of Group B methods, namely, FiMIAM by applying the weights established within the enterprise distributes the obtained difference across the three intellectual capital components, i.e. the human, organizational and relational – thus establishing their value in a monetary equivalent. This identification of the values of intellectual capital components is well-grounded and logical just because of the fact that all the intellectual capital components and elements are interwoven as they are worthless separately; hence, the separation of their values is an extremely complex or even insurmountable challenge. Considering this, *the model of intellectual capital evaluation and disclosure in financial statements* is based on principles typical of Group B methods.

4 Model of intellectual capital evaluation and disclosure in financial statements

The theoretical *model of intellectual capital evaluation and disclosure in financial statements* consists of six steps (Figure 3). *Step One* is the calculation of the difference between the market value and the book value of the enterprise which is equaled to the value of the realized intellectual capital of the enterprise. It should be remarked that this idea originates in IAVM method. In *Step Two*, within the enterprise, those elements of the intellectual capital are identified which define and explain the future monetary flow. Then they are assigned to the corresponding components of the intellectual capital of the enterprise. In *Step Three*, on the grounds of *Step Two*, the weights of the components of the intellectual capital of the enterprise in the general context are outlined in order to reflect the relative influence and importance of each of them upon the entirety of the intellectual capital. This step should be performed by the management of the enterprise on the grounds of their experience and on the basis of their understanding of value creation within the enterprise. It should be noted that additional regulation and/ or recommendations for *Steps Two* and *Three* are required at national or regional levels; these steps could apply various quantitative non-monetary and qualitative methods of intellectual capital valuation; however, this requires a more profound research into the methods of the intellectual capital *measurement* that has not been performed in the framework of this paper.

On the grounds of the established weights of the components of the intellectual capital within the enterprise, *Step Four* calculation represents the discovery of the value of intellectual capital components in monetary units. These values are consequently presented in the balance sheet of the enterprise (*Step Five*): 1) in the assets side by including the additional position “*Intellectual capital*” and its components “*Human capital – HC*”, “*Organizational capital – OC*” and “*Relational capital – RC*” while 2) the position of “*Equity*” on the side of the equity and liabilities of the balance sheet is supplemented with a line “*Unrealized profit (losses) of the intellectual capital*” thus restoring the expenses that the enterprise underwent when maintaining its intellectual capital which were treated as expenses (in the case of profitability) or when acknowledging consequences of inefficient use of the intellectual capital (in the case of losses).

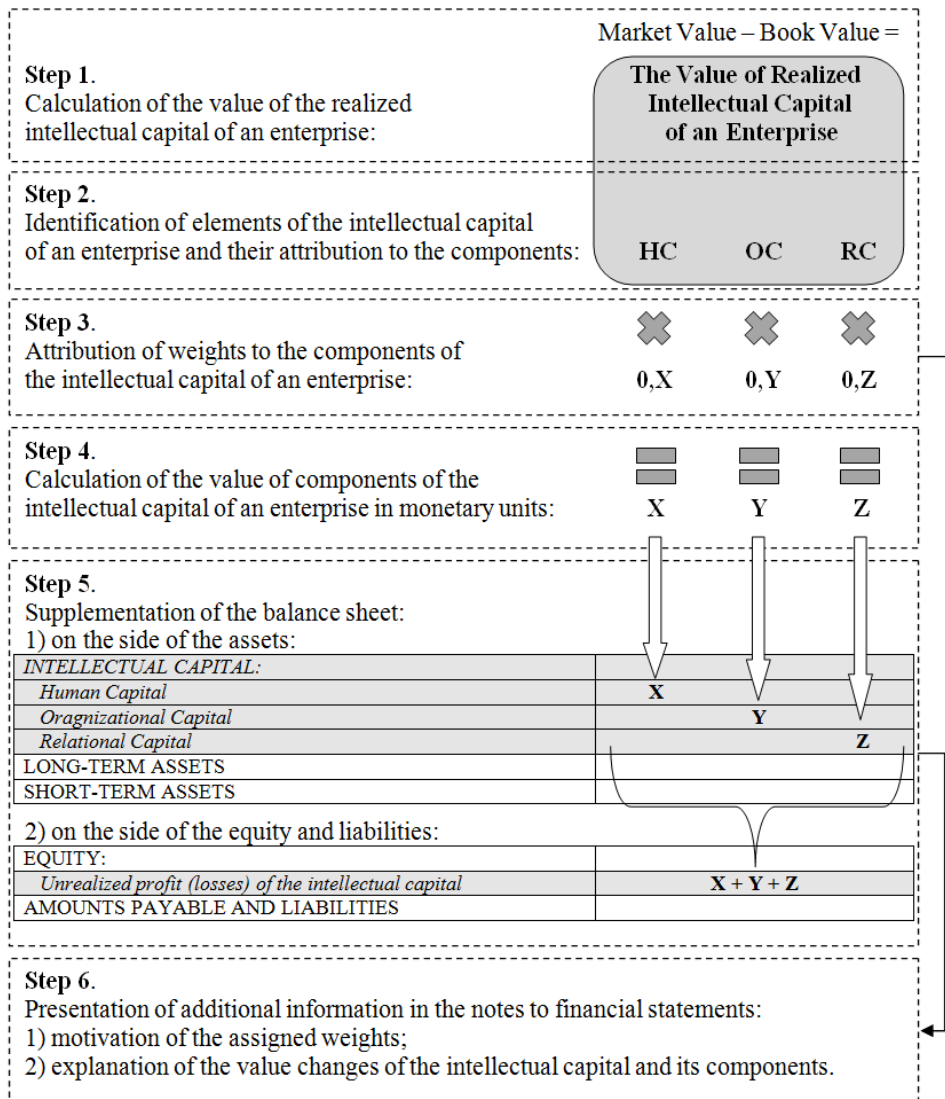


Figure 3. The model of intellectual capital evaluation and disclosure in financial statements

On the grounds of *Step Six* of the model, the explanatory note should contain additional information in order to explain the values of the intellectual capital and its components presented in the balance sheet better: 1) to ground and argue the weight attributed to specific components of the intellectual capital of the enterprise; and 2) in order to explain alterations of the value of the intellectual capital and its components. This

step also requires useful additional regulation(s) and/ or recommendations at regional or national levels.

Consequently, if enterprises apply this model, they not only present the values of the realized intellectual capital and its components in the balance sheet but also provide motivation for the calculation of these values and the explanation of changes in the notes to financial statements. As a result, stakeholders are supplied with additional information on the capital possessed by the enterprise while creation, filling in and presentation of new statements is avoided.

5 Application of the model of intellectual capital evaluation and disclosure in financial statements in Lithuanian enterprises

This part establishes the methodology of the research of the model application and assessment of the obtained results. On the grounds of this methodology by employing data of annual statements of publicly listed enterprises operating in dairy products and alcohol industries of the Republic of Lithuania, the possibilities of integrating *the model of intellectual capital evaluation and disclosure in financial statements* developed by the Author of the paper into the system of financial accounting and the significance of the model for the decisions based on the information provided in financial statements are evaluated.

5.1 Methodology of the research of the application of the model

The object of the research is the model of intellectual capital evaluation and disclosure in financial statements. *The aim* is to assess the applicability of the model and its significance for consumers decisions based on the information presented in financial statements. In order to achieve the aim, the following *objectives* were set in the research: 1) to highlight issues encountered in application of the model in practice; and 2) to analyze the significance of the integration of the model into the system of financial accounting regarding the decisions taken by stakeholders.

Methods of the research. In order to achieve the set objectives, the inductive method of research was selected. Induction is a method of empirical research of phenomena when, after the investigation of specific objects and the discovery of a specific quality of the phenomena, a conclusion is drawn that all the objects belonging to the class possess the same quality (Pleckaitis, 1978; quoted from: Tidikis, 2003). Research statements are

correspondingly set to be followed during the course of the empirical research: T(1). The model of intellectual capital evaluation and disclosure in financial statements **is not** applicable in practice; and T(2). Financial statements supplemented with data on the intellectual capital of an enterprise **do not alter** the results of financial analysis conducted on the basis of these statements. In order to verify the selected claims, case study was selected. This research involves document and content analysis methods.

Sample of the research. When establishing the sample of the research, it was considered that the core data element necessary for the application of the model is the market value of an enterprise. In Lithuania, the market value may be reliably established only for these enterprises whose shares are publicly traded in the market. There are 33 enterprises of this type. Enterprises have been selected for this research considering the branch of economy they represent and the date since which they have been continually listed. These enterprises and branches of industry were attempted to be selected whose data may be compared both among enterprises and between/ among branches of industry. As a result, eight enterprises operating in the branch of industry “food and beverages” have been selected for further analysis, four of which are involved in alcohol production and trade while the four others deal with the production and trade of dairy products. A four-year period from 2009 to 2012 inclusive was selected for exploration.

Organization and course of the research. In order to accomplish Objective One, the instrumentation of the research was described which is based on systematic implementation of the steps of the verified model. In the course of the research, publicly available information posted on the internet was being used, i.e. the data of the annual statements of the enterprises and the data of the stock exchange internet website was being employed. Data on the elements of the intellectual capital of the enterprises (Step Three of the model) and the weights assigned to the components (Step Four of the model) were obtained by using alternative methods, namely, by performing content analysis of the publicly posted data.

In order to implement Objective Two, financial analysis of the enterprises was conducted on the grounds of information presented in the financial statements of these enterprises: horizontal, vertical and financial ratios (profitability, turnover and financial leverage) were considered. On the basis of this information, the research statement T(2). *Financial statements supplemented with data on the intellectual capital of an*

enterprise **do not alter** the results of financial analysis conducted on the basis of these statements is divided further and verified in terms of five operative claims:

T(2)₁: Supplementation of the balance sheet assets side with the data on the intellectual capital of an enterprise **does not alter** the results of horizontal and vertical analysis;

T(2)₂: Supplementation of the balance sheet equity and liabilities side with the data on the unrealized profit (losses) of the intellectual capital of an enterprise **does not alter** the results of horizontal and vertical analysis;

T(2)₃: Supplementation of the balance sheet with the data on the intellectual capital of an enterprise **does not alter** the results of the analysis of financial profitability ratios;

T(2)₄: Supplementation of the balance sheet with the data on the intellectual capital of an enterprise **does not alter** the results of the analysis of financial turnover ratios;

T(2)₅: Supplementation of the balance sheet with the data on the intellectual capital of an enterprise **does not alter** the results of the analysis of financial leverage ratios.

These statements have been selected by the Author of the paper for verification in both selected branches of industry (alcohol and dairy industry) separately; hence, each statement is split into two and ten operative claims T(2)_{1A}, T(2)_{1P}, T(2)_{2A}, T(2)_{2P}, T(2)_{3A}, T(2)_{3P}, T(2)_{4A}, T(2)_{4P}, T(2)_{5A} and T(2)_{5P} are verified where index *A* stands for the industry branch of alcohol while index *P* stands for the industry branch of dairy products. The outlined statements are empirically verified in the course of the research. *Microsoft Excel* software is employed for statistical and graphical data processing.

5.2 Results of the model application

Having implemented Objective One, four core issues in the implementation of the verified model in real life were established. The first issue is *the impossibility of the establishment of the market value of these enterprises whose shares are not traded in the market*. In order to eliminate this drawback, a method or methods offering reliable establishment of the value of a specific enterprise in monetary units should be involved into the model of intellectual capital evaluation and disclosure in financial statements. However, this requires additional research in the field of enterprise value establishment which was not conducted in the framework of this paper. On the other hand, investment decisions are usually taken by individuals involved into the stock market and they are mostly interested in those enterprises whose shares may be traded in the market.

The second issue of the practical application is the *identification of elements of the intellectual capital of an enterprise and their attribution to the components of the intellectual capital of the enterprise*. The third issue in the application of this model is closely related with the previous one; it is the *assignment of weights to the components of the intellectual capital of the enterprise*. In order to help enterprises properly implement these steps of the model, additional regulations or recommendations may be required and useful which would: 1) extensively explain the concept of specific elements of the intellectual capital of an enterprise; 2) present potential methods for their identification and assignment to components of the intellectual capital; and 3) recommend ways for assigning weights to specific components of the intellectual capital of an enterprise.

The fourth issue regarding application is the *presentation of data in the notes to financial statements*. Here, additional regulations are also required and useful at national or regional levels. In order to harmonize the type and shape of information, the minimal scope of information related with 1) the assignment of weights to specific components of the intellectual capital of an enterprise and 2) changes in the values of the intellectual capital and its components should be presented in the notes to financial statements.

Considering the issues of the model identified during the practical research it is possible to claim that the developed *model of intellectual capital evaluation and disclosure in financial statements* **is applicable** in practice and providing that the necessary regulations and/ or recommendations are passed/ drafted it may be successfully integrated into the system of financial accounting. *On these grounds, the Author of the paper negates the research statement T(1).*

When dealing with Objective Two, a research of the impact of the model integration into financial accounting taking into consideration the effect on decisions taken by stakeholders was conducted. The generalized data of the investigated operative statements is presented in Table 4. When exploring the obtained results, it is evident that six out of ten operative statements were negated which determined the negation of the initial research statement.

When generalizing on the conducted research, it may be stated that financial statements supplemented with data on the intellectual capital of an enterprise **do alter** results of the financial analysis conducted on the grounds of these statements.

Table 4. Results of verification of the operative statements and negation of the initial statement

No.	Claim	Result
T(2) _{1A}	Supplementation of the balance sheet assets side with the data on the intellectual capital of an enterprise does not alter the results of horizontal and vertical analysis	Negative
T(2) _{1P}		Negative
T(2) _{2A}	Supplementation of the balance sheet equity and liabilities side with the data on the unrealized profit (losses) of the intellectual capital of an enterprise does not alter the results of horizontal and vertical analysis	Negative
T(2) _{2P}		Negative
T(2) _{3A}	Supplementation of the balance sheet with the data on the intellectual capital of an enterprise does not alter the results of the analysis of financial profitability ratios	Affirmative
T(2) _{3P}		Negative
T(2) _{4A}	Supplementation of the balance sheet with the data on the intellectual capital of an enterprise does not alter the results of the analysis of financial turnover ratios	Affirmative
T(2) _{4P}		Affirmative
T(2) _{5A}	Supplementation of the balance sheet with the data on the intellectual capital of an enterprise does not alter the results of the analysis of financial leverage ratios	Affirmative
T(2) _{5P}		Negative
T(2)	<i>Financial statements supplemented with data on the intellectual capital of an enterprise do not alter the results of financial analysis conducted on the basis of these statements</i>	Negative

Considering this in the context of the opinion of Mackevicius (2006) that 1) the current financial statements provide insufficient information which does not meet the needs of internal and external information users under the permanently changing conditions of the competitive market and that 2) financial statements are required to present such information which should help information users take the right decisions, evaluate events of former, current and future periods, organize economically rational and efficient activity, the Author concludes that the integration of *the model of intellectual capital evaluation and disclosure in financial statements* into the system of financial accounting will provide analysts with additional data for the implementation of analysis thus reducing the limitations of the information which is currently provided in financial statements.

6 Conclusions

Having analyzed the essence of the intellectual capital and its typical qualities, a *definition of the intellectual capital* has been developed. It was established that this is resources having no tangible form which are created, purchased or maintained within an enterprise where, together with the material and financial capital of the enterprise, these resources contribute to the creation of the added value. The intellectual capital may be divided into minor constituent parts – components and elements.

Having researched constituent parts of the intellectual capital presented in academic works, a *structural scheme of the intellectual capital* was developed by singling out three components of the intellectual capital: the human capital, the organizational capital and the relational capital. Taking into consideration the needs and the specificity of the enterprise, all of them may be split into minor constituent parts – elements – which may be grouped on the grounds of the content analysis of various academic works.

Having researched and systemized the conducted empirical research in various countries regarding the trends of the presentation of information on the intellectual capital of an enterprise to stakeholders it was established that many academic works highlight the need to standardize the presentation of the information on the intellectual capital of an enterprise as peculiarities of the enterprise culture and the attitudes of the managerial staff obstruct the natural development of the process and hamper the achievement of the main objective, namely, *the provision of more data on the objects creating value of the enterprise to stakeholders so that the data could be comparable between/ among different enterprises, industry branches or regions.*

Having generalized on the suggested methods of intellectual capital valuation, a *scheme of classification of these methods* is suggested. It was established that at least sixty different methods are suggested for the valuation of the intellectual capital of an enterprise. Most of them are based on scorecard, assess specific components of intellectual capital and do not employ monetary units in the process of valuation; as a result, the expression of the valuation result is non-monetary, i.e. it is qualitative and presented as text or quantitative and presented as an index.

Having explored the theoretical and practical aspects of nineteen methods of intellect capital *evaluation*, possibilities of their integration into the financial accounting were explored. During the research, two groups of methods with possible application were developed. On the grounds of synthesis of these methods it was established that the use of the market value in the process of valuation (Group B methods) helps to avoid drawbacks related with the subjectivity of the valuator (Group A methods). This value is precise and possible to establish at any given moment. It measures an enterprise as an entirety by covering both identifiable and unidentifiable objects of the capital of the enterprise. The comparison of this value with its book value simply and plainly reveals whether the enterprise possesses any capital which is not presented in its financial statements.

Considering this, *the model of intellectual capital evaluation and disclosure in financial statements* is based on the principles of Group B methods.

A theoretical *model of intellectual capital evaluation and disclosure in financial statements* consisting of six steps has been developed. Having applied this model, enterprises would not only present the values of the intellectual capital and its components in the balance sheet but would also provide motivation for the calculation of these values and the explanation of changes in the notes to financial statements. As a result, stakeholders would be supplied with additional information on the capital possessed by the enterprise while creation, filling in and presentation of new statements would be avoided.

For the application and verification of the *model of intellectual capital evaluation and disclosure in financial statements*, the empirical methodology of research was applied. The results showed that the developed *model of intellectual capital evaluation and disclosure in financial statements* is **applicable in practice** and provided that the necessary regulations and/ or recommendations are passed/ drafted it may be successfully integrated into the system of financial accounting; and that the integration of *the model of intellectual capital evaluation and disclosure in financial statements* into the system of financial accounting will provide analysts with additional data for conducting data analysis thus decreasing the limitedness of the information provided in the currently presented financial statements.

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Strategic Intellectual Capital Management as a Driver of Organisational Innovation

Holger Kohl, Mila Galeitzke*, Erik Steinhöfel
Ronald Orth

Corporate Management Division
Head of Corporate Management Division
Fraunhofer Institute for Production Systems and Design Technology
Pascalstr. 8-9, 10587 Berlin, Germany

* *Corresponding author*

Structured Abstract

Purpose – Enterprises are facing transforming framework conditions that are manifesting on several levels. Increased competition from emerging markets, limited availability of resources as well as political and societal requirements with regard to the sustainability of enterprises' operations are only an extract of changing factors of influence. The capability to innovate has proven to be a strong competitive advantage and is to be assessed as a major success factor to limit the exposure to the intensified competitive (Schmeisser et. al. 2010), normative or even legal pressure especially for small and medium-sized enterprises.

Design/methodology/approach – In order to identify and describe the interdependences between intangible resources, their management and innovation capabilities the principal terms are put into focus at first. Building up on the theoretical explanations and taking the management method “Intellectual Capital Statement – Made in Germany” as a starting point the interdependencies between intellectual capital and product innovation as well as process optimisation and innovation are analysed. Within this article the interdependences between the standard intellectual capital factors are investigated with regard to product and process innovation on the basis of 38 Intellectual Capital Statements of German enterprises.

Originality/value – The significance of intangible resources for business success has evidently increased and may in some cases already be assessed as higher than the impact of tangible resources. Analyses have indicated some intellectual capital factors as the most prominent and important, yet the impact on the intra- and inter-organizational innovation ecosystems has not been analysed thoroughly. Although the most important factors of intellectual capital are identified, the specific drivers for innovation have not been investigated. This paper seeks to close this gap and draw meaningful conclusions with regard to drivers of innovation and related differences between manufacturing and service enterprises.

Practical implications –The analysis of the correlation between intellectual capital and innovation capabilities allows statements regarding the intellectual capital factors, onto which enterprises should be focused in order to foster innovation. The qualitative content-

related analysis of the 38 intellectual capital statements with regard to the consideration of new and different types of innovation management methodologies allows the identification of existing gaps in intellectual capital management. The close examination of the framework of new types of innovation and cross-reference to practical interdependences shall establish the theoretical basis for future case studies with enterprises that have the objective of establishing new types of innovation to continue this very research.

Keywords – Innovation Management, Intellectual Capital Statement, Knowledge Management

Paper Type – Academic research paper

1 Introduction

Enterprises are facing transforming framework conditions that are manifesting on several levels. Increased competition from emerging markets, limited availability of resources as well as political and societal requirements with regard to the sustainability of enterprises` operations are only an extract of changing factors of influence. The capability to innovate has proven to bear the potential to establish and ensure strong competitive advantages and is to be assessed as a major success factor to limit the exposure to the intensified competitive (Schmeisser et. al. 2010), normative or even legal pressure especially for small and medium-sized enterprises. This contribution aims at analysing the potential contribution of strategic intellectual capital management to improve the framework for product and process innovation. Moreover, the mere product or incremental process innovations are neither a guarantee for success nor sufficient to cope with the emerging information, knowledge and time-competition (Stern, Jaberg 2010). The organizational innovation as a third category of innovation (Stoneman 1983 / Hemmelskamp 1997) and the implications of new types of innovation management as well as new methodologies to generate innovations such as collaborative innovation, design thinking and methodologies alike are put into perspective along with a closer look at the significance of business model innovation in this regard.

The significance of intangible resources for business success has evidently increased and may in some cases already be assessed as higher than the impact of tangible resources. Analyses have indicated some intellectual capital factors as the most prominent and important, yet the impact on the intra- and inter-organizational innovation ecosystems has not yet been analysed thoroughly. Although the most important factors of intellectual capital are identified, the specific drivers for innovation have not been investigated. This

paper seeks to close this gap and draw meaningful conclusions with regard to drivers of innovation and related differences between manufacturing and service enterprises.

2 Description of Principal Terms

In order to prepare the analysis and evaluation of the Intellectual Capital Statements in regard to product and process innovation and their relation to other standard factors a few principal terms shall be defined in the next paragraphs. The basics of intellectual capital management and in particular the Intellectual Capital Statement (ICS) are followed by a description of product, process and organizational innovation.

2.1 Intellectual Capital Management

In order to bridge the gap between the requirements for internal management purposes and external reporting, InCaS developed instruments to systematically assess, develop and report an organisation's IC. As a main project result, the "European Guideline for Intellectual Capital Statements (ICS)" has been published. The guideline describes in detail each single step of the ICS implementation and provides templates, checklist supplements and the ICS toolbox in order to support this process (EU Commission 2008).

The InCaS project consists of 50 pilot implementations in SMEs from 5 different EU countries (Germany, France, Poland, Slovenia and Spain). Indeed, it represents the extension of a methodology previously implemented with great success in 50 German SMEs (Mertins et al. 2009). Today there are known approximately 1.000 ICS implementations and the German guideline and toolbox have been downloaded from the internet more than 100.000 times (Herrmann 2013).

The ICS approach consists of two models to guide and to enable the ICS implementation process: firstly, the Structural Model aims at defining the "language" (i.e. the vocabulary) to be used when dealing with IC and secondly, the Procedural Model leads the organisation through the ICS process and defines five implementation steps: (1) Define Business Model, (2) IC Analysis, (3) Measurement, (4) Strategy Refinement & Measures and finally (5) prepare the Final ICS Document.

ICS Structural Model

The structural model of the ICS approach – a result of the consolidation process of international approaches on IC management and reporting – describes the main elements

of the ICS as well as their interrelations. The model is a holistic and systemic representation of the way the organisation has structured its business processes to deliver value to the customers. Starting point is the vision and strategy of the organisation with a view to the possibilities and risks encountered in the external business environment. Following the most frequently used structure to describe intangible resources, the ICS framework divides intellectual capital into three dimensions: human, structural and relational capital (Figure):

- Human Capital (HC) includes the staff’s competencies, skills, attitudes and the employee’s motivation. Human Capital is owned by the employee and can be taken home or onto the next employer.
- Structural Capital (SC) comprises all structures and processes needed by the employee in order to be productive and innovative. It “consists of those intangible structures which remain with the organisation when the employee leaves” (Edvinsson, Malone 1997).
- Relational Capital (RC) sums up all relationships to external groups and persons established by the organisation, e.g. customers, suppliers, partners and the public.

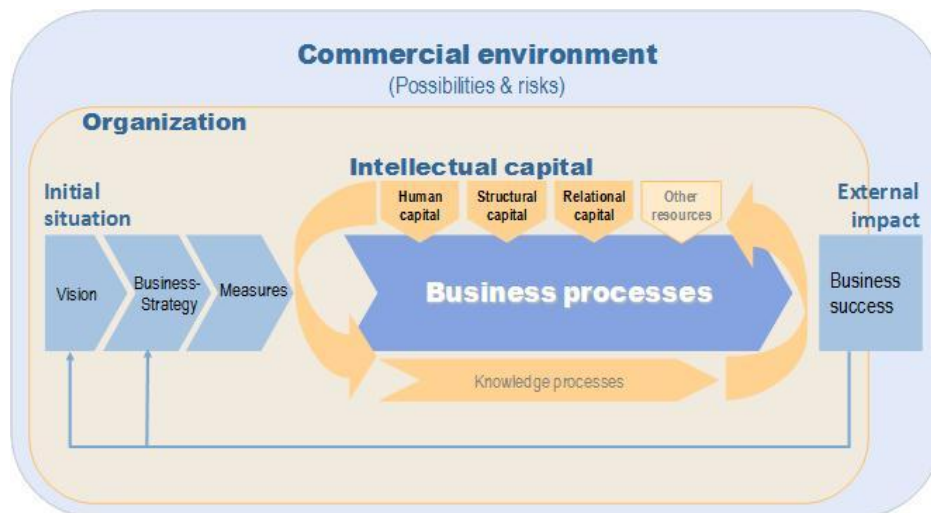


Figure 1: ICS Structural Model (Mertins et al. 2009).

IC Standard Factors: A decisive step towards the harmonisation of international approaches in the field of IC measurement and reporting has been taken by the initiatives

mentioned above. They established a concept on how to harmonise the huge variety of intangible elements which build the basis for superior business performance in order to bridge the gap between individuality and comparability of IC-related information (Mertins et al. 2009).

Using the IC categorisation as mentioned above the harmonisation of ICS content was started on basis of the empirical results collected in more than 50 pilot implementations. The results from practice showed, that approx. 80-90% of individual IC elements could be harmonised on an aggregated level, while the remaining 10-20% are individual respectively organisational specific (Mertins, Will 2008). The table below shows those factors of Intellectual Capital, which could be harmonised across all participating companies and have been empirically identified as a standard set of so called "IC factors".

2.2 Product, Process and Organisational Innovation

Innovations are of substantial significance for the effective economic and technological development of economies and enterprises. Innovations replace existing products, processes or organizational structures and have the capability to change the persisting technological, economical systems or even organizational and social structures. In this contribution product and process innovation are perceived as the main categories, while the strategic organizational – or business model innovation - is subject to an evaluation regarding the adaptability.

According to the definition of the standard success factors of IC, that cover 80 % of all intellectual capital factors (Mertins, Will, Wuscher 2007), product innovations are defined as innovations of great importance for the future of the organization. The development, testing, production and introduction to the market of new or improved products or services or the adaption of functionality to other uses is considered product innovation. Incremental changes to products e.g. the change of specifications, materials or addition of functionality is also comprised in the general definition.

The optimization and improvement of existing procedures as well as the development and implementation of new processes is defined as the process optimisation and innovation standard success factor of intellectual capital. Inefficient procedures within an organization or in regard to the interfaces and interaction with suppliers, partners or customers are often regarded as a cause for low or decreased competitiveness and economic losses. Therefore, the continuous improvement of procedures, striving to

increase the effectiveness and efficiency, is a corner stone of the definition of the standard success factor for intellectual capital. Utilizing systems such as idea management to constantly map and evaluate potential improvements and implementing new procedures or incremental process innovations can help to overcome the inefficiencies.

The business model – the means and methods employed by organisations to create, deliver and capture value (Osterwalder, Pigneur 2010) – is usually subject to innovation, when new markets are developed or penetrated by an organisation or through the structural change in existing markets (Zott, Amit 2007). Thus, both product and process innovation may render the inherent business model obsolete or inadequate. Organisational innovation is herein defined as the adaptation of new organisational structures or procedures within the business model, structural organization or external relations.

3 Analysis and Evaluation of Intellectual Capital Statements

The analysis and evaluation of previously created Intellectual Capital Statements of 38 German enterprises is separated herein into the description of the data and the analysis and evaluation in regard to the relations between the standard success factors of intellectual capital (see *Figure 2 - Figure 4*) with a special focus on product and process innovation.

	Standard Success Factors	Description
HC-1	Professional Competence	Human Capital includes the staff's competencies, skills, attitudes and the employee's motivation. Human Capital is owned by the employee and can be taken home or onto the next employer.
HC-2	Social Competence	
HC-3	Employee Motivation	
HC-4	Leadership Ability	

Figure 2: Standard Success Factors for Human Capital

	Standard Success Factors	Description
SC-1	Internal Co-operation and Knowledge Transfer	Structural Capital comprises all structures and processes needed by the employee in order to be productive and innovative. It “consists of those intangible structures which remain with the organisation when the employee leaves” (Edvinsson, Malone 1997).
SC-2	Management Instruments	
SC-3	Information Technology and Explicit Knowledge	
SC-4	Product Innovation	
SC-5	Process Optimisation and Innovation	
SC-6	Corporate Culture	

Figure 3: Standard Success Factors for Structural Capital

	Standard Success Factors	Description
RC-1	Customer Relationships	Relational Capital sums up all relationships to external groups and persons established by the organization, e.g. customers, suppliers, partners and the public.
RC-2	Supplier Relationships	
RC-3	Public Relationships	
RC-4	Investor Relationships	
RC-5	Relation to Co-operation Partners	

Figure 4: Standard Success Factors for Relational Capital

3.1 Data-basis

In this contribution the Analysis of 38 consolidated Intellectual Capital Statements of German enterprises of both the production and service domains are evaluated regarding the interdependencies of the inherent standard success factors for intellectual capital concerning product innovation as well as process optimization and innovation in particular. Of the 38 ICS 25 are service enterprises, while 13 are associated with the production domain. The interrelations between the standard success factors of intellectual capital are shown in the table below as aggregated averages. The table is structured in such a way, that the influence evaluation numbers correspond influence the standard success factors in the rows have on the factors in the columns. As an example the number “2” in row 1 and column 8 is an assessment of the influence HC-1 has on SC-4. The scale for the interrelation assessment is structured as follows: factor (row) has (0 = no, 1 = a weak, 2 = strong, 3 = very strong) influence on factor (column).

Table 1: Aggregated average interrelations (From Mertins, Wuscher, Will 2012)

	HC-1	HC-2	HC-3	HC-4	SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	RC-1	RC-2	RC-3	RC-4	RC-5	AS
HC-1	x	1	2	1	2	1	1	2	2	1	2	2	1	1	2	21
HC-2	1	x	2	2	2	1	1	1	1	2	2	1	1	1	2	20
HC-3	2	2	x	1	2	1	1	2	2	2	2	1	1	1	2	22
HC-4	2	2	3	x	2	2	1	2	2	2	1	1	1	2	1	24
SC-1	2	2	2	1	x	1	1	2	2	1	2	1	1	1	1	20
SC-2	1	1	2	2	2	x	1	2	2	2	1	1	1	1	1	20
SC-3	2	0	2	1	2	1	x	1	2	1	1	1	1	1	1	17
SC-4	2	0	2	0	1	1	2	x	2	2	2	2	2	2	2	22
SC-5	2	1	2	1	2	1	2	2	x	1	2	1	1	1	1	20
SC-6	1	2	2	1	2	1	1	2	1	x	2	1	1	1	1	19
RC-1	1	1	2	1	1	1	1	2	1	1	x	1	2	1	1	17
RC-2	1	0	1	0	1	1	1	2	1	0	1	x	1	1	1	12
RC-3	0	0	1	0	0	0	1	1	1	1	2	1	x	2	1	11
RC-4	0	0	1	1	0	0	0	1	0	0	1	1	1	x	1	7
RC-5	2	1	1	1	1	0	1	2	1	1	2	1	2	1	x	17
PS	19	13	25	13	20	12	15	24	20	17	23	16	17	17	18	269

AS = Active sum

PS = Passive sum

Considering the active sums (AS), it is visible that product innovation as well as process optimization and innovation have a strong influence on the other standard success factors for intellectual capital. In a first step of the analysis, the active and passive sums of the interrelations of the factors product as well as process optimization and innovation are considered. Both innovation factors show a relatively high influence on all other factors, where product innovation shows a slightly higher aggregated average influence of 22 in contrast to the value of 20 of process optimization and innovation. Considering the influence of other factors on the innovation factors SC-4 and SC-5, the same observation is made.

For an in-depth analysis, the data basis is separated into the data regarding the service and production enterprises. The following tables show the aggregated average interrelations of the service and production enterprises. The passive data indicates the influence of the factors in the columns onto the innovation factors. The active data indicates the influence taken by the innovation factor onto the other factors.

Table 2: Aggregated average interrelations of production enterprises

Passive	HC-1	HC-2	HC-3	HC-4	SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	RC-1	RC-2	RC-3	RC-4	RC-5	
SC-4	3	2	2	2	3	1	2	x	1	2	2	2	0	1	2	25
SC-5	2	1	2	2	2	1	2	2	x	1	1	1	0	0	1	18
Active																
SC-4	2	1	2	1	2	1	2	x	2	2	3	2	2	2	2	26
SC-5	2	1	2	1	1	1	2	1	x	1	2	1	0	1	1	17

The sample of the production enterprises allows a closer look at the assessed influences between the standard success factors of intellectual capital. In comparison to

the service enterprises (see Table below) the influences on product innovation are assessed as stronger on average. The active and passive influence of process optimisation and innovation is slightly higher rated by service enterprises.

Table 3: Aggregated average interrelations of service enterprises

Passive	HC-1	HC-2	HC-3	HC-4	SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	RC-1	RC-2	RC-3	RC-4	RC-5	
SC-4	2	1	2	2	2	2	1	x	2	1	2	1	1	2	1	22
SC-5	2	1	2	2	2	2	2	1	x	1	1	1	1	0	1	19
Active																
SC-4	1	0	2	0	1	1	2	x	1	2	2	1	2	2	2	19
SC-5	2	0	2	1	2	1	2	2	x	1	2	1	1	1	1	19

In the inspection of this data, the larger sample size of the service enterprises needs to be considered, as it provides a solid basis for general assumption, while compensating for major exceptions.

4 Intellectual Capital and Innovation

As described, the close relation between innovation capabilities and the intellectual capital is manifested in the definition of process and product innovation as standard success factors of the structural capital. Moreover, the influence of intellectual capital and the strategic management thereof to increase the innovation capabilities of enterprises can be assessed as a crucial effort to maintain the organisations' competitiveness. The following descriptions of interrelations are limited to those that show a strong or very strong influence on the innovation standard factors. The inherent definitions of the standard success factors are based on the European ICS Guideline (European Commission 2008). First, this assessment is conducted for the production enterprises, followed by a comparative assessment of the service enterprise. In these, generic improvement methods are described and other drivers as well as innovation inhibitors (Wulfen 2011 / Trías de Bes, Kotler 2011) are addressed.

4.1 Human Capital and Innovation

The capabilities that are brought into the value adding process of an organisation, the human capital, is a basic prerequisite for product innovation as well as process optimisation and innovation. The standard success factors of human capital have an overall strong influence on the product innovation. First of all, the professional competence has a very strong influence on the product innovation and a strong influence

on the process optimisation and innovation, as the collective expertise and experience is a prerequisite to develop technical enhancements or new technical solutions. Generally, the competence management should therefore target the recruitment of highly competent employees and their further professional development to increase the innovation capability. This competence however, needs to be balanced across the knowledge domains of the operation and organisation and should include the competence to implement and adapt solution-oriented innovation systems and methodologies.

The social competence and especially the communication aspect are essential for the product innovation activities as it includes the employee's creativity and flexibility. Moreover, the communication of ideas and the nurturing trust-enhancing behaviour foster the generation of ideas and innovations through constructive discussions and co-operation. The specific training of communication and co-operation competences of the employees and the inherent prevention of fear-inducing environments (Trías de Bes, Kotler 2011) can improve the idea generation and communication. This is important in order to align the technological and product strategies with the idea evaluation. The social competence has only a weak influence on the process optimisation and innovation, a fact that can be explained, as the general value adding processes of an organisation are set within the business model and it is the human capital that determines the quality and efficiency with which these are executed.

The employee's motivation to play a part in the organisation and in particular the sub areas of identification with the organisation and the sense of participation in achievements has a strong influence on product innovation. In general the individual employee's motivation influences the performance in terms of quality and efficiency. Findings by SAUERMAN and COHEN suggest that the employee's motivation (to innovate) is influenced by extrinsic and intrinsic factors that have an impact on the individual effort in idea generation and implementation (Sauer mann, Cohen 2008 / Tyrone, Simpson, Dehlin 2012).

Equally strong as the latter, the influence by the leadership ability concentrates around the ability to administrate and motivate people, showing a close connection to the other human capital factors. Therefore, the utilization of methodologies to develop and communicate strategies, visions as well as their empathic implementation should foster the intrinsic factors for motivation to innovate.

4.2 Structural Capital and Innovation

The organisational structures and processes that determine the employees' interaction and their overall productivity have a weaker influence on product innovation and process optimisation and innovation, where these are part of the structural capital. The internal co-operation and knowledge transfer stands out with a very strong influence on product innovation. Here the ability to co-operate, as included in the social competence, is applied across the different hierarchy levels. The focused internal knowledge transfer builds professional competencies and retains knowledge within the organisation, thus building the innovation capabilities regarding products and processes between generations.

The management tools have a weak impact on both innovation factors. This is mostly due to the fact that tools and instruments are utilized to support the leadership ability, which might not directly be perceived by all employees in the participative assessment of the success factors.

The information technology and explicit knowledge is assessed to have a strong impact on both innovation factors. Information and communication systems are a significant part of today's working environment and implicitly influence the acquisition, processing and utilization of knowledge. State of the practice information and communication systems help to effectively and efficiently perform given tasks, and assist the employees to operate and control integrated production systems. Moreover, the fast and convenient access to information, design and simulation systems may optimise products or processes and generate innovative ideas.

The influence of SC-5 on SC-4 was assessed as weak, while on average a strong average influence was calculated vice-versa. As most process innovation in the production domain is of technical nature it may induce product innovation due to new possibilities, but is mostly concerned with existing products or procedures. Product innovation entails a certain change in processes, of which some may not exist and require optimisation or innovation.

The corporate culture, comprising all values and norms, influencing joint interaction, knowledge transfer and the working manner, has a strong impact on product innovation. Compliance to rules, good manners, "Do's and Don'ts" and the handling of failures are important aspects of this factor. While in product innovation the risk of failure induces a natural fear of failure and their consequences (Trías de Bes, Kotler 2011), the process optimisation or innovation is regarded as being influenced weaker as such conditions are

less evident. Moreover, the economic impact of process optimisation is measurable directly, whereas the economic impact of product innovation remains relatively uncertain, thus.

4.1 Relational Capital and Innovation

The relational capital, comprising all relationships to external groups or individuals established by the organisation, e.g. customers, suppliers, partners and the public, overall has a weak impact on product and process innovation. Public and investor relationships are in part even assessed as having no impact on the innovation factors.

Relationships to customers, whether former, current or potential customers have a strong influence on product innovation, which is evident, as the innovative solution generation is at least in part based on the customer's demand. The management of these relations, beyond the classical understanding of Customer Relationship Management (CRM), allows deeper insight to the customer's demand for innovative solutions, whereas the internal procedures are an underlying factor that are not influenced by these relationships as much.

Basically the same assessment was made regarding the relationships to suppliers. Product innovation is influenced strongly by the purchasing and cultivation of suppliers, whereas the internal procedures and their optimisation are only influenced in a weaker manner. It is noteworthy, that the relationships to the public on average have no influence on the innovation factors and the investor relationships play only a minor role for the product innovation.

The relations to professional co-operation partners, where joint activities in customer, supplier or investor acquisition and the networking knowledge transfer activities influences the product innovation more than it does the process optimisation and innovation. The transfer of knowledge and best practices in research and development partnerships has evidently a higher impact on the innovation activities regarding products than on the internal processes. Based on experiences in the analysis and transfer of best practice (processes) the sharing of internal process-related information is often associated with greater impediments due to the sensitivity or confidentiality.

4.1 Comparative Evaluation of Interrelations in the Service Domain

The assessment of influences between the standard success factors of intellectual capital of the enterprises within service domain shows a similar pattern to that of production enterprises. However, the passive and active influence of product innovation is evidently higher in the production domain, while the same counts for process optimisation and innovation in the service domain.

The influence of the relational capital is more or less equal in sum to that of the production enterprises, though it is apparent, that in service enterprises the strength of these influences is distributed more even amongst the factors. Although in the average there are no interrelations assessed as very strong by the service enterprises, due to aggregation - only two were assessed as very strong – within the human capital, the passive interrelation is evenly distributed. The influence of the innovation factors on human capital is non-existent regarding the social competence and weak or non-existent regarding the leadership ability.

5 Conclusion

The ability to manage the organizational performance with regard to standard success factors such as the price-performance ratio, production cost and quality is perceived as a standard part of any operation. However, in order to achieve and maintain a competitive advantage, enterprises need to progress their internal procedures and products according to the customer demand (Stern, Jaberg 2010). This contribution analysed the interrelation of the standard success factors of intellectual capital with a special focus on product and process innovation in order to derive an insight to the possibility to generate good practices to increase the innovation capabilities. Although the definition of success factors for organizational innovation is to be perceived with caution, as the applicability is questionable (Lager 2010) for each individual enterprise, a set of good or best practices can be identified along the interrelations of the standard success factors for intellectual capital. However, the generic definition of standards or good practices should be performed separately regarding the type of organisation that is considered.

The increasing normative pressure to increase the sustainability performance of the organisational operation is manifested in legislative requirements to limit the environmental, social and economic impact. This regulatory-push is not evident in this research. Equally, the increasing requirement of investors to gain insight into the

sustainability of their investments and a certain demand in economic and socially sustainable investments, as evaluated in social responsible investment (SRI) indices and others (OECD 2009). While the potential contribution to the sustainability performance by eco-innovation and process optimisation in the production domain is unquestionable (Forschungsstelle für Energiewirtschaft e.V. 2009), this interrelation is not accounted for in the inherent data of this research.

The research and development co-operation in competitive situations (Stern, Jaberg 2010) and increasingly in innovative co-operation networks is proving to become an effective opportunity for SMEs to systematically encounter the increasing performance pressure of changing framework conditions. These networks comprise suppliers and customers as well as competitors, therefore distinguished from the standard success factor of relationships to co-operation partners. In this contribution this holds true for product innovation, while the influence of relationships to customers and suppliers on the process optimization and innovation were assessed as weak. A closer look into the structure of the inherent enterprises as well as the evaluation of intellectual capital statements of enterprises that are active in such networks shall provide a more in-depth insight. The organisational innovation as a result of the innovation activities could be analysed, when considering the new forms of collaboration such as open innovation, collaborative innovation and design thinking in enterprises of this sort. Furthermore, the derivation of good practices regarding the management of intellectual capital will be further developed with a supplementary evaluation of the interrelations, taking the secondary influences into account.

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The customer knowledge management and customer collaboration: its impact on innovation capacity and marketing results in SMEs¹

Pilar Fidel*, Walesska Schlesinger,
Amparo Cervera

Department of marketing and market research
University of Valencia, Faculty of Economics
Av. Tarongers s/n 46022 Valencia, Spain

* *Corresponding author*

Structured Abstract

Purpose – Customer Knowledge Management (CKM) has been recognized within marketing as a significant resource that can be managed to improve innovation, to facilitate sensing of emerging market opportunities and to support long-term customer relationships management. Specifically, the aim of this paper is to test a model in order to examine the impact of customer collaboration as an antecedent of CKM, and the influence of both variables on innovation capacity and marketing results, in order to better understand the customer's potential role on innovation.

Design/methodology/approach – The conceptual model and the hypotheses are tested using PLS (Partial Least Squares) approach to Structural Equation Models (SEM) with survey data from 210 companies in Valencia (Spain). Using as key informants the owners of the company, data was collected using a random stratified probability sampling procedure with proportional allocation to the economic sectors. Personal interviews were developed using a structured questionnaire

Originality/value – The value of this study appears as a result of combining the three theories in the field of innovation, not previously tested together - the Resource-Based theory, the Service Dominant Logic (SDL) and the Organizational Learning theory- for proposing model that allows better understanding of the role of CKM and customer collaboration in marketing results and innovation capacity. Moreover this paper provides a comprehensive approach working on all types of innovation (product/service, production processes, management and marketing). It also generates knowledge to empirically test the proposition nº 2 of the theoretical work of Lush et al. (2007) based on the contribution of customer in the innovation co-creation process.

Practical implications – The results of this study hold important implications for business management and policy management. The study shows the CKM importance on

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organizations innovation capacity and marketing results. Furthermore, it contributes to highlight the importance of customer collaboration in the innovation process. Recognizing CKM as an important variable that influences directly and indirectly innovation capacity and marketing results should encourage managers pay attention to their CKM processes.

Keywords – Customer knowledge management, customer collaboration, marketing results, innovation capacity.

Paper type – Academic Research Paper

1 Introduction

Due to the financial crisis and the subsequent difficulties being experienced by companies, now more than ever, they need to survive and succeed through finding a competitive advantage. Companies that work in managing its knowledge and innovation will survive in the market and will improve its performance while maintaining its competitive advantage (Nonaka and Takeuchi, 1995; Pil and Holwelg, 2003; Ribeiro, 2003). Some authors point out Knowledge as the most important strategic resource to build a sustainable competitive advantage (Zack, 1999; Eisenhardt and Martín, 2000). This approach is in line with the Service Dominant Logic (SDL) one, where Lush et al. (2007) propose that knowledge represents the only true basis for the sustainable development of a competitive advantage, given that it is an operant resource that enhances the service, and it is a primary requirement for innovation and competitiveness of the company (Nonaka, 1994; Nonaka and Takeuchi, 1995; De Clercq and Arenius, 2006).

In this way, knowledge and innovation are inseparable concepts, and have become the dominant topics for managers (Prahalad et al., 2004). Innovation is the application of knowledge, and sharing knowledge through collaborative innovation is becoming increasingly important. Much research shows direct evidence of knowledge management implementation on innovative works (Nesta and Saviotti, 2005; Alegre et al., 2011).

Innovation has been studied throughout the literature with a resource-based theory approach (Subramanian and Nilakanta, 1996; Menguc and Auh, 2006; Tajeddini, 2011; O'Cass and Sock, 2013), from the SDL perspective (Flint, 2006; Lush et al., 2007; Vargo and Lush, 2008; Michel et al., 2008), and also from the organizational learning theory (Cavusgil et al., 2003; Lin et al., 2008; Tarí and García-Fernández, 2011), but to our knowledge never from a perspective that approaches the three theories overall.

In this way, findings from this study pretend to provide several contributions in four directions. Firstly, this study works with a new organizational perspective approximating the various theories mentioned previously for the study of knowledge management on the customer in the field of innovation. Secondly, results highlight the critical role of knowledge management and the role of customer as collaborator in the innovation process in its different types (product / service, in production processes, management and marketing). Thirdly, countering evidence from the SDL approach on customer collaboration in the innovation process. specifically about the proposition n° 2 "collaborative competence is a primary determinant of knowledge acquisition in the company to obtain the competitive advantage", of the theoretical work of Lush et al. (2007) based on the role of the customer, not having found empirical study to date contrasting the relationship between customer collaboration in the innovation process and CKM. And finally, this study helps managers and researchers to clarify the relationships between the concepts studied (CKM, customer collaboration, innovation capacity and marketing results) following the new organizational perspective proposed.

2 Conceptual model and hypotheses

2.1 Customer knowledge management

In the emphasis on knowledge as a key competitive factor in the global economy, corporations may be overlooking a major element –customer knowledge. Customer Knowledge Management (CKM) is about gaining, sharing and expanding the knowledge residing on customers, to both customer and organization benefit. It can take the form of prosumerism, mutual innovation, team-based co-learning, communities of practice and joint intellectual property management (Gibbert et al., 2002).

Referring to the origins of knowledge management, there are precursor theories of this variable such as the resource-based theory with its extension to the approach of dynamic capabilities and organizational learning theory. The resource-based theory shows the relationship between profitability and allocation of resources so that companies must identify what the most valuable resources are , and if they have not achieved them, then should seek to acquire these resources in the strategic factors market (Barney, 1991). Based on this theory, Spender (1996) considers knowledge management based on the creation and application of knowledge as a resource.

The dynamic capabilities approach emerges as an improvement of this theory initiated by Penrose (1962) and expanded by Wernerfelt (1984) and Barney (1991) in the sense of giving a dynamic view of organizational behavior (and not static as provided by this theory) in order to explain the success of companies operating in environments with high levels of dynamism and complexity. It is based on this approach that several authors consider dynamic capabilities such a composition of knowledge management activities taking place in the company (Benner and Tushman, 2003; Zahra et al., 2006; Nielsen, 2006). Considering all of this, the knowledge can be conceived as a strategic resource, that is acquired through learning and experience, and whose management generates dynamic capabilities. So knowledge as a resource focuses on the role of dynamic capabilities (Helfat, 1997; Teece et al., 1997; López and Sabater, 2002), understood these such as the ability of the organization to integrate, build and reconfigure their set of resources and capabilities to respond quickly to changes in the environment (Teece et al., 1997). As a result, this study adopts the definition of knowledge management proposed by Alegre et al. (2011) as the set of organizational practices and dynamic capabilities in relation to (respectively) the creation, preservation and transfer of knowledge. Moreover, the purpose of knowledge management is to improve the output to the customer (Darling, 1996).

2.2 Customer collaboration in the innovation process

For innovation to occur, knowledge is best created and transferred in an organizational culture which encourages collaboration and facilitates learning networks (eg. through communities of practice, use of experts and shared social activities). Several studies support the idea of considering the consumers collaboration in the innovation process, arguing that a company should interact with customers because it is a basis for successful innovation (McKenna, 1995; Wind and Mahajan, 1997).

From the Service Dominant Logic (SDL) perspective, the capacity to collaborate with customers during the development of a service, transforms customer into an operant resource, through which the company can encourage innovation and competitiveness (Vargo and Lusch, 2004; Ordanini and Parasuraman, 2011). According to Cheng et al. (2012), customers are considered as important resources for the development of new products and they can serve as a key source of competitive advantage. Also the customer

participation in the initial phase of new products has been recognized as a key factor for manufacturers in the launch of successful new products (Dow et al., 1999).

Customer collaboration in the innovation process has been studied from several perspectives throughout the academic literature according to Alam (2006): from the market orientation perspective (Hurley and Hult, 1998; Jaworski and Kohli, 1993; Slater and Narver, 1994); from the perspective of relationship between companies (Bendapudi and Leona, 2002; Bolton et al., 2003), as a network perspective (Achrol, 1997; Biemans, 1991; Comer and Zirger, 1997) and from competition and market knowledge perspective (Griffin and Hauser, 1993; Li and Calontone, 1998; Moorman, 1995).

This research will adopt the concept of customer collaboration in the innovation process from the perspective of the SDL according to the definition presented by Vargo and Lush (2008), which considers collaboration as a process in which the company interacts and negotiates with customers to develop a value proposition, where collaboration becomes a part of the co-creation of value in which the company can participate and where the customer has an active role as a co-creator. The SDL approach has proved successful in approaching in the conceptualization of relevant topics in marketing (Vargo and Lusch, 2004; Michel et al., 2008; Ordanini and Parasuraman, 2011).

2.3 Innovation capacity

Innovation capacity is a key competitive tool for business long-term success and for survival, being this a widely recognized idea (Deshpandé et al., 1993). It is considered a mechanism through which organizations adapt to the dynamic environment through continuous innovation, providing a response to changes in the environment.

According to different authors the research focused on innovation processes distinguishes two stages (initiation and implementation) (Zaltman et al., 1973; Rogers, 1983; Van de Ven, 1986; Hurley and Hunt, 1998), allowing to identify the terms innovation orientation and innovation capacity. Innovation orientation refers to an aspect of the corporate culture that seeking openness to innovation among its members actively encouraging them to create, contribute and experiment new ideas at work (Hurley and Hunt, 1998). So it is in the implementation stage where the variable innovation capacity appears, where all events and actions occur (related to changes in an organizational

innovation, initial use and continued of it and the time when it becomes a routine feature of the organization) (Damanpour, 1991).

As a result, this study adopts the definition by Hurley and Hunt (1998), who define innovation capacity as the ability of the organization to adopt and implement new ideas, processes or products successfully. This variable reflects whether the organization supports the development and/or adoption of innovations or, by contrast, resists this process.

2.4 Marketing results

It is in the 90's when the revolution of performance measurement begins to occur, appearing a large number of people interested in marketing results (Neely, 1999). A wider conceptualization of business performance would emphasize operational performance indicators (i.e. non-financial) as well as financial performance indicators, so that it would be logical to use measures such as market share, the introduction of a new product, product quality, marketing effectiveness, value added, and other measures of technological efficiency (Venkatraman and Ramanujam, 1986).

This approach follows the more general rational theory of the company that says the purpose of an organization is to achieve a set of objectives (Cyert and March, 1963). Besides, marketing managers feel more and more pressure to measure the impact and value of marketing in their companies (Clark, 1999; Kokkinaki and Ambler, 1999; Marketing Week, 2001) due to high competition, among other factors. This competition forces companies to be increasingly market-oriented and to use marketing metrics - internal and external measures related to marketing and market position that are believed to be linked to the financial performance in the short and long term-, (Ambler et al. 2003; Barwise and Farley, 2004).

2.5 Hypotheses and Theoretical Model

Fang et al. (2008) propose that customer participation in the development process of a new product increases the level of information shared during the process. According to Lush et al. (2007), the SDL recognizes the competence of collaboration as a key for any business aiming a competitive advantage because it helps in the development of two additional meta-competencies -absorption and adaptation-, created from knowledge management, that the authors argue that are critical in the complex, dynamic and

turbulent environment. Lush et al. (2007) state in their proposal 2, that collaborative competence is a primary determinant of knowledge acquisition in the company to obtain the competitive advantage, we can infer that collaboration is a key to acquire knowledge within the firm. In addition, customers provide a broad base of skills that often represent an untapped source of knowledge. Companies that are based on knowledge on a customer base can capitalize them during the course of their innovation activities (Blazevic and Lievens, 2008). This knowledge is not created by an individual mind but rather through activities and interactions between companies and customers - co-produced knowledge- (Blazevic and Lievens, 2008). So that we can say that collaborations with customers generate knowledge creation or, more specifically, the co-production of this knowledge, which is one of the activities of knowledge management process and contributes to such management.

As a result of this discussion, we can infer that customer collaboration in the innovation process improves knowledge about the customer (the level, intensity, frequency and amplitude) and consequently in its knowledge management generation. This allows us propose the following hypothesis:

***H1:** Customer collaboration in the innovation process is directly and positively related to customer knowledge management.*

Knowledge management is an important tool to manage innovation activities and represents a routine element of the innovation process. These knowledge management activities make the innovation process seem less uncertain and more specific (Cantner et al., 2009).

According to the study of Tarí and García-Fernández (2011), innovations come from the creation of knowledge, such as incubator projects, the application of this knowledge through teamwork, empowerment and engagement with knowledge. And that knowledge creation has positive effects on innovation performance (Kessler et al., 2000).

Implicit knowledge resources and knowledge capabilities positively influence in company innovation capacity (Subramaniam and Youndt, 2005; Urgal et al., 2011). Systems of knowledge and learning contribute positively to innovation process (Wheelwright and Clark, 1992), to improve the performance of innovation activities and innovation results (Sánchez and Mahoney, 1996; Helfat and Raubitschek, 2000).

Also, several authors have analyzed the influence of knowledge and their characteristics in the innovative capacity of the company, concluding that knowledge

positively influences the probability of business innovation (Duguet, 2000; Gopalakrishnan and Bierly, 2001; Rao and Drazin, 2002). Knowledge management has a positive effect on innovation (Forcadell and Guadañillas, 2002; Andreou et al., 2007) given that the capture, store, share and distribute knowledge allow innovation (Baptista et al., 2006). In addition, this knowledge management facilitates the creation of new products or new methods of production, because it develops scenarios for the introduction and improvement process design.

Focusing on knowledge management dimensions, the adoption of knowledge management practices is positively correlated with innovative performance according the study of Alegre and Lapiedra (2005) who understand this performance as the union of the effectiveness of innovation (including measures of innovation capacity) and efficiency, and Alegre et al. (2011) authors show that both knowledge management practices and dynamic capabilities are valuable to the company because it contribute to innovation performance.

As a result of all this, we propose customer knowledge management as an antecedent to innovation capacity and we pose our following hypothesis:

H2: *Customer knowledge management affects directly and positively the innovation capacity of the company.*

Knowledge management and innovation produce a significant impact on performance given that these are deliberately aligned with the strategic objectives and this strategic orientation allows the organization to anticipate and respond to changing market conditions (Ferraresi et al, 2013).

According to Tarí and García-Fernández (2011), there are theoretical studies that confirm how knowledge management practices have a positive influence on the operating results of the companies (Davenport and Prusack, 1998; Massey et al., 2002) considering marketing results as part of them. This influence has also been empirically validated in other studies (Schulz and Jobe, 2001; Choi and Lee, 2003; Darroch and McNaughton, 2003; Tanriverdi, 2005; Lloch et al., 2007; Zack et al., 2009). Particularly, a positive influence of knowledge management on marketing results -such as sales and market share- has been approached (Darroch and McNaughton, 2003; Chadam and Pastuzak, 2005; Tanriverdi, 2005; Huang and Shih, 2009). This allows us to propose the following hypothesis:

***H3:** Customer knowledge management is directly and positively related to marketing results.*

Several studies (Matthing et al., 2004; Alam, 2006; Carbonell et al., 2009) conclude that company-consumer interactions are positive for the following reasons: it provides a more complete idea on consumer needs, it reduces the development time of a new service and it generates an improvement in the economic and financial performance of the new service. In addition, when the customer collaboration in the innovation process is being carried out, the co-creation of the product/service and this is what will cause a positive impact on business results (Vargo and Lusch, 2004; Ballantyne et al., 2008).

García et al. (2011) contrast empirically that customer participation impacts favourably on customer results -such as loyalty, customer satisfaction and value added or marketing results.

Other studies show empirically that the customers' involvement in service innovation improves sales performance. In this way, Martin and Horne (1993) show the positive link between customer participation in the development process in a service and the success in its commercialization process. Gales and Mansour-Cole (1995) demonstrate how customer participation is positively related to the success in the sale of the new technology. Therefore:

***H4:** Customer collaboration in the innovation process is directly and positively related to marketing results.*

Through the use of customer participation techniques -focus groups, surveys, interviews and others-, companies can achieve a better understanding of customer needs and innovation opportunities that the market offers (Hennestad, 1999). This interaction with the customer is very useful in the initial and final stages in the innovation process (Gruner and Homburg, 2000; Alam, 2002; Alam, 2006) because these require more amounts of information (Zahay, et al., 2004).

Furthermore, this customer collaboration in new product development activities can provide the innovation capacity to develop more differentiated products and services for certain target markets (Lagrosen, 2005); having a positive effect on the innovation capacity and more specifically in products innovation (Lin et al., 2010), in process innovation (Slater y Narver, 1995), in services innovation (Lin et al., 2010) and in marketing innovation (Dean and Evan, 1994; Lin et al., 2010). Therefore, we propose our last hypothesis:

H5: Customer collaboration in the innovation process is directly and positively related to company innovation capacity.

In Figure 1 we can see the theoretical model proposed in this research.

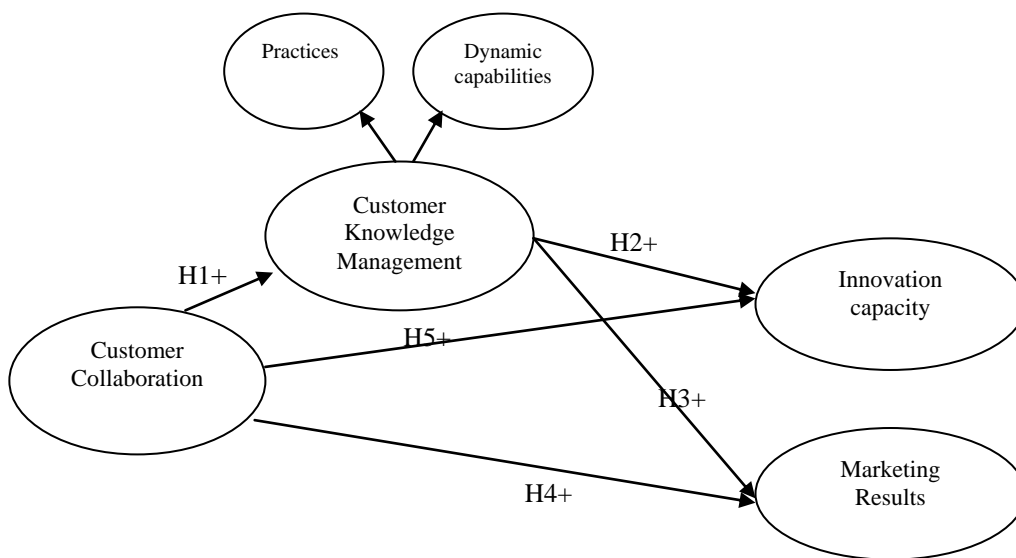


Figure 1. Proposed Model

3 Methodology

In order to better understand Valencian Companies Innovation processes, the city of Valencia local government innovation area (Inndea) financed this research. It would constitute the first step to better design policies directed to innovation improvement.

Firstly, a qualitative study was conducted through a focus group with eight representatives of major business associations in Valencia and its metropolitan Area in order to have a better approach to the innovation concept and improve the quality of the questionnaire.

Then, obtaining data was conducted using a personal structured questionnaire directed to directors/managers of the companies.

Valencia and its metropolitan area constitute the third largest city in Spain, after Madrid and Barcelona. The city hosts 47.222 companies, basically SMEs and in the area of services. This study was conducted with a random sample of 210 companies of

Valencia and its metropolitan area, which were chosen according to a random stratified probability sampling with proportional allocation to the economic sectors (agriculture, industry, construction and services).

Most of companies included in the sample have less than 20 employees (96%), the 60% are companies with antique of more than 6 years and whose managers/entrepreneurs are more than 35 years old (81.5 %), with a training level between basic and intermediate (69.5%). This profile represents the Valencian business framework, constituted by family owned small companies. We worked with a confidence level of 95.45% and an error estimate of +/- 7%. Fieldwork was conducted during the month of July 2013.

The instruments used for the measurement of the variables were adapted from the literature employing 5-point Likert scales. CKM was measured adapting the scale of Alegre et al. (2011), considering it as a second-order construct with two dimensions: knowledge management practices on customers (knowledge storage and dissemination of knowledge) and dynamic capabilities of knowledge management (composed of the internal and external learning competences). Customer collaboration in the innovation process was measured using the 4-item scale by Ordanini and Parasuraman (2011). Innovation capacity was adapted from Santos et al. (2013) 4-item scale. Lastly, marketing results was measured using the scale 4-item scale by Vorhies and Morgan (2005) (Table 2) which was measuring marketing results in relation to their competitors.

4 Results

Data was analyzed in two stages, first we validate the measuring instrument and secondly we proceed with the estimation of the structural model (Barclay et al., 1995). For this analysis, the partial least squares regression (PLS) technique data analysis was used (Smart PLS software, 2.0). This technique was used as recommended by the work of Barroso et al. (2005), for predictive purposes These authors confirm in their study that the PLS technique is mainly oriented to the causal predictive analysis in situations of high complexity (i.e. models with large number of variables, indicators and relationships) but with a theoretical knowledge little developed (Wold, 1979; Barclay et al., 1995).

4.1 The measuring instrument validation

The evaluation of the measurement model implies the individual item reliability analysis, internal consistency or reliability of a scale, convergent validity and discriminant

validity (Barclay et al. 1995; Cepeda and Roldán, 2005). Regarding the item individual reliability, it can be affirmed that loads of all items have a value higher than 0.7 for the corresponding factors.

The reliability of the constructs was analyzed based on the criteria of α Cronbach and composite reliability index (CRI) giving values above 0.7 in all cases, which is the recommended value (Churchill, 1979). AVE values were higher than 0.6 in all cases. This shows that over 60% of the variance of each construct is due to their indicators (Cepeda and Roldán, 2004). The results of these tests can be seen in Table 2.

Table 2. Reliability and Convergent Validity

Factor	Ítem	Load	Cronbach's α	CR	AVE	
F1.Customer collaboration (CC)	CC1	Interact with customers to obtain useful information for the process	0,918*	0,966	0,975	0,908
	CC2	The intensity with which we interact with customers is high	0,967*			
	CC3	The frequency of meetings with customers is high	0,959*			
	CC4	The number of customers with whom we interact is high	0,966*			
F2.Dynamic capabilities of customer knowledge management (DCCKM)	DCCKM 1	(I'm better than my competitors) on my ability to obtain information about customers and their needs (in fairs, events, industry news, expert reviews, newsletters ...).	0,850*	0,842	0,893	0,679
	DCCKM 2	(...) in my effective and updated collection of customer information	0,761*			
	DCCKM 6	(...) in my ability to put myself in front line of innovation (such as ability to generate new processes, new products, new markets, etc.)	0,895*			
	DCCKM 7	(...) in my ability to manage the effort we make in innovation (such as information search effort, monetary resources, training, etc.)	0,781*			
F3. Customer knowledge management practices (CKMP)	CKMP1	We use coding systems of knowledge/information that have about our customers (in databases, software, etc.)	0,794*	0,915	0,933	0,667
	CKMP2	We use internal mechanisms to promote exchange of information on customers	0,782*			
	CKMP3	We use participatory techniques among our employees and customers (such as client meetings, client interviews for improvements, etc.)	0,732*			
	CKMP4	We use tools to customer information reaches everyone in the company	0,754*			
	CKMP5	We have information processing systems about customers	0,881*			
	CKMP6	We use control systems and review of existing information on the company on customers	0,871*			
	CKMP7	We use systems that allow the customer information that was used in previous innovation tasks to be used in innovative new tasks	0,885*			
F4. Innovation Capacity (IC)	IC1	The company has introduced innovative products and/or services in the last 3 years	0,788*	0,854	0,899	0,690

	IC2	The company has innovated in production processes (adoption of new technologies, improved processes) in the last 3 years	0,832*			
	IC3	The company has innovated in management processes (administrative area, human resources, new departments, project management) in the last 3 years	0,829*			
	IC4	The company has innovated in marketing aspects (commercialization, penetrate in new markets and/or segments, new distribution channels, new forms of communication with customers and/or suppliers, new methods or pricing strategies) in last 3 years	0,870*			
F5. Marketing results (MR)	MR1	The growth of our market share is higher than our main competitor	0,881*	0,919	0,943	0,805
	MR 2	The growth of our sales revenue is higher than our main competitor	0,912*			
	MR 3	The acquisition of new customers is higher than our main competitor	0,894*			
	MR 4	Increased sales to existing customers is superior to our main competitor	0,900*			

*All loads are significant $p < 0,001$

Discriminant validity was evaluated by comparing the square root of the average variance extracted (AVE) with the correlations between the factors. It can be confirmed that the correlations were lower than all square roots of AVE and therefore, discriminant validity is achieved.

4.2 Structural model estimation

Once the psychometric properties of the instruments have been evaluated, we proceed to analyze the structural model using PLS. To assess the predictive capacity of the structural model, we begin by evaluating the R^2 . According to Falk and Miller (1992), these values must exceed the value of 0.1: lower values, even being significant, would not be acceptable. Table 4 shows that R^2 of all dependent factors is higher than 0.1 (the critical level mentioned).

We continue then to evaluate the predictability of the model by applying the Stone-Geisser test (Q^2) for each dependent construct through the blindfolding procedure. It was tested that Q^2 revealed an acceptable model predictive capacity, due that all values exceeded 0 (Table 3).

Table 3. Hypotheses testing

Causal relationship	Hypotheses	β	Value T
		standardized	bootstrap
H1: Customer collaboration \rightarrow CKM	Accepted	0,362*	7,234
H2: CKM \rightarrow Innovation capacity	Accepted	0,316*	7,756
H3: CKM \rightarrow Marketing results	Accepted	0,384*	7,289

H4: Customer collaboration → Marketing results	Accepted	0,113**	2,282
H5: Customer collaboration → Innovation capacity	Accepted	0,230*	4,882
*p< 0,001; **p< 0,05			
R ² (CK)= 0,130 ; R ² (marketing results)= 0,191; R ² (innovation capacity)= 0,205			
Q ² (CKM)= 0,0833 ; Q ² (marketing results)= 0,0279; Q ² (innovation capacity)= 0,0646			

The results presented at Table 3 allow confirm the five hypotheses proposed, which means that CKM affects directly, positively and significantly to innovation capacity and marketing results, being promoted directly by customer collaboration in the innovation process. Likewise this study demonstrates how the customer collaboration has a direct and positive impact on marketing results and innovation capacity.

5 Conclusions

This study proposes a promising approach by connecting three key theories accepted in the literature: the resource-based theory, SDL and organizational learning) to better understand the variable CKM and its behavior in the area of innovation.

The results show how customer knowledge is a key strategic resource for companies as it positively contributes in improving organizations' innovation capacity (innovation in products/services, in production processes, in management and in marketing) and marketing results, increasing market share, sales revenue or the acquisition of new customers.

We also provide evidence on the importance of customer collaboration in the innovation process and its influence on CKM, confirming that customer collaboration is an antecedent of CKM. Also, the direct influence of this collaboration in innovation capacity and marketing results is proved.

Furthermore these empirical results show that CKM and customer collaboration in the innovation process allow the company improve results in relation to its immediate competitors (sales, market share, new customers acquisition) in a sustainable way, which can be interpreted as the achievement of competitive advantage.

The results involve a number of implications for business management and policy makers. First, this study helps managers to realize the importance of CKM given its positive influence on organizations innovation capacity and marketing results. Firms managing CKM are more likely to detect emerging market opportunities before their competitors and also to more rapidly create economic value for the corporation, its

shareholders, and its customers. Second, results obtained show the relevance of collaborating with customers in the innovation process as a key input given its effects both on innovation capacity and marketing results. In conclusion, this paper provides better bases for managers to encourage innovation in their companies and how to improve marketing performance.

In consequence, companies should implement CKM practices, such as the use of mechanisms for sharing information -databases, computer programs- and techniques for employees-customers participation.

In the area of public management, findings suggest that governments should better help companies develop CKM activities by creating programs that would enable companies develop an organizational culture more customer-oriented.

Limitations in this research pose areas for further research. First, note that it has been used the same source of information (the director / manager) to measure all model variables (antecedent and consequences) and collect information on the same moment of time, which could generate common variance bias. Although this is a common practice, it would be appropriate to conduct the survey at different key informants of the company and in different times. Another aspect to consider is that this study was conducted in one city and its metropolitan area. It would be interesting to evaluate the model in other geographical areas and/or other countries. Finally, it would be of interest to introduce other variables in the model that can act as consequences of CKM, such as financial performance (profitability, ROI) or customer outcomes (customer satisfaction, customer loyalty). Likewise, other antecedent variables of CKM as innovation culture (Davenport et al., 1998; Lloria, 2004), or customer orientation (Narver and Slater, 1990; Cantner et al., 2009) could be approached.

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Emergent Knowledge Management in SMEs: a case study

Ettore Bolisani*

DTG - Department of Management and Engineering
University of Padua
Stradella San Nicola, 3 – 36100 Vicenza (Italy)

Luca Giuman

Infonet Solutions
Via Einaudi, 23 – Pieve di Curtarolo, Padova (Italy)

Enrico Scarso

DTG - Department of Management and Engineering
University of Padua
Stradella San Nicola, 3 – 36100 Vicenza (Italy)

** Corresponding author*

Structured Abstract

Purpose – The body of research about knowledge management in SMEs is rather scarce. Nevertheless, scholars that have investigated the peculiarities of KM processes in SMEs have found that SMEs do not manage knowledge the same way as large firms. Particularly, even though SMEs seem to be aware of the value of their knowledge assets, they generally have an unplanned and unsystematic approach to KM. In light of this, the paper intends to deepen our understanding about the way SMEs plan, implement and use KM. Specifically, it aims at identifying the nature (deliberate or emergent) of this process, the involved actors, and the relevant influencing factors.

Design/methodology/approach – The paper examines the KM experience of Infonet Solutions, a small Italian ICT services company. It adopts the case study approach, given the descriptive and exploratory nature of the research. The unit of analysis is represented by the KM system implemented by the company in the last decade. The background conditions, the history of the system, its features and drawbacks are deeply analysed. The company was selected for two main reasons. First, it is a typical Knowledge-Intensive Business Service company, where knowledge is the key competitive resource. The second is a question of opportunity: it was possible to have direct access to relevant information thanks to the participation of a company executive to the research.

Originality/value – The paper contributes to improve understanding of KM approaches by SMEs. Given that this is a single case-study, the idea is not to draw conclusions of

general validity, but rather to derive some implications concerning the implementation of KM practices and tools by SMEs, possible warnings for both researchers and executives, and suggestions for the formulation of new hypotheses on KM abilities of SMEs, to test by means of other research methods.

Practical implications – The outcomes are significant for both research and practice. As regards research, it is argued that the adoption of KM practices in small businesses can be seen as an “emergent strategy”, in other words it is strongly affected by the specific situation in which the individual firm operates. This leads to conclude that a single “best-way” KM approach, based on a rational planning method, is almost impossible to define in SMEs. As concerns the practice, the study reveals the key adoption patterns of KM by SMEs, and provides suggestions on how to manage the factors that influence these patterns in a context that will be called “emergent KM”.

Keywords – Knowledge Management, Emergent KM, SMEs, KIBS, Case-study

Paper type – Academic Research Paper

1 Introduction

It is widely acknowledged that the body of research about knowledge management (KM) in SMEs is rather scarce (Durst and Edvardsson, 2012; Dwivedi et al. 2011), especially when compared with the large number of studies concerning big companies. The relatively few existing contributions, however, seem to agree on the fact that SMEs do not manage knowledge the same way as large firms (Chan and Chao, 2008; Wee and Chua, 2013). Consequently, their KM initiatives cannot simply be seen as a scaled-down reproduction of large company practices (Desouza and Awazu, 2006). In fact, SMEs, even when they are aware of the importance of their knowledge, usually follow an unplanned, unsystematic and informal approach to KM (Edvardsson, 2006, 2009; Hutchinson and Quintas, 2008). In light of this, the paper aims to deepen our understanding about the way SMEs plan, implement and use KM practices and systems. Specifically, it aims at identifying the nature (deliberate or emergent) of the implementation process, the main involved actors, and the relevant influencing factors.

The paper illustrates and discusses the KM experience of Infonet Solution, a small Italian ICT services company. The unit of analysis is represented by the set of KM systems and practices that the company has implemented in the last decade.

The study covers two research areas regarding KM in SME that, according to Durst and Edvardsson (2013), need more attention and development, i.e., longitudinal studies (namely, studies that analyse the dynamics of a phenomenon over long periods of time)

and realistic lens (namely, studies that explicitly focus on the peculiar characteristics of SMEs). As regards the first point, the case study covers a time span of about a decade, during which the KM approach of the company has changed and intensified, since it has modified its business, has faced new challenges, and new tools for managing knowledge became available. Concerning the second point, the analysis has adopted a realistic view of the company under investigation by taking into account the limited resources it has and the specific business environment where it competes.

Since this is a single case study, the idea is not to draw conclusions of general validity, but rather to derive some implications concerning the implementation of KM systems by SMEs, possible suggestions for both researchers and executives, and ideas for new hypotheses about the peculiarities of KM in SMEs to be tested in future research.

The paper articulates as follows. The next section proposes a brief review of the literature on KM in SMEs, and clarifies the conceptual framework of the study. The third section illustrates the research methodology adopted. Section four describes the case of the company and its path towards KM. The fifth section discusses what emerged from the study, while the last makes some conclusive comments, illustrates the limitations of the study, and suggests some possible research directions.

2 KM in SMEs

As well documented by recent reviews (Durst and Edvardsson, 2012; Dwivedi et al., 2011; Ribière and Christian, 2013), the literature that examines KM in the context of SMEs is still scarce. Nevertheless, there are some interesting contributions that deserve to be mentioned here in order to frame and describe the rationale of this study.

It is first necessary to step back and discuss the meaning of the term KM and its nature, in order to avoid confusion and to clarify its possible use in the case of SMEs. Although there is no commonly shared definition on what KM is or should be, several authors focus on its deliberate and planned nature. Otherwise, there is the risk that any activity of an enterprise that deals with knowledge directly or indirectly can be called “a KM practice”: in other words, everything. Therefore, these scholars assume that only systematic practices directly and evidently targeted to managing knowledge (in one of its manifestations) should be intended as KM.

For instance, Wong and Aspinwall (2004) define KM as the systematic management of knowledge-related activities and processes (i.e., creating, organizing, sharing and using knowledge) in order to create value for an organisation. Daft (2007) refers to the efforts to systematically find, organise and make a company's intellectual capital available, and to foster a culture of knowledge sharing so that the organizational activities built on what is already known. Under this perspective, it is possible to speak about KM initiatives when they refer to a deliberate action intended to enhance the distinctive capability of the organisation through a systematic approach to generating, capturing, disseminating and exploiting knowledge (Chua and Goh, 2008). Such actions can involve managerial practices, organisational solutions, human resources, technological tools and so on.

The above definitions emphasises the purposive nature of KM, and consequently they fit the context of large organizations and multinationals, characterised by a formal and systematic planning of all the activities including KM. Therefore, this way of conceiving KM may tend to deny, for small businesses, the possibility or even the capability to implement KM.

However, it is clear that KM practices are not limited to large companies (Wei et al., 2011), but they are adopted by SMEs as well. In particular, KM can give to SMEs the same benefits as large organizations, such as better communication, improved customer knowledge, faster response times, greater efficiency in processes and procedures, and reduced risks from the loss of critical knowledge. According to Dotsika and Patrick (2013) implementing KM initiatives in SMEs may be even more crucial, as knowledge can be their single key resource. The problem is that KM is not so popular in SMEs, due to some factors such as inadequate awareness of managers, high costs and budget issues, as well as poor resources and insufficient technical expertise.

The empirical research about KM in SMEs provides fragmented insights (Edvardsson and Durst, 2012). Nevertheless, all the authors seem to agree on a point, and specifically on the fact that it would be wrong to assume that SMEs can practice KM in similar ways as large organisations (Desouza and Awazu, 2006): KM in small businesses can't simply be reduced to scale-down versions of the large companies' experience (Wong and Aspinwall, 2004). Hence a key question is: to analyse KM practices in small businesses, do we need a new concept of KM and new interpretive frameworks that are different from those normally used to analyse the case of large firms?

A possible answer to this question can be found in the recent literature. In this regard Hutchinson and Quintas (2008) affirm that, to understand the management of knowledge in SMEs, it is necessary to look beyond the introduction and practice of formal or nominal KM initiatives. SMEs, in fact, without “being fluent” in the language of KM, or even recognizing their behaviours as KM, are often proactively engaged in what are called “informal KM practices”. In a previous paper, Edvardsson (2006) had already noted that explicit KM policies in SMEs are lacking, but many small companies treat KM on an operational level, i.e. at the level of systems and tools.

According to Edvardsson and Durst (2013), compared to larger firms, SMEs tend to be more oriented towards the management of tacit knowledge, and their communication flows often involve other companies. They are also less successful in sharing knowledge by means of formal systematic approaches than large companies. In short, small businesses manifest an “informal short-term approach” towards organizational learning and KM. In SMEs, KM processes occur naturally regardless a formal charter has been set in place (Wee and Chua, 2013): in these organizations, KM is often practised but may be not recognized as such.

This unstructured and not-formalised approach to KM by SMEs poses significant challenges to both scholars and practitioners, and hence it deserves to be analysed more carefully. So far, the literature has especially investigated the peculiarities of KM processes in SMEs, and the relevant enablers and barriers (Desouza and Awazu, 2006; Nunes et al., 2006; Wee and Chua, 2013; Wong and Aspinwall, 2005). Less attention, instead, has been deserved to the pathways that small companies follow when they implement KM. In particular, little is known about the real nature (deliberate or emergent) of KM processes, and the relevant managerial implications. In order to help fill this gap, present study aims to investigate the ways with which KM initiatives emerge and are implemented by SMEs and the involved actors, and to identify opportunities and risks, as well as enablers, and constraints.

Some clarifications are needed about the terms that appear in the rest of the paper. The term “deliberate” will be used to indicate a planned process, i.e. a process that is precise and articulated, and directs the organisation towards goals that have been established in advance. Conversely, the term “emergent” will indicate an unplanned process, whose goals (and how to achieve them) constantly change, depending on the evolution of the circumstances. The previous words were preferred to the use of “formal” and “informal”:

particularly, the adjective “informal” does not clarify the evolutionary nature of an emergent KM. Instead, the term “formal” is reserved to practices that are applied with the idea of implementing KM, while “informal” to practices that are concerned with knowledge processes, but are not labelled or constituted as KM. Finally, we won’t equate deliberate (formal) KM with the management of codified knowledge, or emergent (informal) KM with the management of tacit knowledge. For instance, the unplanned adoption of a CRM system to manage relationships with customers is exactly the case of emergent introduction of a KM system that deals with explicit knowledge.

3 Research method and research questions

This paper draws its insights from the experience of Infonet Solutions. We used the case study approach given the descriptive and exploratory nature of the research, and the complexity of the investigated issue (Leedy and Omrod, 2005). In particular it can be seen as a revelatory case in Yin’s terminology (Yin, 2003) since it offers the opportunity for an in-depth analysis of internal features that are generally less accessible to outside researchers. The purpose of the case study is a combination of a “how” and a “why” questions concerning the management of cognitive assets by small companies. The case has been elaborated by using information provided by various people in the company, and from documental sources that have been collected over several years. As regards the generalization of the findings, the idea is not to draw conclusions of general validity, but rather to derive some implications concerning the approach followed by SMEs in the adoption of knowledge management practices and systems, as well as to provide suggestions for further analysis or for implementation in similar situations.

The unit of analysis is represented by the practices and projects to introduce and use KM that the company has carried out in the last decade to support its business activities. The company was selected for two main reasons. First, it is a typical Knowledge-Intensive Business Service company, where knowledge is the key competitive resource and, as such, it requires to be carefully managed. The second important reason is a question of opportunity: it was possible to have direct access to relevant information especially thanks to the participation of a company executive to the study. The direct contact with people involved in the project allowed to reveal aspects that are often difficult to discover by an external observer. The potential bias in the analysis (due to the

fact that one of the authors is a company's employee) was mitigated by separating the "collection" phase from the "analysis" (which was mainly conducted by the other two authors).

Research questions are as follows:

- Does this small business follow a deliberate or an emergent approach to KM?
- If an emergent approach (as suggested by the literature) is followed, which are the relevant opportunities and risks? Which are the main enablers and obstacles?

The assumption here is that even an emergent approach has to (and can) be adequately managed, which means creating the conditions for the organization for adopting KM practices and systems that make its business processes more efficient and effective.

4 The case study

4.1 The company

Infonet Solutions is a small ICT company located in the North East of Italy with 30 employees and 5 external collaborators; the annual turnover is about 5 billion Euros. Infonet provides high-level custom-made solutions to optimize the IT platforms of the clients, which are mostly medium-sized organizations belonging to different sectors, from manufacturing and service industries to healthcare centres, public agencies and no-profit organizations. Customers are all located in Northern Italy, especially in the eastern part. The main services include: cloud computing, data centres, virtualization, and business continuity. The company, founded as a reseller of telecommunications components, was taken over about 20 years ago by three young computer technicians who have progressively turned it into what it is today. Currently, it is organized into five main Departments: Management, Accounting, Sales/Marketing, Support and Delivery. The last two are the technical heart of the company: the first one deals with the design, development and implementation of new brand solutions, while the second manages the technical assistance and maintenance of the installed systems. Being an ICT company, Infonet Solutions can be deemed to have the peculiar features of a knowledge-intensive business service company as described by Muller and Doloreux (2009), i.e. a firm where knowledge is the main competitive asset that must be strategically managed. This makes the company under examination particularly interesting with regard to issues related to KM.

The story of Infonet is that of a dynamic company that has undergone a huge evolution in the last decade. Until 2003 it was a typical small private company run by the owners, who had no managerial competencies. It worked only on a job-order basis, and provided installation services of computer infrastructures. At that time, the company counted 12 people including the owners. These, being aware that the firm would not have been able to grow without taking on more managerial characteristics, decided to hire an outside manager and to entrust him the role of Chief Executive Officer. Since then, the company has begun to focus on support services that consist of managing systems installed at the customer site for the years of operation. At the same time, the company also started doing marketing, an activity hitherto neglected. Recently, Infonet opened a branch in Milan, with two new employees that have the mission to expand the market in North-western Italy.

4.2 Cognitive content of the service delivery process

To better understand the KM needs of Infonet it is useful to recall its nature of KIBS company. As well underlined by the literature, very often KIBS firms act as innovator brokers or “bridge for innovation” (Leiponen, 2006; Muller and Zenker, 2001) when they occupy an intermediate position between external sources of knowledge and local recipients (Figure 1). In cognitive terms, this means operating as interfaces and mediators between the more tacit and specific knowledge buried in the daily practice of client firms, and the more generic knowledge which is available in the economic environment as a whole (Bolisani and Scarso, 2009; Bolisani et al., 2011; Scarso and Bolisani, 2012). As brokers, KIBS companies are containers and dynamic sources of “quasi-generic knowledge” extracted from repeated interactions with customers and other actors, including the producers of new scientific knowledge. Hence, the management of external knowledge is a particularly crucial issue for a company of this kind especially that required to manage the business relationships with the customers.

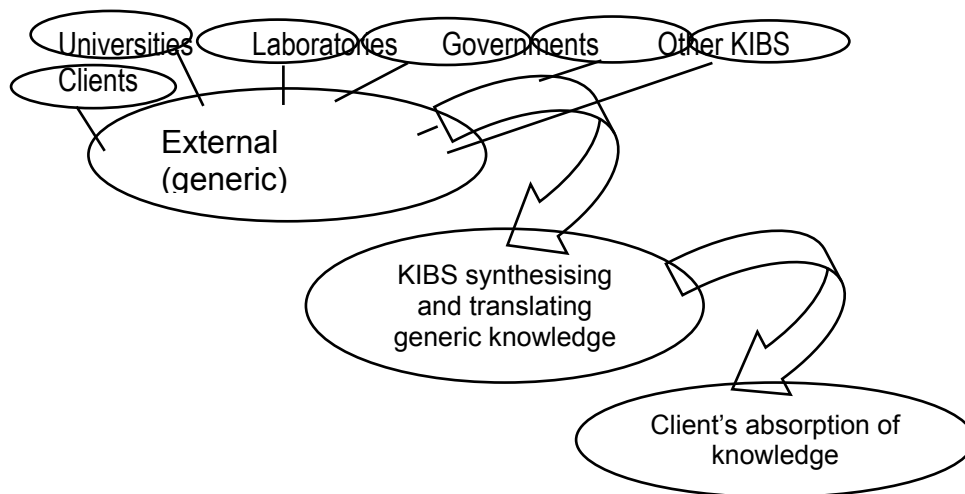


Figure 1: The intermediating role of KIBS

To better understand the knowledge flows that characterize the business of Infonet, the activities that denote the typical service delivery process of the company are now illustrated and discussed. As any firm that delivers project-based technical solutions, it usually resorts to a sequenced project activity that, in the case of a completely new client, involves the following steps:

- first contacts with the customer;
- preliminary analysis, requirement identification;
- feasibility study, formulation of an offer;
- negotiation, contract;
- technical development;
- release, test, and implementation;
- post-sale assistance.

Three issues should be underlined here. First, the whole process can last a long time. Commonly, in fact, the lifecycle of an ICT infrastructure is several years, and it ends with the development of a new project aimed at substituting or completely renovating the installed solution. During this period, the provider ensures the proper operation of the infrastructure. Second, as clearly illustrated in Figure 2, the different phases involve different people, with different capabilities and skills, and belonging to different departments. Third, the successful delivery of the service requires a deep involvement of the customer during the different phases. To sum up, the entire process calls for an

appropriate management of the knowledge exchanges both with the client, and inside the company.

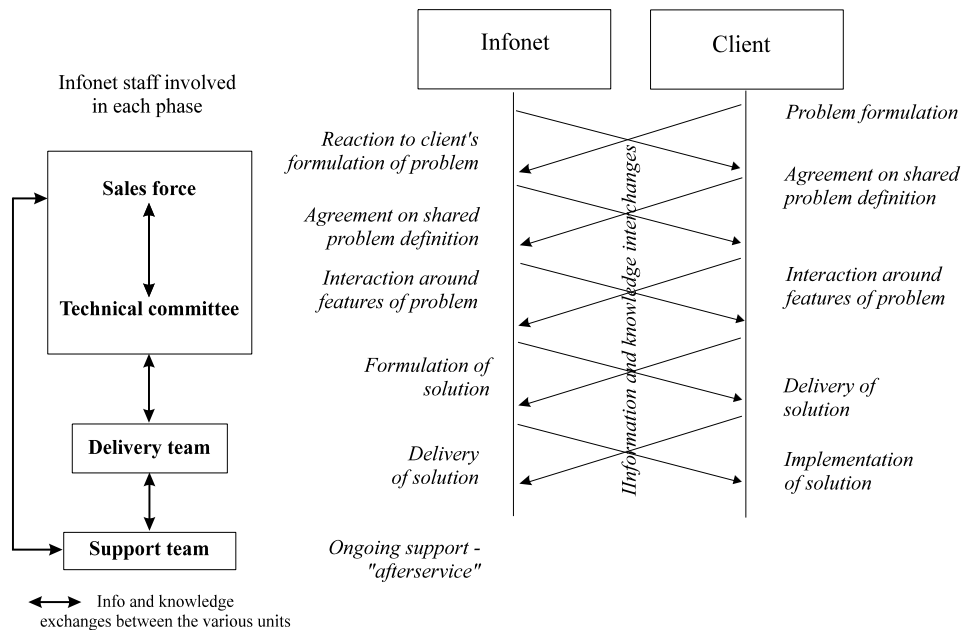


Figure 2: The different phases of service delivery and post-sale assistance at Infonet

In particular, a successful delivery and a post-sale assistance that can solve the clients' problems effectively, require that all the involved employees have a quick and good understanding of the system that is installed at the customer's site. This is not as simple as it may seem, given the long duration of the project and the variety of the involved players. For instance, an employee that is called to assist the customer (e.g., in case of system breakdown or other maintenance tasks) needs to handle both explicit components of knowledge (system configurations, network structures, functioning details) and tacit components (specific explanations of the reasons for some particular configuration). This situation is particularly interesting because the employee that carries on post-sale assistance is generally not the one that designed or installed the system. Therefore, there is a need to perform a complex and deferred transfer of knowledge between different employees. Similarly, the sales agents who want to offer a new solution to old or new clients may need to exploit the knowledge of previous projects and their characteristics. Such knowledge consists of explicit components (i.e., technical data) and tacit ones

(perceptions of user needs, possible market value of a particular system, etc.): also in this case it has to be transferred between different people in different times.

4.3 Infonet path towards KM

As said in the previous section, the knowledge required to effectively manage the business relationships with the customers is particular crucial at Infonet, and hence it deserves to be managed in the best way. The company is fully aware of this, as evidenced by the fact that the first efforts to manage it date back to more than ten years ago, when it introduced the “libretto di impianto” (see below). It should be noted that such knowledge is a mix of technical knowledge (concerning various technical aspects of the installed solutions) and commercial knowledge (concerning the business requirements and other features of the individual clients), which complicates its management.

In the following pages, two paths towards the adoption of KM practices and systems by Infonet will be illustrated. The first path led to the successful introduction and use of a wiki system, and the second path to a delayed and marginal adoption of a CRM application.

4.3.1 The wiki project

In the first years of its business activity, Infonet mainly sold TLC products. Since the clients generally didn't know how to install them, the company started to offer installation services. At that time, there was no need of documenting the work. The company had no necessity of keeping track of the work they were doing: the information coming from the products' catalogue was sufficient. This phase lasted about 5 - 6 years. Later, the company slowly began to move its business toward the design, delivery and maintenance of ICT solutions. It was a real leap, given that the business radically changed from spot commercial transactions to partnership relationships with customers. Such relations began with a consulting activity, continued with the delivery of the solutions, and then with customer support for helping the client use and develop the system. So, at Infonet, executives realized that it was important to start to store pieces of information and knowledge about the installed systems. Especially, this was important to help the effective exchange of knowledge between the delivery people (those that design the systems and install them at the customer site) and the support people (who perform the post sales activity). In particular, the company started to collect information about every

installation of a new system, and to compile a written report for each system. The resulting document (called “libretto di impianto” - book of the system) was intended to support that knowledge exchange between the different parts of the company. Originally, this problem of KM was not intended nor solved in a structured way, but by means of a simple and intuitive paper archive. This situation continued for some time.

The first important step towards a real KM system to improve the management of all the technical knowledge about delivered installations dates back to around 2003, when Infonet started to use Microsoft Exchange Server to share public folders and emails about new installations. This tool had some limits: especially, it was difficult to classify, locate and understand a specific piece of knowledge. Actually, the tool was very flexible, but this ended with increasing confusion among users. The problem is that when people make big efforts to store information and knowledge, but such efforts turn out to be useless because they can't easily retrieve the stored information, the risk is that the instrument is quickly abandoned. The public folders of Microsoft Exchange were a simple way to store emails in a shared ways, and some minimal ability to search by text, date, sender, subject, and the like were offered. But since everyone was free to write and manage his/her own e-mails as he/she preferred, it was practically impossible to locate the needed information. The company tried to give some rules concerning, e.g., the way of writing the object of an e-mail, or the kind of content to include in specific circumstances, but with no significant results. After the abandonment of Microsoft Exchange, public folders were not moved but kept in order to not miss past knowledge and possibly migrate it in a new storage. This never occurred since, in the end, Infonet realised that such migration was an even bigger problem, especially because there was little time to do that.

To overcome the limitations of Microsoft Exchange, the company adopted another software (Owl Intranet Engine), a very simple Content Management Systems with an internal database. This tool was chosen by considering that the actual owners of the useful knowledge were not the “internal” staff (i.e., people that work in the company offices) but the technicians who carried out the installations materially, at the client's site. In point of fact, most of the critical information is collected on the ground, by those who do the work. Owl was a web-based tool that allowed to get the information at any time, and in a shared way. However, given the huge amount of stored data, the tool soon began to cause problems. To simplify the use of Owl, initially a taxonomy to classify documents was created. There was a classification tree divided in two parts: one for “the products” (i.e.,

ICT components) and the other for “the customer installations”. The idea was that technicians could keep a record of the intervention they had made for a customer in a free format; later, the information had to be reworked and stored in the second area of the tree, in a more structured format. Hence, the company identified two stages in the process: a first phase of knowledge collection, where people wrote notes in the way they preferred, and a second of elaboration of the collected knowledge, in order to make it usable by others. This was however complicated by the way Owl indexed topics: searches, in fact, yielded “false positives” or unsatisfactory results. In addition, documents could be of different kinds: texts, files, configuration plans, datasheets, images, zip files, pdf files, links to web pages, and some more. This made it difficult to integrate all them in a common classification framework.

These first experiments showed that developing a KM system that focuses on a particular technology and then fitting it to the flows of knowledge in the organizational processes may result in ineffective use. In view of these unsatisfactory results, the company began to consider other approaches and tools. To facilitate the flexibility of KM, it was decided to focus on systems that allowed dynamic templates for uploading information contents, document revisions, process workflows, and so on. Firstly, a specialized software for KM, Knowledge Tree, was taken into account. This is a complete Enterprise Content Management system with a workflow engine, indexing, metadata management, logical access control system with high security, etc. However, after several reflections and some tests, the company eventually decided to adopt a wiki system, that has the same features of Knowledge Tree, but is a more free and user friendly platform. The decision was based also on the fact that wikis retain all the information that is uploaded, even in case it is unstructured, but they still preserve some logical order so that contents are retrievable and usable for the daily work. Furthermore, with a wiki, the logics of operation and content management can be decided in a shared manner, and is modifiable dynamically.

The present version of the wiki used at Infonet is based on MediaWiki, the free software open source wiki package which is also used by Wikipedia. It was introduced in the company in 2009, by the Support Department, and was implemented thanks to the collaborative efforts of two members of this Department: its head (who is also one of the founding shareholders of the company) and a young new employee. It was configured by reflecting on the knowledge contents that are “really” needed by the different people that

collaborate in a project with a client, and on its usability. The first version was totally devoted to technical people, and focused on technical contents. Later on, in 2013, it was extended to the commercial staff. At present, the introduction of the wiki is apparently a success, as confirmed by a recent survey among the employees of the company, who have indicated this instrument as the main source of knowledge they employ. By the way, the tool has raised the interest of administrative staff who recently asked to have a section dedicated to their activities. Since there is no space here to dwell on the technical characteristics of the system, nor this is the goal of the study, only a few lines will suffice to describe it.

Infonet's wiki portal is split into two different "sub-portals": one for the technical staff (delivery, technical committee, and support) and the other for the commercial staff (sales force). The "technical" part has, mainly, knowledge contents related to the existing applications by customers and past installations. The "commercial" part contains log-in data for accessing vendors' websites and for processing requests for offer. Both portals are, however, accessible by all company users. The wiki is flexible and allows to upload different kinds of content. This turns out to be crucial, because the users need to transfer and retrieve knowledge that can have different forms: technical data, but also pictures, explanations, codes, and so on. It is therefore difficult to use a pre-defined format for all the potential contents that must be uploaded. However, the company decided to pre-define some templates that people use to upload new contents. This allows some flexibility in the way people insert their contents, as well as a quicker retrieval. A pre-defined classification of the contents in different sections is also used. All this derives from the experience of the company, and is specific to that particular way of working. Another important feature of the wiki is that it allows to edit the contents inserted by others, and to track all the changes that have been made. Lastly, to simplify its use, some functionalities were added, such as word-like editor, and a printing feature that allows to create booklets and print them in a pre-defined format.

Having described, although in brief, the road that led to the current situation, now some remarks on its main actors, and on the factors that have shaped it, are needed. Concerning the actors, a key role was played by two members of the Support Department that were the actual promoters of the introduction of the various KM tools that have been adopted and tested. In this regard, it should be recalled that the need to collect and store the information about the client installations originated from this Department, because

they are its members that must resolve maintenance requests, and hence they need knowledge about the systems that other people have formerly installed. It certainly proved to be decisive the fact that one of the members of this Department was also one of the owners of the company: otherwise, probably, the development would have been much slower. Also, the propensity of the CEO towards experimentations – at least in a controlled way (i.e., with a certain degree of freedom but avoiding to make big mistakes) – has given a positive impulse to the process.

The two promoters of the KM systems were also those who have technically implemented and configured the various KM tools: they configured the software, provided the taxonomies, created the templates, added the needed functionalities, and so on. In doing this, they were helped by their competencies in Computer Science, but also by the fact that they are involved in the daily work of the company and, therefore, they have the sensibility to capture the essential requirements and problems of the KM processes. Despite their direct actions in KM, the two promoters continue to carry out their daily work. This means that there is no one who is formally in charge of the KM system: there is no knowledge manager, no chief knowledge officer, etc. There isn't even a "supervisors" that controls those that upload new contents: the control of the pieces of knowledge that are inserted in the wiki are left to the normal "communitarian control" as is usual of wiki systems. However, a person is responsible for a technical check of what technicians upload: this is important to give consistency and fairness to the content. The employee who performs this activity is, however, not an "expert": his task is just to read the documentation and assess if it is understandable from any other person.

Another important aspect, which is probably very important for a small company, is the availability of open source software like in the case of MediaWiki. Costs of implementation of a complex software would be probably detrimental to the development of the project. An additional factor that has undoubtedly affected the development, use and abandonment of the various systems was their respective usability and user-friendliness, and their full integration with daily activities. As we have seen, some KM systems proved to be user-friendly, others didn't. However, it was just the experimentation that made it possible, for the company, to finally select the appropriate solution.

In using the system, the technical people are advantaged, not only due to their familiarity with ICT applications, but especially because the use of the instruments did

not affect the way they worked and therefore didn't imply special changes in internal processes. Quite different is the situation in the case of the sales staff that was not accustomed to document their daily activities in a systematic way. This is the main reason why the commercial employees were involved in the KM project only four years later. It should be noted that to induce the commercial staff to use the wiki, the promoters had to introduce some initial contents that could be useful to them.

4.3.2 The CRM project

Completely different, in both the path followed and the final outcomes, was the introduction in the company of a CRM software: differently from the previous case, this was a planned activity that, however, didn't produce the expected results. After hiring a new employee to follow the marketing efforts of the company, it was felt that a new tool was necessary to help her in this job. It was then decided to implement a Customer Relationship Management (CRM) software. Accordingly, on initiative of the CEO, a preliminary study was made in collaboration with the local University, to understand what information flows of the Sales Department were significant, what relevant information it needs, and how a CRM software could meet these needs.

The company finally bought a CRM software (SugarCRM), that was the specular equivalent of the KM software "Knowledge Tree" but targeted to the commercial area: each customer, phone call, commercial visit (either they result in an order or not) had to be classified and stored in the CRM together with any relevant information that would have been retrievable and used in the future. However, the software was judged very cumbersome by those who had to use it. And this happened even though it had been previously examined and approved by the sales staff. In other words, despite the careful planning, once the system was put into operation, none of the commercial Department practically used it. An internal analysis was conducted to understand the reasons of this scarce use, but the answer given by the commercial people was always the same: "the system is a difficult tool to use", at least in comparison to the way the people were accustomed to work or the expectations they had about it. Almost certainly, the main reason of the failure of the instrument was that the sales staff had to bear the burden of introducing information without obtaining direct benefits.

But surprisingly, at the beginning of 2013, the same commercial staff that previously rejected the CRM system SugarCRM, later asked to use another system – Salesforce –

which has exactly the same logic of an “old” and traditional CRM. The reason was simple: Salesforce is a software that is currently used by the majority of the company suppliers (e.g. HP, Citrix), and hence it allows to share sales leads and other information with them. This software is unfortunately highly structured, so it would be very hard to integrate it with the Wiki system which is used by the technical staff. This means that the sales people have to use the two tools but can’t integrate the information from one to another; this can cause duplication of information, loss of efficiency, and risks of inconsistency.

To summarise, the factors that seem to have hindered the introduction of a CRM software at Infonet can be listed as follows:

- a “top down” approach to the adoption of the system. Actually, the idea of trying to use a CRM software came from the CEO and was probably inspired by the marketing director; while the potential users (i.e., the commercial staff) were involved only in a second time;
- a preference of key persons of the Company for the use non-procedural approaches to sales management;
- a poor alignment between the tool and the current sales processes. In particular, the use of the CRM required additional work in entering information and data that previously were not gathered;
- some technical deficiencies of the systems concerning its integration with the tools generally used by the sales people, in particular mobile phone and e-mail;
- the perception of the sales force that they wouldn’t gain direct advantages for their daily work.

5 Discussion

The history of the introduction of the KM systems at Infonet highlights some interesting points that deserve to be discussed. First of all, the pathways followed in the two cases are significantly different. In the case of the wiki, its adoption is not the consequence of a planned strategy but is a solution that has emerged along the way. Actually, over time the objectives and recipients of the project have gradually but significantly changed. From a system that was conceived to be used mainly by the technical area, the company passed to one targeted to the commercial staff too, and may

be extended to the administrative employees in the near future. As well underlined by one of the promoters of its introduction, the approach followed in the development of the system “*was contingent and closely tied to the tools available*”. On the contrary, the adoption of the CRM was the result of a deliberate strategy, and hence its introduction had been planned directly. For this reason, the CEO considered it appropriate to perform a preliminary study on the information needs of the Sales Department. Anyhow, in both cases there wasn’t a specific reference to the concepts and models of KM – for instance, an analysis of KM processes, of categories of knowledge, of learning processes, etc. Infonet executives had heard of KM, but they had never considered KM approaches explicitly. This confirms the findings of previous studies, namely that small businesses typically adopt and use practices and tools of KM without recognizing them as such.

The two systems also differ as regards the kind of knowledge which they deal with. In point of fact, the CRM system contains only explicit knowledge (i.e., data and information about the clients), while the wiki system stores both explicit and tacit knowledge: ideas, experience, opinions, and so on, expressed in various forms and formats. Moreover, the introduction of information in the CRM system occurs in a highly structured manner, while in the wiki the contributors are allowed greater freedom. In this regard, it is interesting to note that the examined company makes use of both tacit and explicit knowledge, and both are relevant for its business.

In both situations, the characteristics of the technology have played a decisive role. The availability of new tools has led the company to experiment their use. In this regard, one might say that, at Infonet, the management of knowledge has been strongly mediated by the availability of appropriate instruments. In doing this, the company has benefited from the fact that its people work in the ICT field and have, therefore, good competence of Computer Science. The advent of Web 2.0 technologies, as well as the availability of open source software, has acted as a catalyst for the introduction of KM systems.

6 Conclusion

The present study aimed at addressing the question whether small businesses adopt a deliberate or an emergent approach to KM, and in the second case, which are the relevant opportunities and risks, and the main enablers and obstacles to the adoption of KM practices.

The lesson that emerges from the experience of Infonet is that in small enterprises, the introduction of KM practices and tools can follow both deliberate and emergent approaches. As the case study shows, it is not necessarily true that the first approach is more effective than the second.

Also, the empirical evidence confirms that, in small companies, the development of KM can occur with no direct reference to the concepts of KM as a “scientific discipline” as scholars can call it. And even when, in the end, the company recognizes that there are some activities that can or should be called KM, the approach remains strictly “anchored” to the requirements of day-by-day activities. This leads to conclude that a single “best-way” KM approach, based on a rational planning method, is almost impossible to define in SMEs. Nevertheless, the experience of Infonet suggests that there are some conditions that can affect or hinder the successful adoption of KM practices by SMEs, and in particular:

- a bottom-up approach, that is the involvement of operational users from the early stages of the project;
- demonstrating the actual usefulness of the KM systems and practices in the real life of the company;
- integration of KM with the current working practices and technological tools, and alignment with the internal business processes;
- sponsorship of owners, especially when, as it usually occurs, they carry out operational activities that involve the use of the wiki. In this case, the owner must be the first to be convinced of its usefulness;
- propensity to experimentation and tolerance to mistakes. This is crucial because it favours a proactive and well-disposed attitude towards the introduction and use of new managerial methods;
- familiarity with IT technologies, since they can play as catalyst of the adoption of KM practices.

This study has some clear limitations that should be also highlighted. Especially, as any single case-study, generalizations are risky. However, the study can at least represent a starting point for a fresh approach to studying KM implementations in small companies based on a principle of emergent strategies.

In light of this, further research is needed both to confirm the findings of the present analysis, and to investigate in greater depth the factors that can influence the introduction and use of KM in the case of “emergent KM”.

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How can strategic customers be utilized for knowledge marketing in knowledge-intensive SMEs?

Gregor Diehr, Stefan Wilhelm*

Institute for Entrepreneurship
University of Liechtenstein
Fuerst-Franz-Josef-Strasse, 9490 Vaduz,
Principality of Liechtenstein

** Corresponding author*

Structured Abstract

Purpose – This study aims to analyse the use of various forms of „knowledge utilization“ (Zhang et al., 2009), especially the role of knowledge management (Rode, 2001; Lichtenthaler, 2005; Wamae, 2009), as a means to integrate strategic customer knowledge in order to be one step ahead of the market and competitors. For this purpose, premises, processes, and factors are highlighted, which are essential to incorporate the knowledge of strategic customers into the knowledge base of knowledge-intensive SMEs (Spithoven and Teirlinck, 2010) and therefore contribute to the commercialization of knowledge intensive products as well as services (Lichtenthaler, 2005; Chen et al., 2010).

Design/Methodology/Approach – Several factors which are relevant for the integration of strategic customer knowledge have been extracted from knowledge utilization literature. Establishing relations (Teece, 1998; Clarke and Rollo, 2001), solving customer problems (Backer, 1993), and SMEs capacity to absorb knowledge (Teigland and Wasko, 2003) are crucial for the integration of strategic customer knowledge. Since research and literature in the field of “knowledge marketing” (especially in knowledge-intensive SMEs) is still scarce, the authors regard a qualitative research approach as appropriate. The empirical data were not obtained in an artificial way, but in a natural one. The general case study according to Yin (2009) could include both qualitative and quantitative research. However, the following case study primarily focuses on the qualitative research method (Lamnek, 2008; Mayring, 2010; Merriam, 1988).

Originality/Value – The knowledge base – internally or externally acquired – which constitutes the basis of a unique competitive advantage of enterprises in the software and other knowledge-intensive industries, can be expanded and utilized in a better way through “commercialisation of knowledge” (Lichtenthaler, 2005; Chen et al., 2010). Particularly customers and the integration of their knowledge are relevant to knowledge-intensive firms, because these factors allow enterprises to acquire additional know how that supplements the limited resource base and which can be utilized for product development, innovations, and other customers.

Theoretical Implication – This research paper aims to contribute to “knowledge utilization” as well as SME literature since the empirical data collection was exclusively limited to SMEs. Hence, three necessary processes have been identified: (1) Developing

communities of practise or knowledge networks, (2) solving customer problems, and (3) possessing the absorptive capacity to understand and integrate customer knowledge.

Practical Implications – In terms of practical contributions, this paper intends to clarify the utilization of strategic customer knowledge as well as its relevance in product development in knowledge-intensive industries. Additionally, customer knowledge is also crucial in terms of commercialising the predominant resource of such enterprises – knowledge-intensive products and services. Here, three factors are decisive: Establishing relations, solving customer problems, and the capacity to absorb knowledge. Emphasising on these particular factors of marketing activities, might influence the success of knowledge-intensive SMEs in comparison to competitors. Marketing activities carried out by knowledge-intensive SMEs should therefore clearly differ from other industries. The consideration of these factors enables top level management to differentiate themselves by utilizing knowledge marketing.

Keywords – Knowledge Marketing, Strategic Customer Knowledge, Relationships, Absorptive Capacity, Problem-Solving Competence

Paper type – Research Paper

1 Introduction

The globalization of markets, the convergence of previously distinct industries, and the fact that markets become even more unpredictable are challenges for firms (Day and Montgomery, 1999). The increasing speed of information transmission, the increasing amount of information that can be transmitted and processed, is leading to the creation of new types or patterns of information firms (Glazer, 1991). In general, these so called knowledge intensive firms are operating in knowledge markets with aims of generating revenues, gaining knowledge access, setting industry standards, profiting from infringements, realizing learning effects, and guaranteeing freedom to operate (Lichtenthaler, 2005). In the 21st century, the era of communication and information technology, resources responsible for the emergence of intangible assets are becoming more and more important. The resource “knowledge” is seen as a strategic resource as well as a central challenge in the business environment of this century (Spender, 1996; Boisot, 1998). The significant components for a sustainable competitive advantage represent the knowledge lead of the company (Teece, 2001). The goal is to bundle knowledge in a way that enables firms to offer added value to their customers. Problems, experiences, and suggestions for improvements of customers should be identified and

passed on to the company (Handlbauer, 2000). The way firms go about handling knowledge as an ever more important resource and influential factor with regards to long-term business success has become an essential part of business administration. The systematical handling of company knowledge places the company in a position to differentiate itself from the competition (Wiig, 1997).

Zack *et al.* (2009) showed that existing internal knowledge resources are utilized for strategic planning and that the customer is unfortunately neglected as a strategic knowledge partner. The "customer" is placed in the center of attention when it comes to an adequate utilization of knowledge in knowledge intensive firms. The associated knowledge and skills that reflect customer knowledge should be integrated in the value creating activities of the company through experiences, problems and suggestions for improvement (Handlbauer and Renzl, 2009; Gibbert *et al.*, 2002). Several studies show that, especially in small- to medium-sized enterprises, resources are limited (Desouza and Awazu, 2006; Boisot, 1998; Jarillo, 1989; Aragón-Correa *et al.*, 2008; Coviello and Martin, 1999). As Zack *et al.* (2009) and Zack (1999) describes in the area of strategic management, knowledge gaps can come about in order to reach a future strategy. As one approach, it is possible that the customer could fill these knowledge gaps in the form of a value creating complementary resource. We define these customers as "strategic". The „strategic customer“ in a knowledge based sense is seen as, in this context, a sustainable and value creating knowledge cooperation partner rather than a passive product receiver. The goal of the following paper is to clarify processes and factors, which support the utilization of the knowledge of strategic customers, who are involved in value creation activities.

2 Theoretical Background

2.1 Strategic Knowledge Management

Probst *et al.* (2002) define knowledge as it refers to all the knowledge and skills individuals use for the solution of problems. In literature, the resource knowledge is summarized as intellectual capital of the company, which generates value (Zabala *et al.*, 2005). Knowledge involves company's processes, people, values, culture, intuitions, and opinions (Zabala *et al.*, 2005). Nonaka and Takeuchi (1995) distinguish tacit and explicit forms of knowledge. Both forms are described with different attributes, like intangibility,

uniqueness, concurrent usability, value uncertainty, and publicity (Nonaka and Takeuchi, 1995; Chen et al., 2010). Knowledge can refer to an object or a capability and it may reside in individuals, groups, documents, processes, or repositories (Alavi and Leidner, 2001). Nevertheless, or exactly for this reason, tacit knowledge which lies in the minds of employees (Zack, 1999), and that of the customer is regarded as significant. It is therefore indispensable, at the strategy development level, to embed an enterprise-wide and cross-functional knowledge orientation within company principles (Albrecht, 1993). A company provides the physical, social, and resource allocation structure, so knowledge can be shaped into competences (Teece, 1998).

Strategic knowledge management focuses on the core competences of the company, which mirrors knowledge that is critical for success. Core competences can be described as a collection of resources, capabilities, knowledge, as well as technological characteristics of the company. In combination they can create added value for the customer base (Barney, 1991; Prahalad and Hamel, 1990, 1999). Competitive advantages can be generated and protected owing to the fact that strategic components of “knowledge goals” are focused on the core competences (expansion of internal company strengths) in this century. As a result, generated knowledge can be employed higher customer usage. In order to reach this goal, Zack (1999) believes that firms must be able to describe the relationship between strategy and knowledge. The type of knowledge is of significance for the strategic direction and needs to be identified. Subsequently, this knowledge should be compared with the current knowledge in the company to identify any possible knowledge gaps. The existing internal knowledge assets are predominantly used for strategic planning. Involving the customer as a strategic knowledge partner in strategic matters is, however, hardly done in most firms (Zack *et al.*, 2009). For this very reason - that knowledge goals can concentrate on the core competences of the company - we can speak of customer orientation.

2.2 Customer Oriented Focus

The concept of customer oriented knowledge management is becoming increasingly important. The CKM approach represents an embellishment of traditional knowledge management with a special focus on customer knowledge as a resource. This stems from the fact that not only the "internal (employee)", but also "external (customer)" knowledge flows should be recorded (Gibbert *et al.*, 2002). The concept has the aim to support

corporate strategy with customer insights, offer an ideal basis for the optimization of strategy and innovation processes (Smith and McKeen, 2005), and facilitate internal improvements. The terminology of CKM has been seen in the relevant literature as the management of customer knowledge. The application should serve to expand the organizational knowledge base with the customer perspective. The focus lies on the internal company view within the classical knowledge management model and should make more effective and efficient work possible, which should then optimize costs (Probst et al., 2002; Nohr and Roos, 2003; Ostertag, 2003; Garcia-Murillo and Annabi, 2002). In contrast, the strategic focus of CKM rather concentrates on growth and innovation through the incorporation of customers and shows that customer knowledge represents a part of the organizational knowledge, which can generate competitive advantage (Gibbert *et al.*, 2002; Smith and McKeen, 2005). It could be characterized as knowledge management with a special focus on customer knowledge (Handlbauer and Renzl, 2009), which Gibbert *et al.* (2002, p. 459) describes in the following way:

„In the emphasis on knowledge as a key competitive factor in the global economy, corporations may overlook a major element – customer knowledge.“

As already mentioned, the customer holds a central position in place. However, there are varying customer types in the corporate environment. Grönroos (2000) distinguishes different customer categories. On the one hand, the “transactional approach” states that customers are not interested in building a sustainable and intensive partnership with the company. On the other hand, there are customers that wish to have a relationship with the company. This concept is entitled the “relational approach”. The relational approach is divided into both active and passive partnerships. Passive-oriented customers are content when they have the possibility to contact the company when the need arises. Active-oriented customers, in contrast, search for contact with the company and want to actively participate in corporate affairs. These customers can be used for various value creation activities as long as they are motivated to be involved for this purpose. It is therefore possible, for example, that these individual customers act as their own marketing department and evaluate the products or services which they have most experience with.

They could then also share their experiences with other customers (Bowers and Martin, 2007; Bettencourt, 1997; Berthon *et al.*, 1999; Hood, 1998; Parasuraman *et al.*, 1985).

Customers can also be integrated into the innovation phase as they possess knowledge concerning new market trends and needs of other customers as well as their expectations (Kelley *et al.*, 1990; Kelley *et al.*, 1992). The customer further possesses optimal prerequisites in order to advise the company both internally and externally if improvements and complaints are received. As a result, additional value creation activities can be improved (Bettencourt, 1997). Ultimately, their knowledge should support both the existing and newly acquired customers in terms of their purchasing processes when not only present knowledge but also latent knowledge influences their decision and purchasing behavior (Davenport and Klahr, 1998; Garcia-Murillo and Annabi, 2002; Schaschke, 2007). Another approach concerning how value can be generated with customers is referred to as client co-production in the “service literature”. This infers that such customers are seen as “partial employees” and can be implemented anywhere from marketing to engineering services. The model of co-production focusses on complex multidimensional structures and is rather oriented towards short-term partnerships (only a few months) (Bettencourt *et al.*, 2002). Additionally the customer could play a strategic role, which can be defined as a trustful partnership where the customer is intrinsically motivated and represents a marginal percentage of the entire customer base (Wilhelm *et al.*, 2013).

2.3 Knowledge Markets and Participants

Another key term in this article is the knowledge market, where intangible goods are traded (Kafentzis *et al.*, 2004; Jeong *et al.*, 2013). In general, the market transparency in these knowledge markets is very low and high risks or uncertainties concerning knowledge asset quality and value may occur on both sides (firms and clients) (Desouza and Awazu, 2004). Because of these uncertainties, for example, clients often hesitate to change their knowledge provider (Greenwood *et al.*, 2005). Following activities are described within these markets: comparison of available products and services, acquisition of knowledge of providers, exchanging of tacit or explicit knowledge forms, competition, and cooperation of firms for knowledge resources (Probst *et al.*, 2002; Desouza and Awazu, 2004; Kafentzis *et al.*, 2004; Grover *et al.*, 2009).

Following participants and factors characterize these knowledge markets: market makers, buyers, sellers, brokers, market rules, and the market space (Desouza and Awazu, 2004). Kafentzis *et al.* (2004) and Chen *et al.* (2010) additionally highlight different roles

in the market for knowledge: the knowledge supplier and requester, third parties, knowledge processor, and the knowledge service provider. For participants with current technologies for distributing information in knowledge markets, it is easy to explore market segments that were not reachable before (Shapiro and Varian, 1998). Here, the so called imperfections of knowledge markets (Teece, 1998) lead to different challenges for participants: the identification of knowledge clients, absorptive capacity, intellectual property rights, adequate compensation for knowledge transfers, assessing the value of intellectual assets, or the nature of knowledge (Lichtenthaler, 2005).

In general, human and social factors appear in many areas of trading and exchanging knowledge (Kafentzis et al., 2004). The sharing of knowledge is a social process (Rodger, 2012). Here, the “social exchange theory” plays an important role for all participants of the market, which describes that people share information or knowledge with the expectation of reciprocity (Kankanhalli et al., 2005; Rodger, 2012). Additionally, in these markets for knowledge, a high variety of knowledge intensive services and corresponding skill requirements exist (Consoli and Elche-Hortelano, 2010). In other words, the level of education of knowledge employees is quite important to identify appropriate cooperation partners and to access and assimilate the relevant knowledge (Spithoven and Teirlinck, 2010).

2.4 Special Role of Knowledge-Intensive SMEs (KISMEs)

Today, the processing of information in firms is regarded as the critical task and the ability to do so as the critical competition requirement (Greenwood et al., 2005). Here, firms, which clearly differ from industrial firms in terms of value creation and the level of information asymmetry between the company and its clients, are in the focus of interest (Sheehan and Stabell, 2010). In general, knowledge intensive firms are defined as organizations within a knowledge economy (Drucker, 1999), that create market value through the application of knowledge to client demands (Swart and Kinnie, 2003). Starbuck (1992) characterizes them when at least on third of the personnel are experts. Their output must be of an exceptional expertise, which makes an important contribution (Starbuck, 1992). Therefore they rely mainly on human and organizational resources, like experts, which are highly educated individuals, and the application of expertise to deliver their services (Swart and Kinnie, 2003; Greenwood et al., 2005; Sheehan and Stabell, 2010; Leon, 2011; Abecassis-Moedas et al., 2012). The human resources are also called

knowledge workers, which predominantly use cognitive skills (Leon, 2011). These employee skills are essential to the creation of competitive advantage for these kind of firms (Swart and Kinnie, 2003). Also known as expertise, these skills are the very core of the KISMEs offerings (Sheehan and Stabell, 2010). Not only the personnel is the most important resource, because of the intensive interaction with clients, but also clients are essential (Alvesson, 2000). In general, the human capital dominates products, services, and innovations (Starbuck, 1992). KISMEs often have the problem of retaining key personnel, which emphasizes the significance of factors like commitment and loyalty (Alvesson, 2000). In general, enhancing knowledge sharing capabilities by strengthening employee trust depends on employee commitment and, furthermore, on a corporate environment of collaborative teamwork (Tongo, 2013). Nevertheless, a certain style of working and organizational culture implies additional organization-specific knowledge (Alvesson, 2000). Other individual factors like intrinsic motivation, norms, reciprocity, and identity are enhancing for an effective knowledge sharing environment (Alvesson, 2000). Here, so called community-based organizations building long lasting and trusting relationships with all employees (Tongo, 2013).

The literature analysis has shown that distinct characteristics are: the type of input or capital, the type of work, and industry characteristics (Swart and Kinnie, 2003). Within KISMEs you can additionally differentiate between: the knowledge intensity, the low capital intensity, and a professionalized workforce (von Nordenflycht, 2010). These firms are mostly born out of an innovative idea, as a directly employed workforce will not always grow quickly and supply services just to a few clients (Swart and Kinnie, 2003). They mainly sell problem-solving services, which are based on feedback from clients (Sheehan and Stabell, 2010). Generally, problem-solving strategies are constrained by the capabilities of both employees and clients (Consoli and Elche-Hortelano, 2010). The strategic customer can serve as a complementary resource given that this type of firm displays a limited resource base (lacking knowledge, marketing and finance). Furthermore, firms strive to recognize new and additional opportunities through their clients. Customer orientation, therefore, encompasses that companies orientate themselves towards their customers and should manage to get a hold of useful knowledge concerning current products (Handlbauer, 2000).

The products and services are often called knowledge intensive business services, which are innovative activities, sources of innovation, and carriers of innovation (Hertog,

2000; Mas-Verdu and Alba, 2011). These are carried out through a strong interaction between customer and the corporate knowledge base (Hertog, 2000; Mas-Verdu and Alba, 2011). The main goal is to transfer tacit knowledge and experiences in order to become useful and effective in delivering services to new clients (Abecassis-Moedas et al., 2012). The tacit nature of knowledge makes its exchange more difficult, while simultaneously making its reuse by clients and competitors more difficult (Laundry et al. 2012). In general, work processes in KISMEs are always novel, complex, and involve problem solution (Swart and Kinnie, 2003). Hereby, tacit knowledge or experiences of the employees are repeatedly enacted in novel circumstances (Swart and Kinnie, 2003). Especially combining various types of highly specialized knowledge to develop problem-specific solutions is the main process of them (Laundry et al. 2012). Hence, these firms heavily rely on self-determination, one-dimensional hierarchies, and the need for extensive communication for coordination (Alvesson, 2000).

2.5 Processes and Factors of Knowledge Utilization

First, the identification of knowledge assets a company possesses or needs, their possible knowledge clients as well as the knowledge product or service these clients need (Teece, 1998; von Krogh et al., 2001) are prerequisites for the utilization of knowledge. Furthermore, the identification process plays a major role, because of the imperfections of the knowledge markets, like the lack of market transparency (Lichtenthaler, 2005). Here knowledge exchanging relationships are essential for knowledge utilization, which is described, for example, by an external growth by means of takeovers, mergers and acquisitions (Antonelli, 2006). A company by itself seldom possesses the complete set of resources required to commercialize its knowledge stocks effectively, because new knowledge usually emerges from beyond a company's boundary (Lin and Wu, 2010). Here, firms need to pay attention to cultural and organizational contexts, in which their stakeholders most effectively are encouraged to utilize knowledge (Clarke and Rollo, 2001). Therefore, it is crucial to develop an organizational culture that reflects the willingness of members to seek others' disparate knowledge and share their own (Hargadon, 1998; Thite, 2004). Additionally, the KISMEs reputation increases the value of knowledge for buyers (Zhuge and Guo, 2007; Weiss et al., 2008; Greenstein and Markovich, 2012). Acquiring a reputation as an innovator may facilitate firms' access to

financing, may make it easier to get contracts, grants and subsidies, or hire the best researchers (Muller and Pénin, 2006; Rodger, 2012).

Another main process of knowledge utilization described by authors is a coordination and governance process of knowledge assets in firms. The heterogeneity of knowledge and participants who possess knowledge require coordination in order for firms to succeed (Antonelli, 2006). Here, the governance of knowledge includes coordinated transactions, quasi-hierarchies, and constructed interactions (Antonelli, 2006). In general, the coordination and governance of knowledge is dominated by different factors like identifying the appropriate knowledge and the intended application (Hicks et al., 2002), finding knowledge providers and recipients, evaluating knowledge assets, or determining the knowledge value (Chen et al., 2010). In doing so, electronic knowledge repositories enable employees to leverage and reuse existing knowledge, share knowledge with others, and stimulate the development of new knowledge and ideas (Lin and Fan, 2011). An effective knowledge system involves an adequate knowledge transfer (Mudambi et al., 2009) and the company needs to be able to identify experts on recurring problems (Lee and van den Steen, 2010). Garavelli et al. (2004) explain that when firms are organized as knowledge communities, knowledge emerges through the organization actions. The objective of these communities is to connect people in various forums in order to reduce capital and operating costs, increase utilization, and improve the firm's market positioning (Mital et al., 2010; Ramanigopal, 2013). The existence of social networks and social ties enhanced by group dynamics, knowledge activists, knowledge sharing culture (Ramanigopal, 2013), environment of mutual respect and trust, a shared purpose, a shared context, and managerial belief (Moitra and Kumar, 2007) are characteristics of knowledge networks. Today, the electronic connectivity of relevant knowledge producers can combine internal knowledge of a firm and external pieces of knowledge (Patrucco, 2005).

An important factor for the utilization of knowledge is described as the focus of solving problems of customers. Here, firms leverage their intellectual capital and package it into high value-added knowledge based products and differentiated services, which are capable of solving customer problems (Chen et al., 2010). Especially relevant for problem-solving services is task specific information which is collected from the company's customers (Verona et al., 2006; Consoli and Elche-Hortelano, 2010). The focus of the problem-solving capability lies in the interactions between customers and firms. It is a knowledge based process, which consequently requires flexibly customized

services and products in order to respond to customer feedback (Massey et al., 2001). With technological tools of customer relationship management (Massey et al., 2001), the development of customized services and products is supported and the ability of firms to expand their knowledge is maintained (Verona et al., 2006).

One additional factor of knowledge utilization is the capability of firms to absorb knowledge or to innovate from their current knowledge assets (Chen et al., 2010). In general the absorptive capacity is the ability of a firm to recognize the value of new, external information, assimilate it, and apply it (Cohen and Levinthal, 1990). Teigland and Wasko (2003) explain the absorptive capacity as combining existing internal knowledge with novel external knowledge to develop creative solutions and improve performance. The decisions relating to knowledge innovations are ultimately based on three main questions: who (people), what (knowledge assets), and why (business objectives) (Goh, 2005). Innovation is usually perceived as a group of activities involving interaction and knowledge exchanges between people and organizations (Muller and Pénin, 2006). Here, the absorptive capacity embodied in people is the key element for the organizational integration of external knowledge (Spithoven and Teirlinck, 2010). Especially the function or skills of the company's employees become a qualitative aspect of absorptive capacity (Spithoven and Teirlinck, 2010).

3 Research Methodology

The first step refers to a case study (in accordance with Vaus (2001)) and possesses an explorative character. Yin (2009) describes a case study as follows:

„Case Study is an empirical enquiry that investigates a contemporary phenomenon in-depth and within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident” (p. 18).

According to the definition of Yin (2009), the case study method focuses on the meaning of the research design. Evidently, the qualitative social research within the case study problem takes on a meaningful determinant. When choosing a research design, case studies are applicable when many variables need to be elicited which limit themselves to a small number of research units (Vaus, 2001). Choosing a case study as research object

is especially interesting in a context where the research design focuses on new or scarcely researched problems (Eisenhardt, 1989).

3.1 Unit of Analysis

The present paper analyzes a single case study. The following criteria were specifically necessary for the choice of the company:

- Company operates using a relatively flat hierarchy system (hardly any bureaucracy)
- Company was created and follows a customer orientation towards a problem-solution strategy
- Most work in the company is based on intellectual nature and well-educated, qualified employees form the major workforce
- Flexibility and open knowledge disclosure are integrated into the company culture

The selected company for our single case study is a small software company located in the Principality of Liechtenstein. The firm meets all the requirements for the choice of our single case study. This company can be seen as a knowledge intensive company and is described shortly in the following section. Furthermore, the approach and selection of the interviewees will be described.

Medical Company

The examined company considers itself an innovative software developer that is clearly in alignment with the customer needs of modern ENT-clinics. The company's headquarter is located in the Principality of Liechtenstein (Rhine valley). The company also has an office in Riga (Latvia) which was established in the course of the firm's expansion strategy. Currently, the company has 18 employees, whereas most of them are graduates who have obtained a university degree. The company develops and sells various databases which enable clinics, researching doctors in the ENT-field, and the pharmaceutical industry to record their therapies and perform statistical evaluations. Individual customer projects are conducted for clinics and various pharmaceutical firms. The company perceives itself as an individual customer software partner in the medicinal field. Naturally, this field of medicine must follow strict guidelines and heavy regulations steadily rising qualitative and legal requirements. Field analyses show that the medical technology field will have a strong growth tendency in the future. Consequently, the

importance of research and quality assurance in the medicinal field will continue to grow. Because of the specific application of individual programs as well as the database that is seen as a complementary product to the clinic information system, the company effectively operates in a niche market. This implies that the demand is relatively small and there are only few directly competitive products in the market. Despite its activity in a niche market, the company serves international customers in over 20 countries.

3.2 Level of Analysis (Approach and Selection of Interviewees)

The selected company provides an excellent research unit based on the chosen focus of KISMEs. Access to the interviewees was facilitated owing to the fact that one of authors is in contact with the company. Retrospectively, the authors put strong emphasis on integrating various perspectives concerning the selection of interviewees such as different departments and positions within the company, as well as distributors and strategic customers. In doing so, much broader data could be acquired, which should consequently reveal more meaningful findings. The selection of the individual interviewees was conducted in consultation with the owner of the business. In conclusion, nine individuals were chosen and interviewed in this study.

The authors' intentions were to ask open questions using an interview guide based on the explorative character of the following paper. A pilot study was conducted after the successful construction of the interview guide. This allowed the authors to make further, small adjustments to the interview guide. The duration of the interview depended on the individual and lasted between 30 and 90 minutes. The individual interviews were recorded and subsequently transcribed in the time frame from January 2012 until February 2014. The characteristics of the interviewees are summarized in Table 1.

Interviewee	Position
A	CEO / Owner
B	Marketing & Sales (M&S)
C	Research and Development (R&D)
D	Supervisory Board
E	Strategic Consultant
F	Research and Development (R&D)
G	Research and Development (R&D)
H	Strategic Customer
I	Strategic Customer

Table 1: Interviewees

3.3 Data Analysis

The information gathered from the data collection will be analyzed in six steps (Bogner, Littig and Menz, 2009). For this purpose, the interviews need to be transcribed beforehand (Saunders and Lewis, 2012). Generally, there are two different approaches: on the one hand, a complete transcription in which word for word is transcribed; on the other hand, a partial transcription in which only a certain degree of detail is transcribed (King and Florrocks, 2010). However, it is necessary to proceed carefully in order to lose or distort as little information as possible. Hence, the single interviews were recorded allowing the authors to completely transcribe them. Subsequently, the content of the nine interview protocols were structured according to topics. This process is called coding. For this purpose, the authors created a matrix to visualize the thematic analysis. The answers of the interviewees were processed according to their content and then entered into the corresponding fields of the matrix. Here, the wording of the answers should be maintained, but, at the same time, not too many quotations should be incorporated (Bryman, 2008). The objective of this method is the thematic classification of the interviewees' original statements.

Subsequently, the statements of the interviewees will be summarized according to their affiliation of the examined department. As a consequence, a new matrix, divided into the departments management, sales, and R&D, is developed and displays the core statements from the strategic customer's view on the particular sections of questions. Through this technique, a comparison of the respective contents is possible. The next step contains the evaluation, in which the authors strive for a conceptualization of the contents. The evaluation of data followed after the qualitative analysis of contents according to Mayring (2010). Mayring (2010) distinguishes four different techniques of qualitative analysis. The evaluation of the interviews is based on the technique of "summarization." Here, the first step includes the selection of the representative partial quantity that relates to the research question and, subsequently, its categorization. The structure of the interview guide served as a starting point for the categorization. After the categorization, the contents of the interview protocols were assigned to the predefined categories. Afterwards, the data could be examined and analyzed. Also, the result were discussed and theory was compared to practice (Flick, 2011; Gläser and Laudel, 2008; Mayring, 2010). The evaluation of data ends with a theoretical generalization. In this step, the specific

themes are abstracted and compared to theory. The assessment of available business records, which are relevant to the examined process, support the data analysis.

4 Presentation of Findings

The strategy of the studied firm emphasizes that the needs of the customers are satisfied to the highest degree and the end customers of the firm's customers can be given medical treatment of highest quality. Based on this strategic thinking, the products must be ideally customized to the customers' needs, which is why the firm constantly advances their products by integrating customer feedback originating in problems customers have experienced in the industry.

4.1 Developing Communities of Practice or Knowledge Networks

The identification of different knowledge sources to generate or adapt products or services of the company stands at the very beginning of the process and represents much more than a routine. In this case, the importance of finding adequate employees of the firm or external partners to further develop the company's main outcomes is highlighted by the limited available resources of the unit of analysis and its reliance on additional knowledge of their customers. Due to the limited resources of the observed firm, it is dependent on additional external sources of knowledge. The firm not only struggles with finding adequate resources such as strategic customers or partners, it also needs to have a workforce and a capable system to implement this external knowledge. Therefore, the company employs more than 15 workers with academic degrees. Due to special terms and conditions in the firm knowledge is maintained by different teams. The general structure of the firm and its flat hierarchy enable the employees to exchange internal knowledge more easily and without formal barriers. A technology-based system of knowledge storage (Intranet) helps to connect different employees in project-based processes. Here, team meetings on a regular basis support the internal sharing knowledge acquired from customers. According to the statement of the interviewees, the external knowledge perspective plays a crucial role; especially the category of strategic customers – who are active participants and value-adding to the firm.

The relationship building process is an important step after the firm has identified the relevant strategic customers. Establishing trustworthy relationships with these customers

constitutes an inevitable prerequisite for the transfer of knowledge. Once more, the integration of knowledge of strategic customers depends on the firm, their employees' willingness to receive knowledge, and the customers' willingness to provide information. Here, the degree of openness for knowledge exchange is influenced by people, knowledge assets, and business objectives of the firm. In the analyzed case, the strategic customer and the firm both seek to develop a sustainable and value-adding relationship. The work processes and styles also represent substantial knowledge from the relationship with customers and their generative feedback on products and services. Since they have a major impact on developed innovations, customers embody a vital factor in the process:

“it does not work without cooperating with the customer, to add value to the programs, because otherwise we would develop things that are not needed [Interviewee A (CEO) & G (R&D)].”

The process of relationship building is not only a necessity for the success of the analyzed firm, but is also an important factor when it comes to the adequate utilization of knowledge. Especially social determinants like trust, reputation, rewards, and motivational factors are essential for establishing potent economic relations. We recognized these items of relationship building in different activities and situations inside and outside of the firm, for example, when employees were collaborating with other colleagues or when employees were contacting potential customers for the first time with the goal of establishing a more intense relationship. The studied firm's customers particularly consider reputation and trust (word-of-mouth) when deciding for a firm and its products. Nevertheless, relationships and cooperation of employees within firm boundaries are also very important for the adequate usage of knowledge. Here a system of rewarding for knowledge exchange and other motivation factors, like trust could be acknowledged in the studied firm. This indicates that the incentives are not based on an extrinsic, but rather on an intrinsic level. This statement was supported by the thoughts of Interviewee I (strategic customer):

„The motivation is that the product can be further developed through ideas, and if you are active, you have to be challenged and encouraged. Challenged means that ideas are contributed and encouraged means that the firm then really tries to implement these ideas and in a short period of time.”

During the exhibitions, it could be observed that knowledge exchange occurred on an implicit knowledge level. The concrete acknowledgements between strategic customers

and the observed company could be elicited and discussed. The empirical analysis showed that the communication channel only occurred directly and was based on concrete experiences. The strategic customer (Interviewee H) described this as follows,

„that occurs by telephone. I sit down and concretely bring my ideas together.”

So, together, strategic customers and the firm form a “community of practice“. The communication within the internal and external knowledge exchange constitutes the knowledge network. Factors such as the choice of the communication channel, experiences, and trust are crucial for the establishment of a knowledge network.

4.2 Solving Customer Problems (Coordination & Governance of Knowledge)

The coordination and governance of knowledge transactions between the analyzed firm and the strategic customers serves and seeks to assure the protection of intellectual capital of the firm and correspondence to customer needs. In this context, we have to take into consideration that, in the medical industry, it is highly important to handle patient-information confidentially and to locate further data of strategic customer correctly, since other customers are competitors and, therefore, it would be counterproductive. The CEO (Interviewee A) of the firm mentions that sometimes both parties are bound to confidentiality agreements, since some customers insist on such a contract, because generally sensitive data is revealed and shared. In further interviews, it was determined that the internal firm knowledge is “hardly” shared with customers. More commonly, new databases are created based on customer input and example criteria. In reference to the IT department, employees share only very little information with customers [Interviewee B (M&S)]. Interviewee C (R&D) explains this fact as follows,

„From the view of the firm, we share relatively little with customers, I mean technically. The customer simply knows how the system functions but only in the meaning of who can use it. What and how the method of programming occurs is not shared with the customer.”

However, when creating customer oriented software products, it is inevitable to integrate the customer into all phases of development. Therefore, flexibility, experiences, and problem-solving competences of employees are essential. Employees, who are directly in contact with customers, must know about the firm’s own competences and the customers’ needs in order to connect these two components. Technology, such as a CRM system, enables employees to oversee internal and external knowledge resources.

However, generally it depends on the frequency and intensity of conversations between customers and employees.

The value creation activities of strategic customers should be seen as honest and constructive feedback in the innovation phase as well as in marketing and sales according to interviewee H (strategic customer). This should happen if they can be seen as active reference contact partners for other customers. Interviewee I (strategic customer) perceives strategic customers as value creating partners in all phases of innovation generation as well as being involved in voluntary marketing activities.

„Development and marketing both demand a high involvement. I conduct a lot of marketing on a voluntary basis because I believe in the product idea and of course support the company. As far as marketing is concerned, the booth that is used at conferences and trade fairs is not enough. Strategic customers have to convince their colleagues of the products in a believable way.” [Interviewee I (strategic customer)].

The studied firm must identify, fulfill, and share customer needs. Furthermore it is important for the firm that the organizational knowledge base is protected. The question of “how much knowledge should a business give away” does hence not arise, since the strategic customers does not reveal any competition-relevant information of the firm is stated by Interviewee C (R&D).

4.3 Possessing the Absorptive Capacity to understand and integrate Customer Knowledge

The capacity of absorbing knowledge from external sources is enabled by the whole workforce and is not dependent on only one person or team. Information, even from other departments of the firm, becomes highly crucial. In the studied firm, this varies from R&D up to the Marketing department in different parts of the value chain, as Interviewee B (Marketing & Sales) argues:

„The employees are not medics, in fact they are specialists in the field of software development, but in order to fill the software with medical knowledge, develop new products, and facilitate growth customer knowledge is certainly necessary.”

Due to the fact that knowledge as well as absorptive capacity can be regarded as intangible assets of a firm, it is very difficult to delineate the decisive conditions and

factors for optimally integrating customer knowledge. One possible approach to integrate customer knowledge into a firm's knowledge base would be the structured documentation and management of knowledge with the help of information technology. Nevertheless, most of the knowledge exists in the minds of the individual employees. The analysis revealed that the documentation and management of such explications was facing obvious limits in terms of time and extent, as Interviewee A (CEO) described:

„we don't have time to sit down and record all thoughts about the customers in detail and then codify them. But if I am totally convinced then I would note a key word or two somewhere in a document.“

The knowledge base of the studied firm is strongly based on the knowledge and experience of employees of this industry. Since customer knowledge, which should be integrated, is firmly related to the core business of the firm, the absorptive capacity simultaneously grows and allows the employee to understand and implement more and more customer needs. Additionally, through the active participation of the strategic customer, the implementation of the customer's ideas leads to a better product, this again serves as a key motivational factor for him. Customer motivation can also be evoked due to additional factors such as customers who are able to increase their own reputation in expert circles by integrating themselves into value creating processes. Documentation analysis shows that the company published multiple statements from strategic customers, since strategic customers seem to feel content and proud when the firm uses their quote in publications. This occurs, for example, if a customer's portrait is published with an existing product and thus strengthens the firm's own marketing (image and look) according to Interviewee B (M&S).

The ability to generate value in cooperation with the customers, or absorptive capacity, depends on the level (intensity) of collaboration and is further used for different value-creating activities. The strategic customer's motivation to share his or her knowledge and the shared information's relevance for product development play decisive roles.

5 Conclusions

The present is targeting the question of "How can strategic customers are utilized for knowledge marketing activities"? We point out, empirically, that three necessary

processes have been identified: (1) Developing communities of practice or knowledge networks, (2) solving customer problems, and (3) possessing the absorptive capacity to understand and integrate customer knowledge. Based on the collected data, by use of interviews, these three processes could be confirmed.

It became clear that firms, which have the opportunity to exchange knowledge internally more easily and without formal barriers, could be referred to as “Management by Corridor” (Durst and Wilhelm, 2011). This pragmatic approach outlines an important factor in order to absorb customer knowledge. The capacity of absorbing knowledge from external sources is enabled by the whole workforce and is not dependent on one single person or team and is distributed in different value creating activities, as described by Cohen and Levinthal (1990). As soon as the customer knowledge and strategic customer are integrated into the organizational knowledge base, the basic requirements for successful knowledge marketing according to Rode (2001) are fulfilled, such as knowledge, experiences, customer, or business relations. Knowledge marketing is a good specific form of marketing (Rode, 2001). According to Lichtenthaler (2005), firms can commercialize their own knowledge assets or knowledge gained by strategic customers by turning it into sales, licensing, joint ventures, strategic alliances, mergers, or even internal use. Another important key element for the commercialization of the strategic customer’s knowledge is his or her motivation to collaborate with the firm and act as an active knowledge partner. As seen in Gibbert et al. (2002), the empirical results suggest that valuable customers feels valued through their integration in the value creation process and thereby could pave the way for sales activities (customer profiling). Based on these factors, it is only possible to conduct “knowledge marketing” after a successful identification.

To summarize, particularly KISMEs, which have to deal with limited resources (Jarillo, 1989; Pelham and Wilson, 1996), can additionally benefit by carrying out Knowledge Marketing. Through the integration of strategic customers, the knowledge base can be expanded, customers and reputation can be increased, and therefore Knowledge Marketing can be carried out.

The case illustrates that the cultural and organizational context (Clarke and Rollo, 2001) are of great importance in order to utilize knowledge correctly. A knowledge sharing culture as a social network (Ramanigopal, 2013) is a necessary requirement to build valuable relations within the firm as well as outside the firm (with customers). To

gain knowledge outside the firm's boundaries, employees must act customer-oriented and solving customer problems must be main priority. Here, task specific information is collected from the company's customers (Verona et al., 2006; Consoli and Elche-Hortelano, 2010). In order to integrate this information, the absorptive capacity embodied in people is the key element (Spithoven and Teirlinck, 2010). The case shows that employees can only utilize customer knowledge for innovations, if they have the required skills to understand relevant information and utilize this knowledge for the product (Teigland and Wasko, 2003). In their works, Lichtenthaler (2005) and Chen et al. (2010) argue that the commercialization of knowledge supports the firm's ability to exactly satisfy customer needs and impart the characteristics of the products/services to customers. The empirical results of this study can only confirm this topic and additionally recommend an integrated knowledge marketing approach, in which we determined that the integration of strategic customers, including the developmental phase, facilitates problem-solving by means of feedback loops.

6 Implications and Limitations

6.1 Research Implications

Due to the novelty of the topic, in regards to knowledge marketing, first empirical analyses could contribute to broaden the field in terms of literature. As shown in Figure 1, three processes (1) developing knowledge networks, (2) solving customer problems, and (3) maintaining absorptive capacity could be proven empirically by the conducted analysis. The current literature could be enriched through this study.

Especially in KISMEs, which highlight the resource knowledge, the results represent an enhancement of literature. In addition, the field of knowledge utilization gained another perspective by deepening the integrated knowledge marketing approach and therefore could be summarized into different processes and factors.

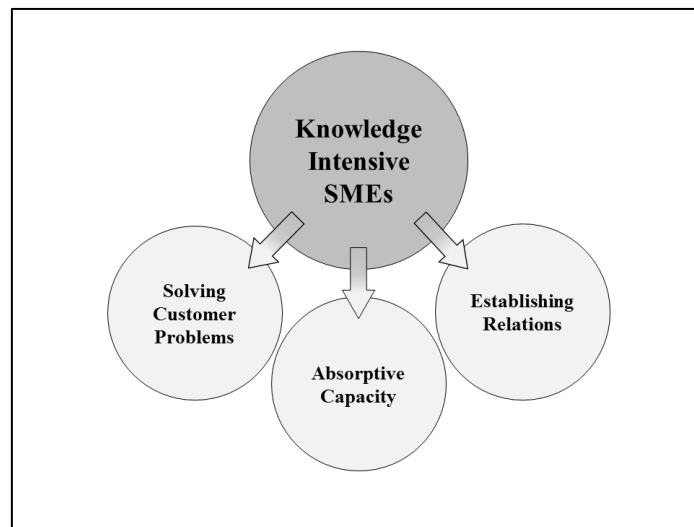


Figure 1: Processes and factors of KISMEs

6.2 Managerial implications

Through an integrated knowledge marketing approach, as described in the case, managers can identify their strategic customers/partners more easily and utilize their knowledge. The establishment of relations and integration of important customers can now be executed in a more focused way and, thus, more efficient solutions for customers can be found. All of these processes serve the management in order to sell knowledge intensive products/services more easily. Especially KISMEs, which only possess a limited resource base, can sell their products more easily with the help of these processes as well as the integrated knowledge marketing approach. By integrating important customer knowledge, they are able to continuously refine their products and are not solely dependent on their own internal resources.

With the present single case study, awareness in regards to the topic “knowledge marketing” in KISMEs could be increased. Managers of such firms should concern themselves with this topic in order to generate competitive advantage and be ahead of competitors. The consideration of these three processes enables top management to strategically orientate them on a systematic basis and implement all three processes.

6.3 Limitations

The following single-case-study includes multiple limitations. This paper can only offer a first confirmation. However, in order to further confirm the result, additional empirical works must be conducted. This study cannot be generalized for all knowledge intensive firms due to the fact that only one single company was analyzed in form of an empirical case study. The empirical results of this case study cannot be transferred to other business fields because the researched field consists of special characteristics and the customer holds a particularly important role. As a suggestion, future researchers in this field should embellish the single-case-study with additional case studies. These measures are described as “exemplary generalization” in qualitative research.

The present single case study has already integrated a multitude of stakeholders, e.g. the owner, supervisory board, employees, consultants, and customers. The research could be applied to a more specific data basis by, for example, conducting market research were possible, by possibly analyzing objectively which customers could be able to fill the knowledge gap.

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The role of knowledge management in small firm virtual networks

Emilio Esposito*

Department of Industrial Engineering
University of Naples Federico II.
Piazzale Tecchio, 80 – I-80125 Naples (Italy)

Pietro Evangelista

Institute on Service Industry Research (IRAT)
National Research Council (CNR)
Via G. Sanfelice, 8 - 80134 Naples (Italy)

** Corresponding author*

Structured Abstract

Purpose - The main purpose of this paper is to investigate the role of knowledge management in the development of virtual networks participated by small firms.

Design/methodology/approach - The paper reviews two streams of literature focused on knowledge management in small firms and virtual enterprise. This allows to define an appropriate research question that has been addressed by a questionnaire survey conducted in network of small firms operating in a high-tech sector. This network of firms acts as a virtual enterprise.

Originality/value - The main value of the paper is to explore two main gaps emerging from the extant literature on knowledge management in small firms and virtual enterprise. In addition, it provides empirical evidences of knowledge management practices adopted in a virtual network populated by small firms.

Practical implications – From the practical point of view, the paper suggests that to fully exploit the potential of virtualisation, small firms need to implement new technological solutions. This means that small businesses need to sustain their virtualisation process through the adoption of technological platforms that allow managing and sharing knowledge more effectively.

Keywords - Knowledge management, Virtual enterprise, small and medium sized enterprises, literature review, questionnaire survey

Paper type - Academic Research Paper

1 Introduction

The important role that small and medium sized enterprises (SMEs) are playing in modern industrial environment has been analysed by a large number of scholars (Al-Mutawah et al., 2009; Dyer, Hatch, 2006; Esper et al. 2010; Esposito, Passaro 1994; Esposito, Raffa, 2007; Genovese et al., 2013; Gunasekaran, Ngai, 2007; Lakshman, Parente, 2008; Lee et al, 2010; Samuel, 2011, Iandoli et al. 2012). Nevertheless, the reasons why small firms show poor usage of KM tools are still unclear and benefits of KM adoption are not fully exploited by these firms (Alavi, Leidner, 2001; Durst, Edvardsson, 2012; Marra, Ho, Edwards, 2012; Thorpe et al., 2005, Esposito et al., 2009).

Several researches show that the factors preventing the adoption of practices and strategies of knowledge management by SMEs are connected to three main aspects: the nature of knowledge is mainly human embedded; there is a sort of common knowledge, that is a knowledge known to all members of the organization; the scarcity of resources pushes SMEs towards the exploitation of external knowledge resources (Esposito, Raffa, 1994; Desouza and Awazu, 2006; Egbu et al., 2005; Frey, 2001; McAdam and Reid, 2001; Pillania, 2006, 2008a; 2008b; Sparrow, 2001; Wong, 2005; Wong and Aspinwall, 2005).

Even though these aspects seem to explain the factors hindering the adoption of KM formal practices in SMEs, it should be emphasized that the Information and Communication Technology (ICT) is increasingly reducing their weight by offering new tools that are low cost, ease-to-use, and more effective (Antonelli, et al., 2000; Esposito, Mastroianni, 2001; Garrigos-Simon, et al., 2012; Matlay, Westhead, 2005).

In summary, on the one hand, the literature highlights the factors preventing SMEs from adopting KMSs. On the other, new technologies are having the effect of reduce the human and financial barriers hindering the adoption of KMSs, are facilitating the process of socialization of the knowledge that is crucial for SMES, and are offering new systems supporting KM practices.

This dichotomy emphasizes that, although the number of papers regarding the knowledge management in SMEs is increasing, the body of knowledge remains still limited and further research efforts are needed (Durst, Edvardsson, 2012).

This is particularly true in the context of networks populated by SMEs. In fact, one of the main gaps in the literature on KM in SMEs concerns the role of KM in the development of the SME networks. In such networks, relationships and exchange of

knowledge between focal firms (namely large companies acting as a product/service developers/integrators and maintaining relationships with customers) and small suppliers firms are critical to ensure the competitiveness of this network. For this reason, it is important to investigate the ways through which knowledge is spread across networks populated by small enterprises. The virtual enterprise (VE) offer an interesting perspective in this context as it is a new organisational model connecting firms (and then small firms also) for limited period of time through a strong technological support (namely ICT tools) and for achieving fast-changing market opportunities in partnership with other firms belonging to the network.

The main aim of this paper is explore the role of KM in the development of virtual networks participated by small firms.

A systematic literature review on VE has been carried out and a research question has been identified. Such research question has been addressed through a questionnaire survey conducted in a network populated by small firms operating in high-tech industries.

The paper is organised into six sections. Following this introduction, the second section describes the results obtained from the systematic review on virtual enterprise. This allows to identify an appropriate research question. The third section provides detail about the research context in which the empirical survey has been conducted, while the fourth section outlines the survey methodology. The main findings emerging from the survey are presented and discussed in the fifth section. Conclusions and implications are outlined in sixth section.

2 Conceptual framework

This section provides the conceptual foundations of this paper. The following subsection is devoted to explore the literature on virtual enterprise (VE). The comparative analysis of the literature allows to identify the research objective of this paper that has been addressed through a questionnaire survey. The methodology and results of the empirical investigation have been detailed in further sections of the paper.

2.1 Virtual enterprise and small firm networks

The radical changes that have occurred in the competitive scenario in recent years have driven SME networks to seek new ways to cope with the growing complexity of the

business environment in order to secure the access to new sources of competitive advantage (Guerrieri and Pietrobelli, 2004).

The recent literature and business practice have shown that SME networks are seeking new forms of collaborative relationships with a high degree of decisional and operational flexibility in order to satisfy the customer demand faster and at lower cost (Chiarvesio et al., 2004). One of these emerging organisational forms is the Virtual Enterprise (VE). The virtual enterprise model has been indicated as suitable for addressing changing market conditions through flexibility, extensive ICT usage and KM (Blecker and Neuman, 2000; Choi et al., 2008; Pollalis and Dimitriou, 2008).

Despite scholars and practitioners devoted an increasing interest towards this organisational form, the literature on this topic appears quite fragmented and a number of issues needs to be further investigated.

Starting from this scenario, a comprehensive and systematic bibliographic survey has been carried out by Esposito and Evangelista (2014).

The objective of this subsection is to analyse the literature on VE in order to explore the potential role of KM in when this organisational form is populated by small firms.

This was achieved primarily by a systematic analysis of journal articles contained in the Web of Science Academic database. A keyword search using the terms “virtual enterprise” was performed and the search process was limited to peer-reviewed publications alone (e.g. ISI journal articles). The final sample consisted of 41 articles (Table 1).

Table 1 - VE: sample articles by macro-areas

Macro-areas	Papers	%
Operations Research & Business Science	21	51,3%
Engineering	6	14,6%
Information Systems & Computer Science	14	34,1%
Total	41	100,0%

They have been grouped in the following three macro-areas: 21 articles from the Operations Research and Business science area, six articles from the Engineering area, 14 articles from the Information Systems and Computer Science area. The 41 articles were studied in detail and the results of the content analysis are described below.

Summarising results of the content analysis it emerges that a number of shared and non-shared viewpoints may be identified in the existing literature on VE (Table 2).

Table 2 - Overview of literature review: shared issues

Issues	Shared literature evidence
Main aims	- <i>Exploit fast-changing market opportunities</i> (Jagdev and Browne, 1998; Park and Favrel, 1999; Mezgar et al., 2000; Zhang et al., 2000; Presley et al., 2001; Jagdev and Thoben 2001; Khalil and Wang, 2002; Mikhailov, 2002; Wu and Sun 2002; Lefebvre and Lefebvre, 2002; Gou, 2003; Kim et al., 2006; Cunha and Putnik, 2006; Dowlatshahi and Cao, 2006; Corvello and Migliarese, 2007; Huang, et al., 2008; Sari et al., 2008; Wang and Chan, 2009; Rosu, and Dragoi, 2011)
Partnership objectives	- <i>Share costs, skills, and core competencies</i> (Jagdev and Browne, 1998, Tuma, 1998; Park and Favrel, 1999; Zhang et al., 2000, Camarinha-Matos et al., 2001; Martinez et al., 2001; Presley et al., 2001; Weisenfeld, et al., 2001; Mikhailov, 2002; Wu and Sun 2002; Gou, 2003; Manthou et al., 2004; Feng and Yamashiro, 2006; Dowlatshahi and Cao, 2006; Sari, et al., 2007; Corvello and Migliarese, 2007; Chen, et al., 2007; D'Atri and Motro, 2008; Gunasekaran et al., 2008; Sari et al., 2008; Rosu, and Dragoi, 2011)
Network characteristics	- <i>Flexible, rapid, dynamic and reactive network</i> (Park and Favrel, 1999; Tuma, 1998; Mezgar et al., 2000; Zhang et al., 2000; Camarinha-Matos et al., 2001; Martinez et al., 2001; Khalil and Wang, 2002; Lefebvre and Lefebvre, 2002; Beckett, 2003; Davidrajuh, 2003; Huang, et al., 2004; Kim et al., 2006; Cunha and Putnik, 2006; Corvello and Migliarese, 2007; Gunasekaran et al., 2008; Wang and Chan, 2009)
Nature of organisation	- <i>Partnership among independent companies</i> (Jagdev and Browne, 1998; Mezgar et al., 2000; Jagdev and Thoben 2001; Lefebvre and Lefebvre, 2002; Khalil and Wang, 2002; Mikhailov, 2002; Davidrajuh, 2003; Manthou et al., 2004; Huang, et al., 2004; Sari, et al., 2007; Corvello and Migliarese, 2007; Chen, et al., 2007; Huang, et al., 2008; Wang and Chan, 2009)
Partnership characteristics	- <i>Temporary relationships</i> (Jagdev and Browne, 1998; Zhang et al., 2000; Camarinha-Matos et al., 2001; Jagdev and Thoben 2001; Weisenfeld, et al., 2001; Khalil and Wang, 2002; Wu and Sun 2002; Lefebvre and Lefebvre, 2002; Tatsiopoulos, et al., 2002; Huang, et al., 2002; Mikhailov, 2002; Beckett, 2003; Gou, 2003; Huang, et al., 2004; Feng and Yamashiro, 2006; Kim et al., 2006; Dowlatshahi and Cao, 2006; Corvello and Migliarese, 2007; Sari, et al., 2007; Gunasekaran et al., 2008; Huang, et al., 2008; Sari et al., 2008; Huang, et al., 2011; Rosu, and Dragoi, 2011) - <i>Collaborative/cooperative relationships</i> (Jagdev and Browne, 1998; Tuma, 1998; Zhang et al., 2000; Jagdev and Thoben 2001; ; Mikhailov, 2002; Yoo and Kim, 2002; Huang, et al., 2002; Davidrajuh, 2003; Manthou et al., 2004; Feng and Yamashiro, 2006; Kim et al., 2006; Chen, et al., 2008; D'Atri and

	Motro, 2008; Gunasekaran et al., 2008; Wang and Chan, 2009; Sari et al., 2008; Huang, et al., 2011)
Coordination and communication tools	- <i>Extensive use of ICT and computer networks</i> (Jagdev and Browne, 1998; Tuma, 1998; Park and Favrel, 1999; Mezgar et al., 2000; Zhang et al., 2000; Camarinha-Matos et al., 2001; Weisenfeld, et al., 2001; Jagdev and Thoben 2001; Martinez et al., 2001; Khalil and Wang, 2002; Mikhailov, 2002; Wu and Sun 2002; Lefebvre and Lefebvre, 2002; Yoo and Kim, 2002; Manthou et al., 2004; Huang, et al., 2004; Corvello and Migliarese, 2007; Gunasekaran et al., 2008; D'Atri and Motro, 2008; Chen, et al., 2008; Huang, et al., 2008; Wang and Chan, 2009; Rosu, and Dragoi, 2011)

In particular, the authors that shared the following features of the VE (Table 2):

1. the *main aim* of VE is to exploit fast-changing market opportunities;
2. sharing of risks, costs and competencies is the main *partnership objective*;
3. the virtual enterprise is characterised by a dynamic and flexible *network*;
4. the *organisation* is typified by relationships involving independent companies;
5. *the partnership* is typically temporary and based on a collaborative approach;
6. *coordination* and *communication* tools used are based on ICT.

Beside these shared issues, a number of important non-shared issues, have been identified in the research works analysed as illustrated by Table 3. In this case, a VE characteristic cited by one or few authors only has been considered as a non-shared issue. The description of each of them is given below.

Even if all the authors agree on the existence of an agent that acts as a coordination unit, there is no common viewpoint on its nature and role. While some stress that the coordination unit may be both internal and external to VE (Jagdev and Browne, 1998), others stress the crucial role of the leader firm (Tuma, 1998; Camarinha-Matos, 2001), or the importance of a small headquarter staff to deal with administrative and management details (Presley et al., 2001), or the function of the product integrator which distributes the manufacturing tasks and manages in parallel the product's physical and virtual value chains (Lefebvre and Lefebvre, 2002; Feng and Yamashiro, 2006).

Table 3 - Evidence from the literature review: non-shared issues

Issues	Non-shared literature evidence
Coordination unit	<ul style="list-style-type: none"> - <i>Coordination agent may be both internal and external to the VE</i> (Jagdev and Browne, 1998) - <i>Small headquarters staff dealing with administrative and management details</i> (Presley et al., 2001) - <i>The product integrator distributes the manufacturing tasks and manages in parallel the product's physical and virtual value chains</i> (Lefebvre and Lefebvre, 2002; Feng and Yamashiro, 2006) - <i>The participants are coordinated by a leadership team that understands who can help get things done</i> (Beckett, 2003)
Organisational structure	<ul style="list-style-type: none"> - <i>VE members self-organise their activities</i> (Mezgar et al., 2000) - <i>The relationship in a VE is mostly non-hierarchical in nature</i> (Jagdev and Thoben, 2001) - <i>The VE organisational structure is mostly hierarchical</i> (Feng and Yamashiro, 2006) - <i>A VE replaces hierarchy with incentives and formal and procedural coordination with communication systems</i> (Corvello and Migliarese, 2007)
Firm size	<ul style="list-style-type: none"> - <i>VE model bridges the gap between large and small firms</i> (Park and Favrel, 1999) - <i>VE is especially suitable for small and medium-size enterprises</i> (Wu and Sun 2002) - <i>VE appears as a business strategy for small and medium-sized enterprises</i> (Hsu and Hsu, 2008) - <i>There is a lack of e-commerce tools supporting the formation of VE among SMEs</i> (Davidrajuh, 2003)
Knowledge management	<ul style="list-style-type: none"> - <i>KM critical resource to achieve competitive advantage in VEs</i> (Pollalis and Dimitriou, 2008; Choi et al., 2008) - <i>KM support systems can provide the management of virtual organizations with effective means of meta-management</i> (Khalil and Wang, 2002) - <i>KM systems supported by web-based technology improve competitiveness of VEs</i> (Yoo and Kim, 2002) - <i>to establish common business processes that support a virtual enterprise physical, information and decision subsystems need to be integrated in an overarching KM framework</i> (Beckett, 2003)
Market relationships	<ul style="list-style-type: none"> - <i>Customer deals directly with the product integrator during product design or may interface with him/her through business platforms</i> (Lefebvre and Lefebvre, 2002) - <i>The manufacturer manages relationships with customers</i> (Jagdev and Browne, 1998) - <i>The agent will validate the identity of every member, manage service requests of every partner, reasonably distribute resources, and implement communication between customer and the cooperative object</i> (Huang et al., 2004)

Also with respect to organisational structure the literature offers no prevailing point of view. For Feng and Yamashiro (2006), VE organisational structure is mostly hierarchical and a leading company needs to create feasible process plans and select suitable partners,

based on product features and candidate partners' capabilities. Gunasekaran et al. (2008) also consider the VE as the integration of participating firms at different levels of cooperation. By contrast, Jagdev and Thoben (2001) consider that relationships in a VE are mostly non-hierarchical in nature. Also for Tuma (1998) one of the interesting features of virtual enterprises is the required lack of hierarchies. Further, Corvello and Migliarese (2007) stress that the VE replaces hierarchy with incentives and formal and procedural coordination with communication systems, whereas according to Mezgar et al. (2000) VE members self-organise their activities.

The role of firm size in the VE context generally appears underestimated. We believe that this shortcoming needs to be addressed as many industrial systems in more developed countries are populated by a large number of small company aggregations, as in the case of industrial districts. Few papers stress that virtualisation is particularly suitable for SMEs (Thompson, 2008; Wu and Sun, 2002); others consider the VE as a network that includes both large enterprises and SMEs (Martinez et al., 2001; Park and Favrel, 1999). For Katzy and Dissel, (2001) the partners potentially participating in the network are in most cases related parties; independent companies, but also decentralized profit centres or strategic business units of a global holding company.

Moreover, the literature seldom refers to the increasingly important role of knowledge and knowledge management systems in the context of VEs. Exceptions are Pollalis and Dimitriou (2008), Blecker and Neuman (2000), and Choi et al. (2008) who consider KM a critical resource to achieve competitive advantage in VEs; Khalil and Wang (2002) according to whom KM support systems can provide the management of virtual organizations with effective means of meta-management; Yoo and Kim (2002) who find that KM systems supported by web-based technology improve competitiveness of VEs; and Beckett (2003) who argue that the form of subsystem reference architecture may help defining the business processes needed by a virtual enterprise, considering the blend of tacit knowledge, codified knowledge and facilitating ICT tools used.

Finally, although the literature shows that the virtual enterprise is designed to create value from a business opportunity, it is not clear which specific participating company manages the relationship with the final user of the product/service. According with Lefebvre and Lefebvre (2002) the customer deals directly with the product integrator during product design or may interface with him/her through business platforms. In the view of Jagdev and Browne (1998) the manufacturer manages the relationships with

customers, while Huang et al. (2004) argued that an external security-based agent manages relationships among the VE partners and the customer (the product integrator).

2.2 Assessment of literature review and research questions

This section summarises the above literature review in order to identify gaps and define an appropriate research question. Considering the aspects of KM in SMEs, one of the main gaps that may be identified concerns the role of KM in the development of the SME networks. In such networks relationships and exchange of knowledge between focal firms (namely large companies acting as a product/service developers/integrators and maintaining relationships with customers) and small suppliers firms are critical to ensure the competitiveness of the entire network. For this reason, it is important to investigate the ways through which knowledge is spread across networks populated by small enterprises. The virtual enterprise offer an interesting perspective in this context as it is this new organisational model connecting firms (and then also small firms) for limited period of time through a strong technological support (namely ICT tools) and for achieving fast-changing market opportunities in partnership with of other firms of the network. As shown in table 3, firm size and the role of knowledge management are both important non-shared issues and need additional investigation.

Considering the above gaps, it is possible to define the main research question to be explored in this paper: what is the role of KM in the development of virtual networks participated by small firms?

In order to address the above research question, a questionnaire survey has been conducted in a high-tech SME network (ENTech hereafter) located in the eastern area of Naples city (Italy). The following sections describe the context of investigation, the methodology and the main results of the survey.

3 The context of investigation

The East Naples high tech network is an association of 25 SMEs founded in March 2007. The main objective of this association is to integrate resources and competences of the firms to seize the opportunities of the local market. The total number of employees is about 3,000 people and the total turnover is about 400 million Euros. The ENTech mainly consists of SMEs as shown in Table 4. In the table, the latest EU definition of SMEs proposed by the EU Commission has been used (European Commission, 2005).

Table 4 - The ENTech firms' breakdown by employees

Employees bands	N.	%
0-9	3	12
10-49	10	40
50-249	11	44
≥250	1	4
Total	25	100

Network firms operate in different high-technology manufacturing and service sectors as shown in Figure 1.

Figure 1 - ENTech high tech network: company sectors

Manufacturing companies	Aerospace	1	Aermec Sud
		2	ARM
		3	ASTRO Ind.
		4	Fox-Bit
		5	K4A
		6	Magnaghi Aeronautica
		7	Vulcan Air
	Engineering	8	Farina Impianti
		9	Mecfond
	Transport (lines, infrastructures and equipments)	10	AET
Service companies	Aerospace (Research & Development)	11	MARS
	ICT	12	Euro.Soft
		13	Intecs
		14	ITS
		15	Kell
		16	Naosys
		17	Null Pointer
		18	SRSe
	Management training and consulting services	19	Form & ATP
		20	Mater
		21	Protom
		22	Tecno-In
	Transport (system and service)	23	Ansaldo Segnalamento Ferroviario
		24	Lead Tech
	TLC	25	Canale Otto S.p.A.

The most part of companies are involved in aerospace and ICT sector. The total turnover increased by 28% in the period 2004-2007 and this led to a growth in investment by 21% in the same period. These investments are mainly aimed at developing new products/services or new professional skills as shown in Figure 2. Other relevant investment objectives consist of replacing obsolete technology, while increasing production capacity and performance improvement play a limited role in motivating company investment.

The ENTech network was chosen as an appropriate case for our investigation for four main reasons.

First, ENTech is one the most important networks of firms in the Campania region operating in high technology manufacturing and service sectors. Therefore, it has a critical impact on the economy of the entire region. The Campania region (and the Naples area in particular) is a long-established leader in producing complex components for the aerospace industry.

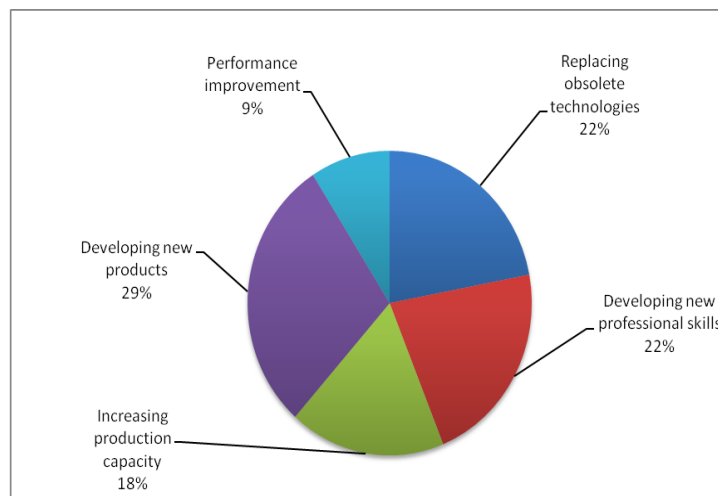


Figure 2 - ENTech main investment objectives

Secondly, most of the ENTech firms are integral parts of international manufacturing and technology supply networks especially with reference to the aerospace and railway industry. More specifically, some of the firms are first tier suppliers of the Alenia Aermacchi company (one of main partners of the Airbus consortium), EADS, Boeing, Bombardier and other domestic and international companies. Some others are main

suppliers of leading railways and defence companies such as Ansaldo Breda, Alstom, and Selex ES.

Thirdly, as with the Virtuelle Fabrik model proposed by Katzy and Crowston (2008), the ENTech network uses trust as internal governance mechanisms which are the basis for setting up virtual collaborative deals. Technology cooperation is complemented by the capability to identify market opportunities to be exploited through new project development.

Finally, the companies operating in the ENTech network are continuously involved in short-term technological innovation projects based on the integration and sharing of their own competencies. Projects are set up between the companies participating in the network and they dissolve once project objectives have been achieved (a sample of relevant projects examples are reported in Table 5). These virtual enterprises are generally aimed at engineering and manufacturing innovative products collaboratively.

4 Questionnaire survey methodology

After reviewing the tow streams of literature a questionnaire survey has been conducted. The survey methodology has been organised into the following five steps:

- a) Definition of basic survey objectives and preparation of the draft questionnaire.* In this phase a draft version of the questionnaire has been prepared together with the basic survey objectives.
- b) Establishment of focus groups.* In order to test the suitability of the basic survey objectives and the comprehensibility of the draft questionnaire a focus group involving 8 experts with different competences and professional background was established. The focus group has been developed in three different phases. Firstly, the topic investigated has been presented in order to make focus group participants familiar with it. Secondly, the draft questionnaire has been submitted to the panellists in order to get their useful feedback and comments. Finally, panellists' remarks have been discussed in a plenary session.
- c) Re-focussing of survey objectives and questionnaire.* On the basis of feedback received during the focus group discussion, the questionnaire has been finalised. Most of the questions included in the questionnaire are based on a Likert scale ranging from 1 to 9. Some other questions allow more qualitative answer in order to allow respondents to express their own personal opinion.

d) *Test of the questionnaire.* In this step, the final version of the questionnaire has been tested through 3 pilot interviews carried out in ENTech network.

e) *Survey implementation.* The survey has been conducted in spring 2008. The total number of respondents is 18 out of 25 companies with a response rate of 72%. The questionnaire has been submitted during face-to-face interviews involving at least two managers with different skills and role (e.g. a manager involved in the strategic firm decisions making process and a manager involved in the operation management). This allowed obtaining both strategic and operational perspectives.

In order to have a more comprehensive picture of the ENTech network, information from complementary sources (e.g. company websites, company reports and industry magazines) have been collected and analysed.

5 Survey findings

This section presents findings emerging from the empirical survey. In particular, the findings presented here are related to the questionnaire sections analysing firm relationships and knowledge management practices.

5.1 Firm relationships

In this section the relationships among the firms are analysed. Such relationships have a dynamic nature due to the collaborative projects undertaken by ENTech network firms. The survey investigated the nature of relationships among firms belong to the network. Findings are shown in Figure 3 where each bar represents the number of firms out of the 18 respondents that are engaged in a particular type of collaboration.

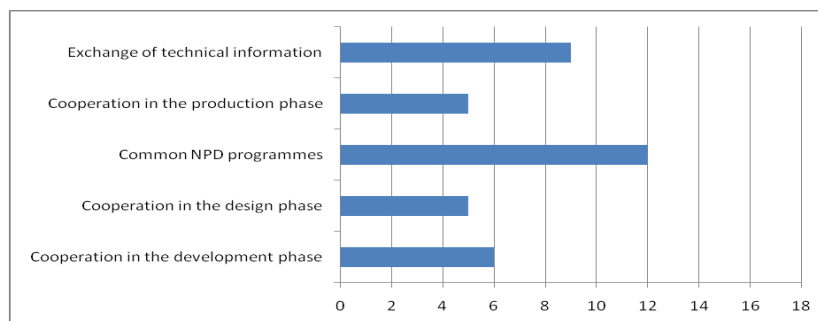


Figure 3 - Nature of relationships

Relationships in the production, design and development phase account for only a limited percentage. The most important forms of relationships are the involvement in common shared new product development (NPD) programmes and the exchange of technical information.

In order to provide a more detailed picture of collaboration within the ENTech network, a sample of projects currently undertaken is shown in table 5. In such projects, the proposer not always assumes the role of coordinator. Sometimes the coordination of the project is committed to another firm involved in the partnership.

Table 5 - ENTech collaborative projects as potential VEs

Project name	Project Description
Electric aircraft	Mixed electric propulsion aircraft
KA-2H	Innovative helicopter
SAC	Composite anti-crash system for helicopters
SAEG	Steering electric innovative system
RTA	Advanced coverings for aircraft industry
IRENE	Space capsule for picking up cosmic dust
SPA	Advanced system for satellite antennas polymerisation
HM&M	Health monitoring and management system for space aircraft
FSL-EC	Study of human - computer interaction systems
Liquid bag buffers	Development of liquid bag buffers systems for innovative bearing
HPF	Heat pipes for spatial vehicle control
3D Modelling	Real time capture system of 3D models
Tele-medicine	System for the application of telemedicine and remote-medicine using satellite system
SIGRI	Information system for monitoring and control of forest fires

According to the competencies required, each project listed in Table 5 may be a potential VE involving ENTech network firms. The development of collaborative projects is the main objective of the partnerships in the VE model. This makes the ENTech network a context for the creation and implementation of VEs.

5.2 Knowledge management practices

In order to develop collaborative projects, companies generally tend to adopt knowledge and information management tools (Figure 4).

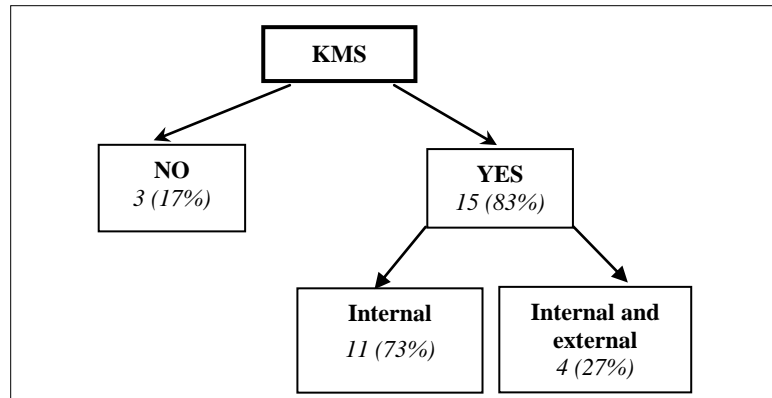


Figure 4 - KMS adoption in ENTech

For this reason, the usage of Knowledge Management System (KMS) has been explored. Firstly, the survey indicated that 83% (15 firms) of the sample firm have a KMS in place 73% of these companies (11) adopt an internal KMS. The most widespread tools of internal KMS implementation (Figure 5) are the Internet website (87%), work teams (87%) and intranet (67%).

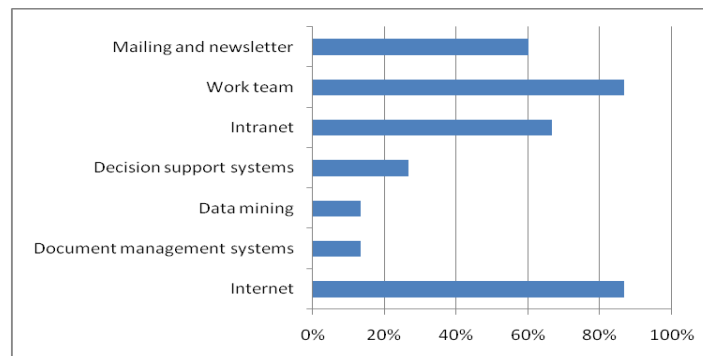


Figure 5 - Internal KMS implementation tools

The high importance attached to work teams demonstrates that, in high technology sectors, interactions and interpersonal relationships are a fundamental tool for problem solving. In this context, it is worth to distinguish between service and manufacturing firms. On the one hand, service firms operating in the telecommunications, ICT, and aerospace sectors generally tend to use advanced and structured KMS equipped with a document management system, data mining, decision support systems, and dedicated

work team. On the other hand, manufacturing firms working in the aerospace sector as sub-suppliers, use a less structured KMS finalised to management control and business resource management.

Although only 4 firms use internal and external KMS, each single firm investigated claimed for wider KMS embracing the entire East Naples high tech network. For this reason, the benefits of a KMS serving the entire firm network have been analysed (Figure 6). In the figure the average value of answers for each expected benefit is reported.

The figure interestingly shows that a KMS serving the entire East Naples high tech network may have a positive impact not only on the innovation and the operational management, but also to better understanding of the marketplace. This feature further clarifies the potential support that a KMS can provide to VEs. In fact, the main aim of a VE is to exploit market opportunities using the competencies of member companies.

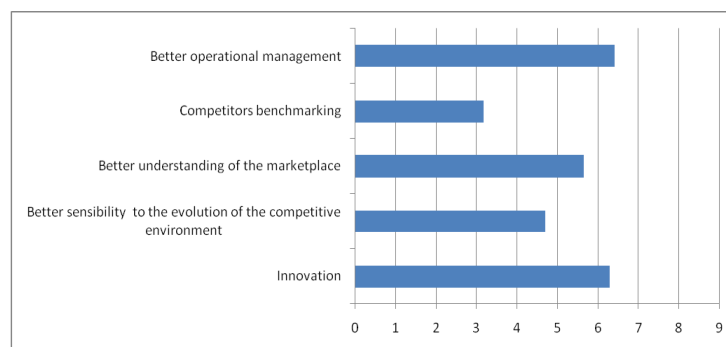


Figure 6 - Expected benefits of the KMS

However, there are a number of barriers to implement KMS in the ENTech network (Figure 7). The unavailability of partner to share critical information, the safeguard against competitors and the need to protect critical information are the most relevant barriers. This suggests that companies seem oriented to preserve their own intellectual assets from the opportunist behaviour of potential partners. Such obstacles may be overcome through increasing mutual trust. This objective may be achieved stimulating the collaboration among firms.

Another aspect investigated relates to information that firms are willing to share (Figure 8) and obtaining (see figure 9) through the use of a KMS platform serving the East Naples high tech network. In both figures the average value of answers for each item is reported.

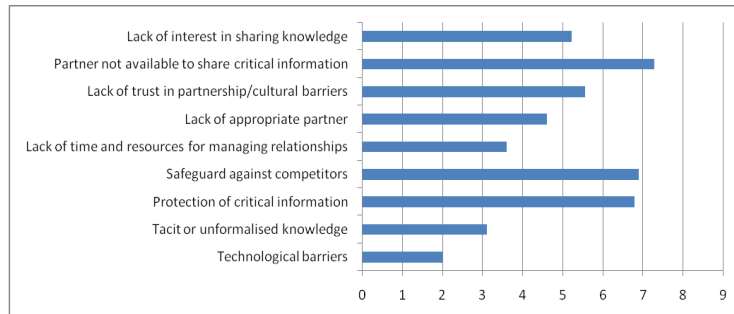


Figure 7 - Knowledge-sharing barriers

Simultaneously analysing figures 8 and 9, it emerges that firms show a strong appreciation about the implementation of a KMS platform to facilitate the diffusion of information on products/services. Other relevant information that firms are willing to share and obtain from a KMS concern market features and market opportunities. It is worth noting that firms show a special interest in sharing information on market opportunities.



Figure 8 - Information which firms are willing to share through a KMS platform

This is a common VE feature that literature has put in evidence (see table 3). The most relevant difference in the two figures above relates to information on relationships with institutions and funding opportunities. In fact, considering these two items it emerges

that firms view the KMS of the East Naples high tech network as a platform for mainly obtaining information.

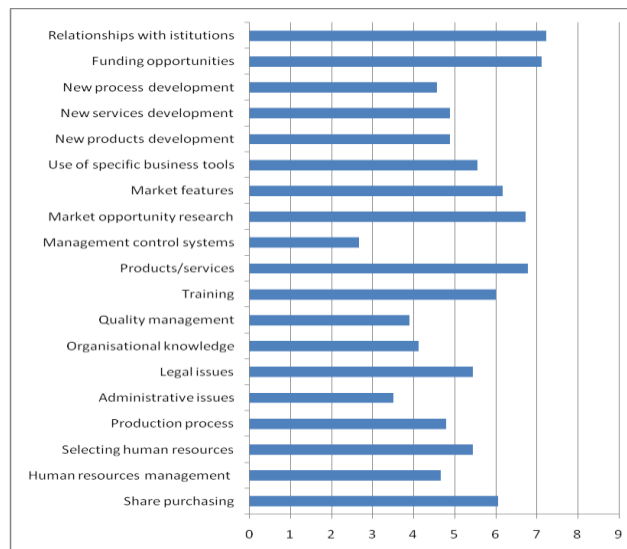


Figure 9 - Information which firms need to obtain from a KMS platform

6 Conclusions

The main aim of this paper is to address the following research question: what is the role of KM in the development of virtual networks participated by small firms?

In order to address the above research question, a questionnaire survey has been conducted in a high-tech SME network. The ENTech network was chosen as an appropriate case for our investigation for four main reasons. First, ENTech is an important network of firms operating in high technology manufacturing and service sectors with a critical impact on the local economy of the entire region. Secondly, most of the ENTech firms are integral parts of international manufacturing and technology supply networks especially with reference to the aerospace and railway industry. Thirdly the ENTech network uses trust as internal governance mechanisms, which are the basis for setting up virtual collaborative deals. Finally, the companies operating in the ENTech network are continuously involved in short-term technological innovation projects based on the integration and sharing of their own competencies.

The survey results show that the companies investigated have perceived the strategic value of managing knowledge processes and consequently adopt a variety of KMSs. In particular it emerges that:

1 - 83% (15 firms) of the sample firm have a KMS in place, 73% of these companies (11) adopt an internal KMS. The most widespread tools of internal KMS implementation are the Internet website (87%), work teams (87%) and intranet (67%).

2- service firms operating generally tend to use advanced and structured KMS equipped with a document management system, data mining, decision support systems, and dedicated work team.

3- manufacturing firms use a less structured KMS finalised to management control and business resource management.

4- each single firm investigated claimed for wider KMS embracing the entire network.

5- KMSs serving the entire network may have a positive impact not only on the innovation and the operational management, but also to better understanding of the marketplace. This feature further clarifies the potential support that a KMS can provide to VEs.

6- the unavailability of partner to share critical information, the safeguard against competitors and the need to protect critical information are the most relevant barriers. This suggests that companies seem oriented to preserve their own intellectual assets from the opportunist behaviour of potential partners.

7- firms are willing to share and obtaining through the use of a KMS platform serving the East Naples high tech network.

8- it emerges that firms show a strong appreciation about the implementation of a KMS platform to facilitate the diffusion of information on products/services.

9- firms are willing to share and obtain from a KMS concern market features and market opportunities.

The survey results allow the identification of a number of potential avenues for further research. The first research implication derives from the fact that SMEs generally use not updated KMSs instead of the newer ones. This issue requires further and in-depth analysis concerning the degree of alignment between KMSs used by SMEs and the nature of knowledge from both the ontological and epistemological perspectives.

Secondly, the literature review indicates that the vast majority of papers analysed have used quantitative or qualitative methodologies (with a prevalence of quantitative

methods). Considering that the KM phenomenon is characterised by both quantitative and qualitative elements, further research in this field should be based on multiple research methods used in combination (e.g. a triangulation approach).

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Mechanisms of enterprises' participation in sustainable local governance: The case of Poland

Katarzyna Dohn*, Katarzyna Sienkiewicz-Małyjurek

Institute of Management and Administration
Silesian University of Technology
Roosevelta St. 26-28, Zabrze 41-800, Poland

** Corresponding author*

Structured Abstract

Purpose – The range and configuration of public services depend on needs expressed by society, and the responsibility for the implementation of these needs within a given territory lies with basic public administration bodies. The provision of public services within the idea of sustainable local governance is possible as a result of cooperation between the public and private partners, business environment institutions and society. In this paper, we adopted definition of sustainable local governance as a process run by local governmental bodies within inter-organizational collaborative networks aimed to socially and economically boost a specific region, while respecting environmental protection and land development.

Design/methodology/approach – An approach based on both in-depth literature studies and empirical research was proposed. Two main types of public services were analysed: social (health care, education, culture, recreation, social care, housing, public safety) and technical (public transport, waste management, water management, recreation areas). The research was conducted from 2011 to 2013 in Poland, among privately-owned and state-owned enterprises in the range of the research project, entitled “Technological Foresight of Public Service Sector Development within the Silesian Metropolis”. After the project had been completed, these analyses were complemented as a result of in-depth literature studies and direct structured interviews with experts.

Originality/value - The study was conducted from the perspective of local authorities, of experts operating within the public sector, and finally from the perspective of enterprises. The use of studied mechanisms was identified, and the needs in terms of their development were analysed. In addition, the solutions for the elimination of restrictions concerning the cooperation between public administration and enterprises in the provision of public services were proposed. An innovative methodology, which includes opinions from the perspective of public administration, representatives of enterprises, and is additionally supplemented by the interviews with experts, enabled the analysis of the issue in a comprehensive manner.

Practical implications – Public administration needs information regarding the possibilities of involving enterprises in the process of providing public services within the idea of sustainable development. These analyzes enabled us to achieve the following results:

1. We identified the mechanisms motivating enterprises to participate in the public services provision.
2. We estimated scope of using and utility of enterprises' participation mechanisms.
3. We analysed the needs and methods of increasing enterprises' participation mechanisms in the public services provision.

These results were based on the statistical analysis.

Keywords – Sustainable local governance, Public services, Participation mechanisms, Collaboration, Public management.

Paper type – Academic Research Paper.

1 Introduction

The organization and course of social life depend on many functional factors. These include, among others, the supply of necessities, the movement of persons and goods, health care, water management, waste management, administration, culture and education. These factors are elements of public services, which cover all goods meeting the needs of and services provided to the general public. The range and configuration of public services depend on needs expressed by society, and the responsibility for the implementation of these needs within a given territory lies with basic public administration bodies. However, the development of social and economic life runs increasingly ahead of the authorities' ability to meet citizens' expectations as for the type and quality of public tasks, especially taking into account the principles of sustainable development. In addition, the experience of developed countries shows that only knowledge-based economy leads to the sustainable development of local government. This approach enables the growth of comprehensive actions that create new products and services. This is due to the specific nature of innovation processes which take place in the context of inter-organizational and inter-sectoral collaboration centred around a given issue (Peled, 2001; Sienkiewicz-Małyjurek, 2013).

Due to these conditions, the public sector should become interested in engaging the private sector in the provision of public services. However, the private sector has no obligation to participate in these tasks. Private sector entities might participate on a

voluntary basis, if such a move appears to them as a beneficial and desirable one. Therefore, the following questions arise:

1. What mechanisms are used to motivate the private sector to participate in public service provision?
2. How useful are the enterprise participation mechanisms in public service provision?
3. What factors and to what extent affect the use of the enterprise participation mechanisms in public service provision?

The aim of this article is to answer these questions.

2 Research methodology

In the article, the subject of the study are the mechanisms of collaboration of enterprises in the provision of public services. The time range covers the period from 2011 to 2013 and the spatial area of the Silesian Metropolis, formerly known as Metropolitan Association of Upper Silesia (Polish: *Górnośląski Związek Metropolitalny*), which includes 14 large cities with county rights (Provincial Spatial Development Plan of Silesia, Silesian Marshal's Office, 2004). The choice was determined by the possibilities of conducting the research, and by development dynamics of the region. The amount of GDP and investment outlays gives the Silesian Metropolis the second place in the regional division of Poland (Strategy for the Development of Upper Silesia..., 2010). In addition, considerable industrial potential of the country is focused in this area. The dominant industry sectors here are coal mining and metallurgy. Changes connected with the restructuring of the economy of the region caused modern branches, such as electronics, automotive and food processing, to develop here more and more rapidly (Strategy for the Development of Upper Silesia..., 2010). At the same time, the Silesian Metropolis and Ostrava Agglomeration are seen in Europe as the so called Moravian-Silesian Metropolitan Group, representing the core area of the cross-border region of Upper Silesia and Northern Moravia. It is, moreover, the sixth-largest urban-industrial concentration of the United Europe.

A part of the analyses was conducted within the research project entitled “Technological Foresight of the Development of Public Service Sector within the Silesian Metropolis”, and after the project had been completed, these analyses were supplemented with interviews with experts. Screening performed in the initial phase of the project

indicated that thematic panels should focus on the following issues relating to the various categories of public services (Bondaruk et al., 2009; Karbownik, Dohn, Sienkiewicz-Małyjurek, 2012a; Karbownik, Dohn, Sienkiewicz-Małyjurek, 2012b):

- culture: culture, physical culture and recreation, education;
- environment: water management - water supply and sewerage, waste management, keeping the environment clean and orderly, energy supply, public green;
- transport: services and infrastructure;
- health: health care, public safety, welfare services.

The study also includes services that are not covered by the above classification, and which link those areas (such as administrative and information services etc.). This classification is not a finite set, but is composed for the research purposes. Test procedure used here is based on both the in-depth study of literature, and empirical research. The latter is qualitative and quantitative, and uses the following methods: desk research, survey research and interviews with experts. The research was conducted in three stages:

1. Identification of enterprise participation mechanisms in public service provision.
2. Assessment of the scope of use and usability of the enterprise participation mechanisms in public service provision.
3. Analysis of factors affecting the use of the enterprise participation mechanisms in public service provision.

The research regarding the identification of the mechanisms of enterprise participation in public service provision was based on an analysis of industry documents, legislation and the available scientific literature. These sources depict the principles of efficient collaboration aimed at the provision of public services, without taking into account the scope of this collaboration. In fact, this constitutes the objective of further research - the analysis of the scope of use and usability of participation mechanisms. This research project was conducted in May 2011, using a questionnaire. Senior managers from 14 municipalities forming the Silesian Metropolis participated in it. Due to the fact that the project was originally meant to improve the transfer of research results to the realm of business, and to cause its actual spread there, the research encompassed also senior managers from 200 randomly selected companies of the areas of transportation, health, culture and environmental protection (with 50 companies from each area). The research process was concluded by interviews with experts, conducted at the turn of 2012 and

2013 among 15 people. The expert group comprised of specialists from government bodies, academics and entrepreneurs operating in selected areas: transportation, health, culture and environment protection.

3 Theoretical background

3.1 Collaboration of sustainable local governance

Sustainable development is nowadays a priority in the policy of many countries and international organizations, such as United Nations or the European Union. Contemporarily, the fundamental importance in this area is attributed to the regional development factors. This is due to the fact that the existing legislative measures give local governments independence and autonomy of decision in terms of their actions, so that they can directly shape the sustainable development in the area administered (Kozuch, Sienkiewicz-Małyjurek, 2013).

Local governance is the process, in which basic research consideration is given to the efficiency of the network of public entities linked by the power of local authorities or under the control of these authorities. Its specificity lies in the fact that it is performed by proper authorities, while ensuring the departure from caring for individual interests for the sake of common good of stakeholders of the local government, aimed at local development (Kozuch, 2012). Local development is understood as harmonized and systematic activities of both public authorities and all other entities within a given unit of local government. Such activities aim to create new and improve existing usability, form favourable conditions for the economy, and provide spatial and environmental order, in accordance with the principles of sustainable development.

However, local development consistent with the principles of sustainable development is not possible within merely individual actions of local governments (Mah, Hills, 2012; Agranoff, 2006, Lee, Feiock, Lee, 2012). This requires sustainable local governance, conducted by local authorities in inter-organizational collaboration networks. It aims at socio-economic development of the region, with respect to the environment and spatial planning, focused on the sustainable management of resources, and using modern instruments of public management (Kozuch, Sienkiewicz-Małyjurek, 2013). What forms the basis for the sustainable development of local government is inter-organizational

collaboration (Lozano, 2007). It stimulates collective action, enables responding to changes in local conditions flexibly, and also lowers the costs of action (Sullivan, Skelcher, 2002; Considine, 2013; Torfing, 2005). It serves to strengthen the relationships between local investors and social administration, the creation of networks and regional identification (Came'n, Gottfridsson, Rundh, 2011). Cooperation is also an essential element of knowledge management in the public sector (Wiig, 2002). This is due to its focus on the fulfilment of tasks and organizational learning, with the support of advanced technologies.

Terms and conditions of cooperation are determined by a set of values, beliefs, opinions and experiences of individual organizations and their members (van Winkelen, 2010; Rhodes et al., 2012). Past experience affects the perception and evaluation of partners, as well as shapes opinions and expectations. These factors are reflected in the level of trust and commitment to collaboration (Tubin Levin-Rozalis, 2008; Moynihan, 2009; Ryu., So, Koo, 2009; Caceres, Paparoidamis, 2007). Trust emerges as the result of the certainty and predictability of expectations towards other people, having faith in their good will, believing in usefulness of common interests and projects, even in an emergency situation (Tubin, Levin-Rozalis, 2008). Commitment, in turn, is the desire to use skills to their fullest, together with the willingness to effectively operate in the organization. In addition, commitment fosters collaboration through voluntary participation in the projects, despite the existing norms, obligations or beliefs. Moreover, inter-organizational collaboration is dynamic and subject to risk (Veal, Mouzas, 2010; Ehrengren, Hörnsten, 2011). The changing conditions have a critical impact on its course. Changing conditions might result from both the turbulence and uncertainty of the environment, and from the course of managing the process of interaction. These factors may reduce the level of trust and commitment towards joint undertakings, and thus may limit the level of collaboration.

Collaboration in public service provision requires certain outlays, but it might bring much more benefits. The private sector, while participating in the implementation of public service, engages primarily its financial resources, but it also make its systems, technologies or distribution channels available. In return, stable contracts, an opportunity to achieve high profits, technical knowledge, better branding, social legitimacy and influence are achieved. On the other hand, the state sector, while risking credibility as well as social support and influence, might achieve such benefits as: more innovative

services of increased quality, efficient use of public funds, increased investment opportunities, increased income, increased competitiveness, and increased social support. The benefits of collaboration in the provision of public services might greatly exceed outlays. First of all, as a result of revenues from services, acceleration occurs in the area of R&D, in particular in, for example, infrastructure, which is of benefit to all actors in the territorial system, including society, public administration, entrepreneurs, customers, etc. As a result of the involvement of the private sector, the efficiency of the investment might be increased, encompassing, among others, shortened time of preparation and implementation of projects, or increased innovation and quality of services offered.

The legitimacy of cooperation in the sustainable local governance is supported by local experiences from around the world. These include, among others, increased use of public transport and reduced car traffic in Edmonton, Canada (Khare, Beckman, Crouse, 2011), the formation of the Regional Centre of Expertise in Hamburg, Germany (Filho, Schwarz, 2008), and the limitation of greenhouse gases in Sao Paulo and Rio de Janeiro, Brazil (Martins, Ferreira, 2011). It may therefore be concluded that collaboration in the provision of public services favours the creation of new knowledge about this process, which affects the growth of innovation, entrepreneurship and effectiveness of sustainable operations of local governments. As a result, the competitiveness of a region increases, while maintaining the required standards of environmental quality.

2.1 Creating knowledge in sustainable local governance

Theoretical and practical interest in knowledge management in organizations gained importance in the last 20 years. Initially, knowledge management focused mainly around quite narrowly shaped possibility of converting tacit knowledge to explicit knowledge, in the context of its distribution by means of more or less complex systems (Lundvall, Nielsen, 2007). This approach allowed to comprehend the “nature” of knowledge in an organization, as created in two dimensions: epistemological (affecting sources of knowledge – explicit/ formal knowledge and tacit/ silent knowledge) and ontological (the relationship between individual, group, organizational, and inter-organizational knowledge (Rasmussen, Nielsen, 2011)). Undoubtedly, one might claim that the above-mentioned statements, in the context of knowledge management, cannot be directly mapped in relation to public administration. Numerous studies indicate that knowledge management in public administration comes down to the management of information

resources. The transition from information resources management in public administration to knowledge management generally boils down to transforming the data in hand-held archives into the data in the form of digital recordings and tools for selecting, updating and retrieving information. Management systems designed for individual resources are autonomous, since they were created solely for the use of certain services, with virtually no access for others. Current information management systems in public administration seem like “an overlay” on historically traditional solutions. A visible effect here is acceleration and simplification of the tasks previously performed manually. According to I. Maj (Maj, 2004), impediments connected with the transition from information resources management to forms of knowledge management might be of the following nature:

- the methodology of the approach to organization (enterprise) knowledge management is different among the theorists and practitioners of enterprise management, and different among the theorists and practitioners in the management of information resources in public administration;
- lack of funds or high costs of transition to integral solutions, which are usually not standardized, both with regard to IT tools, and system solutions;
- lack of knowledge about new solutions among public administration employees;
- lack of motivation among public administration employees.

The greatest potential for the creation of knowledge lies in the context of the implementation of the tasks entrusted to local governments, mainly regarding the provision of public services. In innovative processes, the participation of enterprises in the provision of public services favors bilateral absorption and transfer of knowledge related to both the technological, or organizational aspects, and the conditions of external environment. In addition, there are interdependencies between the level of development of the public sector and innovation of the private sector.

2.2 Mechanisms of enterprises' participation in sustainable local governance in Poland

Participation is the process by which stakeholders can influence the priorities for action, policy, resource allocation, and access to public goods and services (World Bank Group, 2014.03.15). It is based on the commitment of individuals and groups to the implementation of projects, and it helps to improve decision-making processes, activities,

and stimulate creativity and innovation. In public service provision, in order to ensure high quality of these services, it is necessary to act jointly. However, before it can happen, initiatives aimed at strengthening the relationship between public and private entities are requisite. Appropriate mechanisms of collaboration are introduced for this purpose.

In European countries, in order to increase private sector involvement in the provision of public services, a number of initiatives are introduced (e.g. specific tax incentives, pre-commercial procurement (Amanatidou, 2008; Cec', 2007; Vigoda-Gadot, 2004; Carruthers, Ashill, Rod, 2006; Arlbjörn, Freytag, 2012), but the dominant role in this area is played by public-private partnerships (Jamali, 2004; Cheung, Chan, LAM, Chan, Ke, 2012; Sjölander, 2007; Nisar, 2007; Jamali, 2007). In Poland, the array of tools that might be applied is as wide, and in the course of the conducted research and analyses, 10 basic mechanisms of engaging private enterprises in the delivery of public services were identified. The characteristics of these mechanisms are shown in Table 1.

Table 1. Collaboration mechanisms in public services provision in Poland

MECHANISM	DESCRIPTION
Public Procurement	contracts for pecuniary interest concluded between the contracting authority and the contractor, the subject of which are services, supplies or construction works
Public-Private Partnership	joint implementation of projects, based on the division of tasks and risks between the public entity and the private partner; in the contract for public-private partnership, the private partner is obliged to complete the project in return for remuneration, and to incur, fully or partly, the expenditure on the project's completion implementation, or to pass it to third party, whereas the public entity is obliged to cooperate in achieving the project, in particular by bringing own contribution
Legal instruments	contracts concerning entrusting the private sector with fulfilling a part of the public functions: contracts for services, service and management contracts, leasing agreement, concession agreement, other legally binding agreements
Financial Instruments	subsidies, subventions, grants - the state budget expenditure subject to special accounting rules, passed in order to fill in the missing funds for financing or co-financing of activities important to the public interest, in a strictly defined, unilaterally determined amount, non-repayable, free of charge and interest-free
Privatization	acquiring shares in the increased initial capital of sole-shareholder Treasury company created as a result of commercialization (transformation of a state-owned company into a privately-owned company) by entities other than the Treasury or non-state legal entities; selling state-owned shares in companies; disposing of all tangible and intangible assets of state-owned enterprise or company resulting from commercialization under the terms of legal acts by means of: selling the enterprise, bringing the enterprise to a company, leasing the enterprise for use against payment
Outsourcing	undertaking consisting of separating certain functions performed by the parent company from its organizational structure, and transferring these functions to other economic entities to be performed by them

Digitization	implementation of solutions for the transmission of data in digital form (personal computers, Internet, mobile phones), which poses increasingly better opportunities of remote communication and reception of information
Clusters	spatial and sectoral concentration of entities acting for the purpose of economic development or entities acting for innovation, research units and enterprises engaged in an economic activity [...], competing and cooperating in the same or related industries, and linked by a cooperation network
Activities of innovation support institutions	government institutions (Polish Agency for Enterprise Development, Industrial Development Agency, Regional Industrial Parks), regional organizations (technology parks, business incubators, technology transfer centres, centres of excellence, special economic zones), business environment institutions (both for -profit economic entities and non-profit organizations), training and consulting centres, special economic zones
Territorial Marketing	all strategic and technical approaches that are used by organizations (associations, units, public institutions, enterprises) in order to gain new resources and improve the efficiency and quality of completing projects set to meet the specific public needs, while maintaining the principles of ethics, leading to the fulfilment of certain missions

Source: own work based on: Dz. U. 2004 Nr 19 poz. 177; Dz. U. z 2010 r. Nr 113, poz. 759, Nr 161, poz. 1078, Nr 182, poz. 1228 – art. 2; Dz. U. z 2009 r. Nr 19, poz. 100, z 2010 r. Nr 106, poz. 675 – art. 1 i 7; Dz. U. 1996 Nr 118 poz. 561 – art. 1; Dz. U. 2009 nr 61 poz. 503 - §2 pkt. 8; Zarządzanie publiczne – elementy teorii i praktyki, pod red. A. Frączkiewicz-Wronki, AE, Katowice 2009; Sosnowska A., Poznańska K., Łobejko S., Brudlak J., Chinowska K.: Systemy wspierania innowacji i transferu technologii w krajach Unii Europejskiej i w Polsce, PARP, Warszawa 2003; Trocki M: Outsourcing: metoda restrukturyzacji działalności gospodarczej, PWE, Warszawa 2001; Polska 2030. Wyzwania rozwojowe, Zespół Doradców Strategicznych Prezesa Rady Ministrów, Kancelaria Prezesa Rady Ministrów, Warszawa 2009; Szromnik A., Marketing terytorialny, Wolters Kluwer, Warszawa 2010.

The identified mechanisms are present in Poland both independently, and simultaneously with other ones. They may also complement each other. Frequently, within a single mechanism several others are used, e.g. a public-private partnership uses legal and financial mechanisms that might successfully operate separately. A similar situation may occur in the case of territorial marketing, or innovation support institutions. The mechanisms presented in Table 1 were used in the research concerning the scope of participation of enterprises in the provision of public services.

4. Empirical data analysis

4.1 Mechanisms of enterprises' participation assessment in sustainable local governance

In order to determine the usability of the various mechanisms of enterprises' participation in sustainable local governance, an analysis of the level of their use was

conducted. The results of these analyzes allow one to conclude that both the public sector and the private sector possess experience necessary to assess the identified mechanisms.

The analysis of the level of use of enterprises' participation in sustainable local governance indicates that all of these mechanisms are implemented in practice. The mechanisms utilized to the greatest extent are: procurement (66.1% of total responses), territorial marketing (40.5%) and financial instruments (34.5%). The least frequently pointed out to are: digitization (11.9%) and clusters (15.5%). The results of research carried out in enterprises is somewhat different, with - after the dominant role of public procurement (89.7% of responses) - digitization and activities of innovation support institutions considered to be the most frequently used tools of participation in the creation of public services. In turn, the least frequently pointed out to are: privatization (16.3%), public-private partnerships (28.2%), and - as in the case of local governments - clusters (28.6%).

The level of mechanisms of enterprises' participation in sustainable local governance is largely determined by their usability, understood as the ability to meet existing needs. The research taking the opinions of local governments, enterprises, and experts into account found that the highest rated mechanisms are financial instruments. Legal instruments and digitization were also highly rated. Clusters, privatization and outsourcing were perceived as the least useful. The distribution of ratings, accounting for the average values for the confidence interval $\alpha = 0.05$, is illustrated in Figure 2.

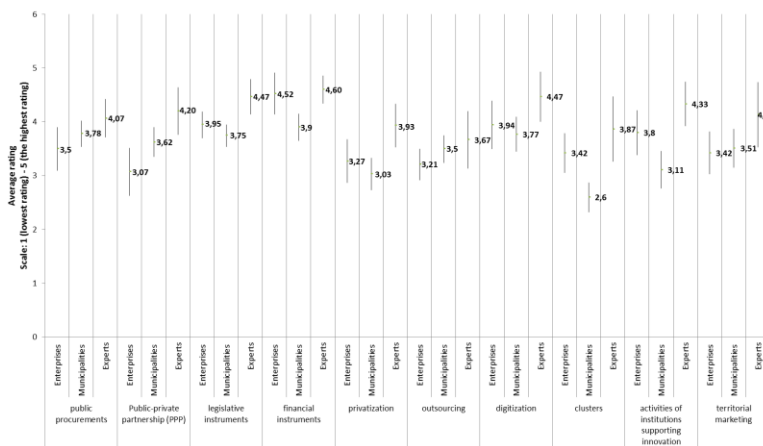


Fig. 1. Assessment of the usability of the instruments of enterprise participation in social services provision

Source: own work

Moreover, the analysis of the observations and comments revealed that the main limitations in the provision of public services on the basis of the relationship between public and private entities are: operations taking more time than when performed separately, the lack of agreement, the risks associated with the functioning of partnerships (e.g. infringement of the rules), bureaucracy, or loss of control of the expansion of networks. These factors may discourage companies from collaborating in the provision of public services. It also unveils the need to improve the undertakings motivating companies to participate actively in this area. In order to eliminate the impediments of cooperation in the provision of public services, the respondents propose the use of the following solutions:

- Laws stabilization;
- Pilot Project;
- Sureties, cancellation of taxes;
- Shortening the way of legal decision to implement;
- A coherent and well thought out policy of public service delivery arising from the verification of social needs, compatible with the national programs;
- Handing over a wider range of tasks from local governments to the non-profit sector;
- Joint planning of public infrastructure development.

4.2 The analysis of the factors motivating enterprises to participation in sustainable local governance

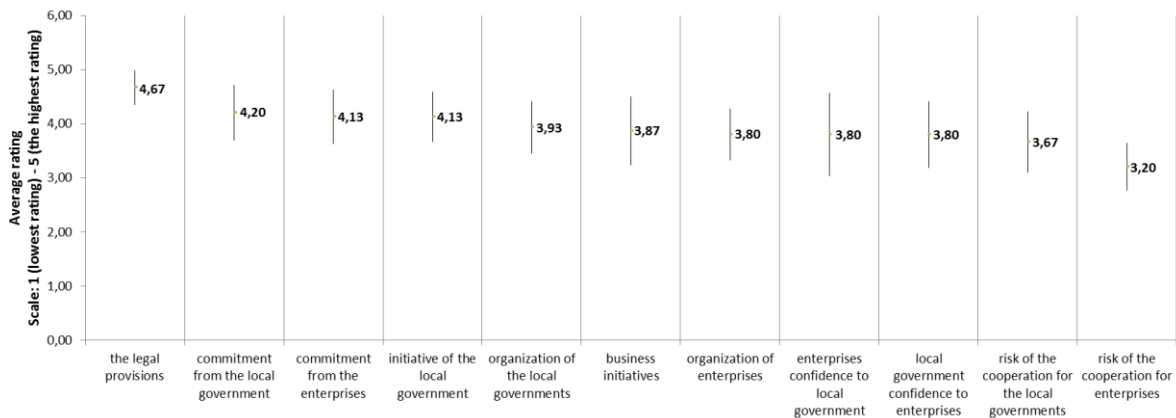
The analysis of the factors that motivate enterprises to participate in sustainable local governance was based on interviews with the experts. On the basis of the analysis of descriptive statistics, it was found that the experts see the need to increase the use of most of the mechanisms of participation, but to a different extent, depending on a given mechanism (cf. Table 2). The needs to increase the investment in innovation support institutions, territorial marketing and digitization are perceived as the greatest ones. Moreover, the experts believe that, in the studied area, it is not expedient to increase the use of privatization and public procurement.

Table 2. Descriptive statistics in the study of the need to increase the use of the mechanisms of enterprises' participation in sustainable local governance

	public procurement	PPP	legal instruments	financial instruments	privatization	outsourcing	digitization	clusters	business support institutions	territorial marketing
Mean	2,60	4,20	3,07	3,53	2,67	2,80	4,53	3,87	4,67	4,53
Standard Error	0,190	0,200	0,206	0,274	0,319	0,312	0,322	0,215	0,126	0,133
Median	2	4	3	4	3	3	5	4	5	5
Mode	2	4	3	4	3	2	5	4	5	5
Standard Deviation	0,737	0,775	0,799	1,060	1,234	1,207	1,246	0,834	0,488	0,516
Sample Variance	0,543	0,600	0,638	1,124	1,524	1,457	1,552	0,695	0,238	0,267
Kurtosis	-0,47	4,01	-1,35	-1,07	-0,78	-0,93	5,24	0,50	-1,62	-2,31
Skewness	0,841	-1,447	-0,128	-0,100	0,214	0,157	-2,516	-0,579	-0,788	-0,149
Range	2	3	2	3	4	4	4	3	1	1
Minimum	2	2	2	2	1	1	1	2	4	4
Maximum	4	5	4	5	5	5	5	5	5	5
Sum	39	63	46	53	40	42	68	58	70	68
Count	15	15	15	15	15	15	15	15	15	15
Confidence Level (95,0%)	0,408	0,429	0,442	0,587	0,684	0,668	0,690	0,462	0,270	0,286

Source: own work

The study also allows one to state that, according to the experts, the increase in participation of enterprises in the provision of public services is to the greatest extent influenced by legislation and the involvement of local governments. These factors, on a scale of 1 to 5, received respectively 4.67 and 4.2 points. Such factors as engagement on the part of businesses and initiatives of local governments were also highly rated. According to experts, among the identified factors influencing the increased use of mechanisms of enterprises' participation in sustainable local governance, interaction risk is the least important. These results are illustrated in Figure 2.



Source: own work

Fig. 2. Factors influencing an increase in the use of the mechanisms of enterprises' participation in sustainable local governance

To assess the internal reliability of the items, Cronbach's alpha was used. Assuming the threshold of 0.7 as satisfactory (Cronbach, 1951), it was found that all the obtained results are reliable. The results of performed tests are shown in Table 3.

Tab. 3. Statistics of reliability in the study of mechanisms of enterprises' participation in sustainable local governance

Reliability statistics		VAR sum	VARP	Cronbach α
assessment of the level of use of participation mechanisms (k = 10)	Enterprises	1,89	5,33	.716
	Local governments	1,90	6,17	.769
assessment of the usefulness of participation mechanisms (k = 10)	Enterprises	36,09	172,47	.878
	Local governments	35,76	201,73	.914
	Experts	7,96	40,19	.891
assessment of factors affecting the use of participation mechanisms (k = 11)		12,34	68,826	.903

Source: own work

The results of this research clearly indicate that the implementation of public tasks in Poland must frequently cope with excessive formalization, bureaucratization and administrative “proceduralization” of support mechanisms. As a consequence, the effects of collaboration between the public and private sectors are of an unsatisfactory level,

since it is based mostly on the mechanism of procurement. In the field of public procurement, in over 90% of cases, the only criterion for the selection of the tenderer is the price, despite the fact that the legislature provides the contracting party with many opportunities of the evaluation of products and services. This allows one to not only choose the products best suited to the needs, but also take into account the social and environmental criteria - socially useful ones. Unfortunately, setting the price as the sole criterion in selecting the contractor is theoretically the simplest and leaves the least room for malpractices. In turn, using the support of so few instruments in the provision of public services leads to avoiding innovative and risky development projects, for the sake of safe and routine activities, which might consequently curb self-sustainability.

5 Conclusions

The partnership of local governments and private entities interested in cooperation is increasingly important in the provision of public services. This process undoubtedly increases the transfer of knowledge through mutual acquisition of experience.

Given the emergent importance of knowledge management in the public sector, particularly on stakeholder partnerships to assist public policy developments, it is regrettable that there still is limited guidance in the knowledge management literature on how governments can develop more effective partnerships (Riege, Lindsay, 2006).

The conducted research clearly indicates the need to involve more mechanisms to support the provision of public services. These actions will ensure a coherent and well thought out policy of public services provision, resulting from the verification of social needs, and based on joint planning of public infrastructure development. This is directly related to the fulfilment of the main priorities of sustainable development

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Corporate Governance and Technological Knowledge Development: A Configurational Approach

Subba Moorthy

Department of Management
Herberger Business School, St. Cloud State University
720 Fourth Avenue S, St. Cloud, MN 56301, USA

Structured Abstract

Purpose - Explore how corporate governance affects development of firm technological knowledge.

Design/Methodology/Approach - I conducted canonical correlation analysis on a large sample of US manufacturing firms. Five dependent variables, measured using firms' patent data, capture five dimensions of technological knowledge - breadth, depth, enhanced, new, and stagnant knowledge. Independent variables cover three dimensions of corporate governance – ownership concentration, managerial stake, and board composition. In addition, I included both industry and firm contextual variables, to increase the study's reliability.

Findings - Results indicate two types of firms. One group consisting of 'cautious generalists', wherein high breadth and depth of technological knowledge and a strong emphasis on enhancement is linked to concentrated shareholdings, increasing top management's stake in the firm by offering stock options, and a board low in accounting experience. In contrast, the second group's technology profile de-emphasizes breadth and focuses on deepening existing knowledge stock. This group has a relatively weaker emphasis on stock options to reward top management and a board with strong financial background.

Originality/Value - This study furthers our understanding of strategic management of technological knowledge in three ways: by developing theoretically meaningful components of a firm's aggregate stock of technology; constructing ratio-scale measures of those components - breadth, depth, enhanced, new, and stagnant technological knowledge; using canonical correlation analysis which, rather than multiple regression analysis, is the more appropriate technique to derive meaningful implications for managers.

Keywords: Technological knowledge, Corporate governance, Ownership, Board of Directors, R&D.

Paper type – Academic Research Paper

1. Introduction

Superior firm performance depends on effective corporate governance. All three ‘corporate governors’ – i.e., shareholders, managers, and board of directors – play important roles in their firm’s strategic management. As technology is strategically important for firm performance, it is well recognized that developing and maintaining the firm’s technological knowledge assets is a corporate governance responsibility (Baysinger et. al., 1991; David et. al., 2006; Hansen and Hill, 1991; Hermann et. al., 2010; Lhuillery, 2011; Premuroso and Bhattacharya, 2007). Most investigations, including those cited above, have almost exclusively focused on firms’ total stock of technological knowledge (measured using R&D expenses or patent counts). But studies on technology strategy clearly indicate that total stock is too aggregate a variable to yield useful results, and suggest taking a more fine-grained approach (e.g., Diaz-Diaz et al., 2008; Hall et al., 2005; Hall et al., 2007; Leiponen and Helfat, 2010; Moorthy and Polley, 2010). Responding to that suggestion, I argue for and develop five dimensions of – breadth, depth, enhanced, new, and stagnant knowledge – as being more relevant for studying firm technological assets.

We face a similar situation in studying corporate governance. It is a multidimensional construct, and inclusion of all three governance dimensions – ownership structure, managerial stake, and board composition – would yield richer dividends. The large number of independent and dependent variables that would be involved in such studies causes analytical challenges, which has been handled by statistically studying effects of one governance factor while holding the other two constant. Conceptually, such ‘divide and conquer’ approach does not make much sense. This is one reason for the ‘mixed and inconclusive’ results observed from studies on the performance effects of one or other of the governance variables (Bell et. al., 2013: 162).

So, it does not look promising to theorize and develop hypotheses on the independent effects of one governance variable on one technological knowledge dimension, or, at most, the combined effects of two governance dimensions on one knowledge component. The point is that any observed combination of breadth, depth, new, enhanced and stagnant technological knowledge is a result of complex interactions between owners, managers, and the board. Whether the technological knowledge profile of a firm is affected by differing corporate governance structures is, therefore, an interesting question to look into. As such, I report here on the empirical study I

undertook to explore the relationship between a firm's corporate governance and its technological knowledge development. In the section that follows I draw on knowledge management and agency theory literatures to explicate the five dimensions of technological knowledge and three dimensions of corporate governance meaningful for this study. The methods section that follows details how patent data can be used to construct meaningful measures of firm technological knowledge, and explains why canonical correlation rather than multiple regression is appropriate for analyzing the corporate governance – technological knowledge relation. After presenting results of the analysis, the paper concludes with a discussion of 'where we should go from here'.

2. Theoretical Arguments

2.1 Dimensionality of Firm Technological Knowledge

Organizations can develop knowledge in a variety of technological domains. Because of their limited resources, organizations are forced to make choices. By choosing to develop knowledge in one domain, they give up their option to develop expertise in other areas. Thus, an increase in knowledge in one technological field implies a lack of knowledge in another field. Such choices profoundly influence an organization's ability to be successful in the long run (Leiponen and Helfat, 2010; Moorthy and Polley, 2010; Subbanarasimha et al., 2003). Hence, decisions regarding the breadth and depth that firms want in their stocks of knowledge become important. It also immediately follows that the kinds of changes to be made in the existing stock to achieve a targeted breadth and depth are important as well. Thus, there are two aspects in capturing firm technological knowledge: the first is the stock aspect which captures the breadth and depth of technological knowledge a firm possesses, and the second is the flow aspect capturing changes in the firm's knowledge over time. Three types of changes can be made to a stock of knowledge. Some portions may be kept unchanged and other portions built upon. Further, technological knowledge in areas completely new to the firm can be added to the existing stock. These dimensions have been observed to affect firm performance (Moorthy, 2012). Thus, the three dimensions that capture the flow aspect of a stock of knowledge are stagnant, enhanced, and new technological knowledge.

Regarding the combinations of breadth and depth of technological knowledge that firms ought to develop, theories of expert learning and performance inform that depth of knowledge is important (Bower and Hilgard, 1981; Day and Lord, 1992). Depth of

knowledge permits firms to have a better and more complete understanding of any one area. In contrast, the technological imperative that firms face points to the need for maintaining some degree of breadth in their stock of knowledge. The imperative arises from the fact that most technologies are faced with the existence of competing technologies. Often, a desired outcome can be achieved using more than one technological method (Arthur, 1989). Hence, there is usually a need for maintaining a certain breadth of technological knowledge.

2.2 Corporate Governance: Factors Influencing Development of Technological Knowledge

Both organizational and environmental factors influence the development of technological knowledge. Organizationally, the players involved in a firm's corporate governance have the greatest impact on decisions about knowledge development. Typically, this happens to be the owner/manager, whose values and beliefs determine both types of knowledge a firm develops as well as the way it goes about their development. If the owner/manager happens to be the same person(s), then one set of values and beliefs affect knowledge development. However, in the case of publicly held corporations, ownership and managerial control do not rest in the same person(s). Three distinct social actors, consisting of owners, managers, and boards of directors are involved in the firm's corporate governance. As the goals of these three groups of claimants differ, and indeed often conflict, technological knowledge development becomes highly problematic.

Corporate governance is concerned with the mechanisms set up to reconcile the conflicting interests of shareholders and managers in publicly held corporations. Shareholders (i.e., owners) desire steady income from dividends and gradual appreciation in the market price of their stock. They have the flexibility of reducing their risk by holding a diversified portfolio of securities (Fama, 1980). In contrast, managers act 'so as to maximize their own lifetime incomes' (Monsen and Downs, 1965: 225). They rent their human capital (knowledge and competence), are dependent on the firm's success for their livelihood, and hence, desire security (Marris, 1963). While both shareholders and managers wish to maximize incomes, the difference is that managerial income consists of both monetary and non-monetary elements (Monsen and Downs, 1965). As shareholding disperses, firm operations may be conducted more to advance managerial interests than to fulfill owner goals (Berle and Means, 1968). There is, thus, a need for some sort of control to align the conflicting interests of owners and managers. This is achieved

through the establishment of a board of directors. The board, by virtue of its legal mandate to hire, fire, and establish compensation schemes for managers, safeguards shareholder interests.

Conflicting goals of owners and managers affect the strategic actions firms take in their search for long-term success. As an intermediary between shareholders and managers, board behavior also affects long-term performance. Thus, all three social actors play a role in corporate strategy, and therefore, in technological knowledge development. Evidence indicates that ownership concentration, managerial stockholdings, and diversification are related to R&D intensity (Hill and Snell, 1988; McEachern and Romeo, 1978). The present study adds to this research stream by investigating whether the same three factors, along with board composition and managerial option values, are related to distinct configurations of the stock and flow dimensions of technological knowledge -- i.e., to breadth, depth, stagnant, enhanced, and new technological knowledge.

2.2.1 Ownership Concentration and Technological Knowledge

Ownership concentration affects development of technological knowledge by affecting owners' coordination ability. If the firm's stock holdings are highly dispersed, then shareholder co-ordination becomes difficult, compromising their ability to affect the firm's strategy. Thus, to the extent that shareholdings are concentrated, owners' technological strategy will be elaborated in such a manner that the five dimensions of technological knowledge will enable the achievement of owners' values and goals.

2.2.2 Managerial Stockholdings, Rewards, and Technological Knowledge.

In the case of managers, the nature of their stockholding and rewards affects the technological knowledge that is developed. There is a fundamental asymmetry in the differential rewards facing managers. As returns to a successful innovation increase, the manager's take does not increase proportionately. But commercially disastrous innovations pose serious threats to a manager's position. Both aspects will act to increase a manager's risk-aversion (Monsen and Downs, 1965). A second risk-aversion source is managerial compensation. To decrease agency problems, owners provide compensation in the form of stockholdings and stock options. While such compensation schemes may decrease agency problems, they also decrease risk-taking by managers. As managers' stock holdings increase, their fortunes become more strongly tied to those of the firm. They are not as willing as owners to take chances on the uncertain payoffs of unknown

technologies. Consequently, we can expect managers to concentrate on exploiting the innovation potential of existing knowledge instead of developing new technological knowledge.

2.2.3 Board Composition, Background and Technological Knowledge

Evidence shows that firms include their boards in determination of corporate strategy (Andrews, 1981; Judge and Zeithaml, 1992), and often down to the functional level (Henke, 1986). Therefore, we can expect boards to participate in decisions regarding technological knowledge development.

When looking at board effects, theories inform us that an effective board should be composed of both insiders and outsiders. Though agency theory and stewardship theory differ about the primary role of a corporate board, with the former emphasizing the vigilance role of a board and the latter focusing on knowledge and social capital that boards bring to the firm, both agree that effective boards need both inside and outside directors (Carpenter and Westphal, 2001; Davis et al., 1997; Hillman and Dalziel, 2003; Kroll et al., 2008; Short et al., 2001). The empirical question is about the ratio of outside to inside directors that an effective board would have. To the extent that insiders -- i.e. members of the firm's management team -- dominate a board we would expect to see the managerial view of technological knowledge to dominate. In contrast, when the board is dominated by outsiders, and is a "participative board" then shareholder's interests will be served. A second property of the board that has a bearing on corporate technological knowledge is its members' functional and educational backgrounds. Backgrounds of board members will influence their understanding and appreciation of science and technology, and hence, the opinion about the role technology should play in the firm's long-term success. Professions have distinctive cultures and uncertainty avoidance is an important dimension along which any culture differs (Hofstede, 1980). Membership in professional bodies leads to socialization of the members into adopting particular values and beliefs. An individual member's attitude toward risk falls in line with that of the professional society's norms. This is particularly the case with accounting, financial, and scientific and engineering personnel, whose respective professional bodies tend to have strong norms.

2.3 Industry and Firm Contextual Factors

While a corporation's owners, top management team, and board of directors affect its knowledge development strategy, the technological knowledge ultimately developed is affected by both industry and firm contextual factors. The rate of technological change affects the breadth and depth of technological knowledge. With increasing change, firms may decide to keep pace with that change by constantly updating, and thus, enhancing knowledge in existing technological competencies. In contrast, it is equally possible that firms may decide to gain knowledge in areas of technology new to them because the nature of products and process requires this. Similarly, industry concentration and market growth affect the nature of technological knowledge that firms develop. The positive economic profits and market power possessed by firms in concentrated industries encourage them to take more risks. Therefore, firms may allocate resources to develop technological knowledge in a variety of technological fields resulting in greater breadth of technological knowledge. Alternatively, market power may result in complacency. Firms may not make concerted efforts to either maintain existing competencies or develop new technological competencies. The same arguments hold for firm-level contextual factors of profitability and product/market diversity. If profitability is high, the firm will have a higher level of slack. R&D is one area on which the firm may expend this slack -- on expanding either breadth or depth of technological knowledge.

In summary, we expect the five dimensions of technological knowledge to be affected by (1) ownership concentration, (2) managerial shareholdings and rewards, (3) board composition and background, (4) industry conditions of concentration and technological change rate, and (5) firm profitability and diversity.

3. Method

3.1 Sample

Data for this study are from six sources. US Patent Office data helped to calculate the technological knowledge variables. Ownership concentration data were obtained from the 1976 and 1977 issues of CDE Stock Ownership Directory published by Corporate Data Exchange, Inc. Mueller (Mueller, 1986) provided managerial shareholdings and option values information. Profitability data were obtained from the National Bureau of Economic Research R&D Master Data Tape (Cummins et al., 1985). Firm diversity was

measured using data from the EIS/TRINET database. The technological change variable was constructed using data from the Yale Industrial R&D Study (Yale Survey, 1983).

Availability of data dictated the use of variables in the statistical analysis. Obtaining patent statistics for firms by the technology classes was the most difficult. As these data were available for just the 1967-72 and 1973-79 periods, all other information had to be collected for one of these periods. Given the difficulty of obtaining past data, it was decided to collect data on the independent variables only for the second (1973-79) period -- the more recent of the two periods. When data from all sources were merged, the sample size containing no missing values turned out to be very small -- a total of 32 cases. It was therefore decided to conduct two separate analyses with different sets of independent variables chosen to obtain a sample size adequate for conducting statistical analyses. This resulted in one subsample of 57 cases consisting of ownership dispersion variables, and a second subsample of 81 cases consisting of managerial shareholding and board composition variables. The context variables were present in both the subsamples.

3.2 Measures

3.2.1 Technological knowledge variables

Measuring the stock (i.e., breadth and depth of knowledge) and flow (i.e., changes in knowledge) dimensions of technological knowledge required information on the nature of technologies for which patents were issued. This information was obtained from the U.S. Patent Office files. To facilitate patent examiners' search of existing patents, the Patent and Trademark Office has constructed an elaborate classification scheme consisting of 352 different classes of technology (the detailed names and titles can be found in the US Patent and Trademark Office Manual of Classification, 1983). When a patent is granted, the technology class to which it belongs is noted on the patent document. The technology class information can be used to construct measures of the stock and flow dimensions of a firm's technological knowledge as described below.

3.2.1.1 Technological Knowledge (Stock)

Suppose a firm's total number of patents is distributed over n patent classes. Let p_i be the fraction of patents that are in patent class i . Then a measure of technological knowledge is:

$$\text{Technological Knowledge} = 1 - \sum p_i^2 \quad (1)$$

This Herfindahl-type index ranges from 0 at the lower end (implying technological knowledge in a single class) to a theoretical maximum of 1 (implying technological knowledge spread over a wide range of classes). One shortcoming of the measure is that it does not provide any indication of the spread of patents across patent classes. The measure can be modified to overcome this lacuna. Adding and subtracting $1/n$ in equation 1 yields:

$$\text{Technological Knowledge} = (1 - 1/n) - \sum [p_i^2 - (1/n^2)] \quad (2)$$

i.e., $\text{Technological Knowledge} = \text{Tech Knowledge-Breadth} - \text{Tech Knowledge-Depth}$

These measures of breadth and depth of technological knowledge were calculated for the sample firms. Information on the technology classes to which a firm's patents belong was available only in an aggregate form for two periods -- 1967-72 and 1973-79, and not on a yearly basis. Thus, the technological stock variables were calculated for the 1973-79 period and the flow variables were calculated for changes in knowledge between 67-72 and 73-79 periods.

3.2.1.2 Technological Knowledge (Flow)

Three measures capture changes in knowledge between the two periods. If TPAT is the total number of patents the firm applied for and was granted during both period one and two - i.e. during the years 1967-79, then the three measures are calculated as follows.

- i. **Tech Knowledge - Stagnant** measures stagnant technological knowledge - i.e. technology classes in which expertise created in period one was not developed further in period two. This is calculated as $\sum \text{pat}_i / \text{TPAT}$, where pat_i = number of patents in technology class i in period one, in which class no additional patents were obtained in period two.
- ii. **Tech Knowledge – Enhanced** captures knowledge possessed by the firm in various technological fields in period one that was enhanced in period two. It is calculated as $\sum \text{pat}_i / \text{TPAT}$, where pat_i = number of patents in period two that are in technology class i , in which class the firm already had patents in period one.
- iii. **Tech Knowledge - New** measures knowledge in those technology fields the firm possessed no knowledge in period one but developed in period two. It is

calculated as $\sum \text{pat}_i / \text{TPAT}$, where pat_i =number of patents in period two in technology class i , in which class the firm had no patents in period one.

3.2.2 Corporate governance variables

Three categories of governance variables are used in this study: (1) ownership concentration, (2) managerial stake, and (3) board composition.

3.2.2.1 Ownership concentration. Three measures index ownership concentration.

- i. **Ownership - # with 2%** is the number of shareholders having two (or more) percent of total stock. Higher values indicate greater dispersion of ownership.
- ii. **Ownership - % with 2%** captures percentage of total stock held in fractions of two (or more) percent.
- iii. **Ownership - % of top 5** being percentage of total stock held by the top five shareholders.

3.2.2.2 Managerial stake is captured with two measures.

- i. **Executive ownership** is measured by looking at the percentage of total stock held by the top five managers.
- ii. **Executive options value** is the dollar value of stock options granted to the top five managers calculated as a percent of their salary and bonus.

3.2.2.3 Board composition. Three measures capture this dimension of corporate governance.

- i. **Board outsider ratio** being the ratio of outside to inside directors.
- ii. **Board acting experience** measured as the percentage of directors with a functional background in accounting.
- iii. **Board finance experience** measured as the percentage of directors with functional background in finance.

3.2.3 Contextual Factors

3.2.3.1 Environmental factors. Three industry-level variables are used to capture the firm's environment.

- i. **Industry rivalry** measured using the industry's four-firm concentration ratio in 1972. For diversified firms in the sample, a weighted average was calculated where the percentage of total firm sales accounted for by each line of business was used as a weight.
- ii. **Industry growth** measured as average annual growth rate in value of industry

shipments between 1968 and 1978. Again, for diversified firms, a weighted average measure was calculated using percentage of firm sales in the particular industry as the weight.

- iii. **Industry technological change** was calculated using data from Yale R&D Survey (Yale Survey, 1983). Researchers at Yale University gathered data on technological change for each industry by surveying R&D managers. Using this data, a weighted average technological change rate was calculated for each firm in the sample. Weights were determined by calculating proportion of firm sales accounted by each industry in which it operated.

3.2.3.2 Firm contextual factors. Two firm contextual variables are used in the study.

- i. **Product diversity** was calculated using an entropy measure (Jacquemin and Berry, 1979). Suppose a firm is active in n 2-digit SIC industries. Then,

$$\text{Product diversity} = \sum_{i=1}^n p_i \cdot \log_n(1/p_i)$$

where p_i = share of firm's total sales accounted for by the i^{th} 2-digit industry segment. 1978 data were used to calculate diversity. 1972 data were used when 1978 numbers were unavailable. (Firm sales data by industry were available for just those two years.)

- ii. **Return on Capital** was measured as the average of yearly return on invested capital for the period 1973-79.

Three steps were taken to increase reliability of the results. One, all financial numbers were adjusted for inflation. Two, return on capital, had to be available for at least five of the study's seven-year period - 1973-79. Three, for a diversified firm to be included in the sample, industry technological change data had to be available for industries accounting for at least 80 percent of a firm's total sales.

3.3 Analyses

Canonical correlation. This study's focus is on exploring how configurations of a firm's technological knowledge are related to its governance structure as well as firm and industry contextual factors. Multivariate regression would have been an appropriate statistical tool if there were just one dependent variable – i.e., if firm technological knowledge were uni-dimensional. Given that we have five distinct dimensions of

knowledge, the analytical technique must be capable of handling five dependent variables. Separately regressing each of the five technological knowledge variables on the governance and context variables does not help determine whether there exists systematic relationships between specific combinations of dependent variables and independent variables. Canonical correlation analysis is the appropriate statistical technique for such a situation. It forms linear combinations of two sets of variables – one set for the dependent variables and the other for the independent variables. The combinations, termed canonical functions, are formed so as to maximize the between-set correlations. Because of multiple variables in each set, rarely does one canonical function account for all of the original variables' variance. After the first canonical function, the technique proceeds to form a second function with the variance that was not captured by the first function. The process continues until all the variance in the set with the smaller number of variables is captured – the dependent variable set in the present case as it has five variables compared to the independent variable set, which consists of either eight or eleven variables. As explained earlier (section 3.1), missing values necessitated splitting the sample into two subsamples. Industry and firm contextual variables are common to both subsamples. The first subsample contains only ownership concentration variables while the second includes managerial ownership and board variables.

3.4 Results

The sample covers a wide variety of manufacturing industries. Average annual sales vary from a minimum of \$27 million to a maximum of \$24 billion with a median value of \$554 million. Average annual R&D expenditures varied from \$6,000 to \$762 million with a median value of \$7 million. Total patents for the 1973-79 period varied from one to 4,309 with a median value of 46, and the number of technology classes over which the patents are spread ranged from one to 208.

Table 1 provides summary statistics and Pearson correlation coefficients for the ownership concentration subsample, and Table 3 for the managerial ownership and board subsample. For both subsamples, canonical analysis provides five canonical functions. The first function was significant for ownership subsample, and the first two functions for the second subsample. Canonical correlation results are presented below for only these statistically significant functions.

3.4.1 Canonical Correlation Analysis with Ownership Concentration Variables. Table 2

In this subsample, the predictor set consists of the three ownership concentration variables, and the three industry and two firm context variables. Wilk's λ for the full model – i.e., with inclusion of all five canonical functions – is 0.29, and statistically significant; $F(40, 140.94) = 1.60, p < .02$. With the first canonical function removed, $F(28) = .97, p < .52$. Hence, Table 2 shows results for only the first function. Redundancy for the function is .24. Thus, 24 percent of the total variance of the dependent variable set is accounted for by the predictor variable set.

The table also helps answer two additional questions about the dependent variables. One, which of the five technology variables are important in the technological knowledge variate extracted by the first canonical function? All five are important based on using a cutoff point of .30 for interpretation of the structure correlations (column 1), as suggested by Tabachnick and Fidell (1983). As the signs indicate, breadth, depth, and enhanced technological knowledge load in one direction whereas stagnant and new technological knowledge load in the opposite direction. Second, how much of the five variables' variance is captured the variate? 48 percent according to Table 1.

The predictor variate is composed of four independent variables with industry rivalry, firm return on capital, and number of influential owners (Ownership - # with 2%) being positively related to each other. In contrast, stock held by influential owners (Ownership - % with 5%) has a negative sign indicating that it is inversely related to the other three. This variate captures 16 percent of the total variance (of the eight independent variables).

3.4.2 Canonical Correlation Analysis with Managerial and Board Variables. Table 4

In this analysis, the first two canonical functions are statistically significant. (For the full model, approximate $F(55, 304.46) = 1.81, p < .001$. With the first canonical correlation removed, approximate $F(40, 252.12) = 1.53, p < .03$, and with the first two canonical correlations removed $F(27, 196.32) = 1.13, p < .30$.)

Redundancy numbers show that the first canonical function accounts for 18 percent of the total variance of the dependent variable set. The dependent variate accounts for 47 percent of the raw variance of the five technology variables, with breadth and enhanced knowledge being positively related to each other but inversely to new and stagnant knowledge. Depth of knowledge makes no significant contribution to this variate. Only technological change (structure coefficient value of .33, in column 1 of table 4) contributes to the predictor variate. If we relax the .30 cutoff value, industry rivalry and

accounting experience of board members are the next two important contributors.

The second canonical function accounts for an additional 4 percent. The dependent variate here (column 3 of Table 4) shows heavy contributions of depth and enhanced knowledge (structure coefficients values of .87 and .54 respectively). This emphasis on depth is reinforced by the high value of stagnant knowledge but with an inverse relationship (structure coefficient = -.54). In the independent variate, market growth and profitability are the strongest influencers with supporting contribution by financial knowledge of the board (structure coefficients = .47, .53, .32 respectively, in column 3 of Table 4).

A surprising result is the role played by technological experience of board members. In the first variate, it does not play any role, and in the second it plays a negative role (structure coefficient = .17 and -.28, in columns 1 and 3 respectively).

4. Discussion

Two aspects will be highlighted in this section. The first subsection below will describe in more detail the two main patterns of governance-knowledge relationships implied by the canonical correlation analysis. This is followed, in the subsequent subsection, by a discussion of limitations to generalizability that is imposed by data as well as by using canonical correlation as the main analytical tool.

4.1 Corporate Governance-Technological Knowledge relationships: Cautious Generalists versus Focused Exploiters

Canonical correlation analyses point to two distinct configurations. The first configuration, to be found in the first canonical function in both Tables 2 and 4, and termed the cautious generalists, points to a situation where both breadth and depth of technological knowledge are important. However, while breadth is important, it is not attained at the expense of ignoring enhancement of knowledge in areas in which the firm currently has knowledge. The negative coefficient of new knowledge reiterates the point that firms do not go about obtaining breadth of knowledge by haphazardly developing knowledge in new areas of technology. This configuration of stock and flow variables is positively associated with rivalry and firm profitability. Surprisingly, technological change is not an important factor in this scenario. Of the governance variables, number of owners possessing two or more percent of total stock has a positive relationship, and

percentage of total stock owned by the five largest shareholders shows a negative relationship to the criterion variate, supporting our expectations.

With respect to managerial and board influences among the cautious generalists, the first canonical function in Table 4 shows that technological knowledge development is not related to the relative importance of outside directors. Instead, professional background of board members does matter - boards with high ratios of accounting professionals seem to frown upon high breadth of technological knowledge and upon enhancing existing knowledge. Concurrently, such boards appear to encourage rather than discourage development of knowledge in technological areas new to the firm. One explanation for this can be found in the contextual situation facing the cautious generalists. The positive coefficients of technological change and profitability in the predictor variate indicate that as these contextual factors grow stronger, accounting-dominated boards and concentrated ownerships de-emphasize enhancement of existing knowledge and push for developing knowledge in technological areas new to the firm.

The second distinct configuration of technological knowledge, termed focused exploiters, is profiled by the second canonical function of Table 2. Firms in this category prefer a technological strategy of focus -- concentrating on a few areas of technology and giving importance to keeping the firm's knowledge in the areas updated. The predictor variate associated with this technology strategy presents a situation where market growth, firm profitability and diversity, and board financial background are important. A strategy of focused technological knowledge is associated with an industry environment of high market growth and by firm conditions of low diversity and high profitability. Again, type of managerial reward is not related to technology strategy. Such a strategy seems to be influenced by boards having a high percentage of directors with experience in finance (or who represent financial institutions).

4.2 Limitations

This study is subject to limitations associated with use of canonical correlational analysis and content-based empirical studies. To increase reliability, canonical loadings rather than canonical weights have been used to decide the contribution that each variable makes to its canonical variate. However, loadings are also not stable across samples. Thus the specific combination of the technological knowledge variables making up the variates in this study may not be replicated in another sample. The specific configuration

of the five technological knowledge dimensions observed in this sample may not be found in other samples. However, it is encouraging to find that the knowledge variables have shown a tendency to fall into meaningful combinations. Future studies can, therefore, expect to find a firm's technological knowledge profiles to be systematically related to its governance structures.

Content studies, such as the one reported, have the advantage that they provide evidence of the consequences of managerial actions. Secondary data help measure and study the technological footprints left behind by the complex and interacting actions of shareholders, managers, and board directors. What is observed are the end results. What remains unanswered is how those results came to be – i.e., how the particular technological profile happened to get formed. To answer the question of 'how', one needs to capture and document the processes of interaction between owners, managers, and the firm's board of directors. This will no doubt be of practical utility to people involved in corporate governance. Apart from being time consuming, conducting such research is difficult because of the challenge of gaining access to observe top management and board meetings.

5. Conclusions

Results of this exploratory study are encouraging, and suggest that follow-up investigations would be useful. The current study contains a wide diversity of firms spanning many industries and of disparate sizes. This is useful in the sense that its results have greater generalizability. A negative consequence is that only simplistic prescriptions can be offered, if at all. To provide meaningful prescriptions we need increased accuracy. One way to achieve accuracy is to study the governance-knowledge relationships in narrow context. An obvious way to narrow the context is to choose specific industries where technological competence is crucial, such as in the pharmaceutical, telecommunication, and semiconductor industries.

This study used patent data from the 60s and 70s. While technological knowledge was important for competitive advantage even then, two significant changes have occurred. One, there has been a tremendous increase in the importance of software-based knowledge, relative to electro-mechanical technological knowledge, for achieving sustained competitive advantage. Thus, studies of the governance-knowledge relationships in software-based industries will be a useful contribution. Secondly, institutional investors have become an increasingly important type of shareholder, and

shareholder activism has increased. Their objectives and time horizons are rather different from non-institutional investors, and can affect decisions regarding importance of technological knowledge development. Preliminary studies indicate that family and institutional owners differential impact on R&D investments (David et al., 2006; Hansen and Hill, 1991; Kim et al., 2008). Follow-up studies on impact of owner type on technological knowledge development would be useful additions in this stream of work.

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Table 1. Descriptive Statistics and Correlations – Knowledge, Context and Ownership Concentration Variables^a

	mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Tech Know – Breadth	0.83	0.26	1.00												
2. Tech Know – Depth	0.06	0.05	.36	1.00											
3. Tech Know – Stagnant	0.19	0.18	-.34	-.29	1.00										
4. Tech Know – Enhanced	0.29	0.14	.39	.30	-.78	1.00									
5. Tech Know – New	0.13	0.18	-.21	-.19	.24	-.54	1.00								
6. Industry Rivalry	42.13	14.56	.20	.26	-.22	.25	-.23	1.00							
7. Industry Sales Growth	0.07	0.04	-.03	.17	-.07	.07	.16	.08	1.00						
8. Industry Tech Change	4.00	0.67	.26	-.13	-.03	.13	-.08	.32	.01	1.00					
9. Firm Product Diversity	1.18	0.61	.15	-.10	-.01	.11	-.07	-.09	.16	.05	1.00				
10. Firm Return on Capital	0.08	0.03	.27	.39	-.35	.33	-.10	.12	.34	.15	.06	1.00			
11. Ownership - # with 2%	34.81	21.11	.48	.29	-.37	.34	-.15	.01	.29	.18	.13	.56	1.00		
12. Ownership - % with 2%	44.46	17.31	.11	.07	.03	-.11	-.02	.14	.09	.18	-.02	.20	.34	1.00	
13. Ownership - % of top 5	25.60	16.22	-.25	-.13	.27	-.31	.07	.06	-.14	.02	-.12	-.18	-.44	.65	1.00

^a: correlations greater than or equal to .20 are significant at 0.05 level; n = 81.

Table 2. Canonical Correlation Analysis with Ownership Concentration Variables: Canonical Correlation, Structure Coefficients, Explained Variances, and Redundancies. (n = 57)

	Canonical Function 1		
	Str. ¹	Explained	Cumulative
	Coeff.	Variance. ²	Variance.
	(1)	(2)	(3)
<u>Dependent Variable Set</u>			
Tech Know – Breadth	.76	(.29)	
Tech Know – Depth	.63	(.20)	
Tech Know – Stagnant	-.77	(.29)	
Tech Know – Enhanced	.77	(.30)	
Tech Know – New	-.49	(.12)	
Variance ³	.51		.51
Redundancy	.25		.25
<u>Independent Variable Set</u>			
Industry Rivalry	.46		
Industry Growth	.05		
Industry Tech Change	.16		
Firm Product Diversity	.09		
Firm Return on Capital	.60		
Ownership - # with 2%	.72		
Ownership - % with 2%	.07		
Ownership - % of top 5	-.42		
Variance ³	.26		.26
Canonical Correlation	.71*		
Sqr. Canonical Correlation	.50		

¹ correlations between the variables and their constituted canonical variate.

² percentage of variance of the specific dependent variable accounted for by the independent variables' canonical variate. Calculated from the cross-loadings matrix -- i.e. from the structure

correlations of the individual dependent variables with the canonical variate of the independent variable set.

³ percentage of variance in the set of dependent and independent variables extracted by their respective canonical variate

Table 3. Descriptive Statistics and Correlations – Knowledge, Context, Managerial and Board Variables^a

	mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Tech Know – Breadth	0.84	0.26	1.00															
2. Tech Know – Depth	0.06	0.05	.27	1.00														
3. Tech Know – Stagnant	0.21	0.18	-.43	-.32	1.00													
4. Tech Know – Enhanced	0.28	0.14	.43	.32	-.78	1.00												
5. Tech Know – New	0.13	0.17	-.23	-.24	.18	-.50	1.00											
6. Industry Rivalry	41.02	15.25	.26	.18	-.21	.23	-.23	1.00										
7. Industry Sales Growth	0.07	0.04	-.08	.21	-.03	.05	.14	.04	1.00									
8. Industry Tech Change	3.93	0.68	.36	-.01	-.17	.18	-.14	.35	-.11	1.00								
9. Firm Product Diversity	1.18	0.67	.13	-.15	.13	.02	-.11	-.04	.19	-.04	1.00							
10. Firm Return on Capital	0.07	0.03	.23	.26	-.30	.35	-.09	.03	.33	.09	.06	1.00						
11 Executive Ownership	0.05	0.08	-.07	.09	.08	.05	-.11	-.02	.09	.12	-.25	-.15	1.00					
12 Executive Options Value	1.94	2.32	.19	.09	-.10	.16	-.03	.33	.12	.15	.12	.22	-.09	1.00				
13 Board Outsider Ratio	1.33	1.31	.04	-.12	.07	-.08	.11	-.01	-.08	-.07	.04	-.15	.19	-.13	1.00			
14 Board Technology Experience	0.27	0.15	.07	-.22	-.12	.03	.05	.11	-.15	-.10	-.13	-.15	-.01	-.07	.57	1.00		
15 Board Acting Experience	0.06	0.06	-.00	-.02	.10	-.20	.34	-.01	.02	.03	-.02	.00	.03	.01	.17	.00	1.00	
16 Board Finance Experience	0.09	0.10	.12	.17	-.14	.15	-.00	-.09	-.04	-.08	.19	-.12	-.08	.04	.19	-.08	.03	1.00

^a: Correlations greater than or equal to .20 are significant at 0.05 level; n = 81

Table 4. Canonical Correlation Analysis with Management and Board Variables: Canonical Correlations, Structure Coefficients, Explained Variances and Redundancies (n = 81)

	<u>Canonical Function 1</u>		<u>Canonical Function 2</u>		(5)
	Str. ¹	Explained	Str. ¹	Explained	
Variance	Cumulative	Variance ²	Coeff.	Variance ²	
	(1)	(2)	(3)	(4)	
<u>Dependent Variable Set</u>	-----	-----	-----	-----	-----
Tech Know – Breadth	.73	(.21)	.07	(.21)	
Tech Know – Depth	.08	(.00)	.87	(.25)	
Tech Know – Stagnant	-.54	(.11)	-.54	(.21)	
Tech Know – Enhanced	.74	(.21)	.54	(.30)	
Tech Know – New	-.72	(.20)	-.05	(.20)	
Variance ³	.38		.22		.60
Redundancy	.18		.04		.22
<u>Independent Variable Set</u>					
Industry Rivalry	.45		.12		
Industry Growth	-.26		.51		
Industry Tech Change	.53		-.20		
Firm Product Diversity	.27		-.44		
Firm Return on Capital	.34		.47		

Executive Ownership	-01	.09	
Executive Options Value	.23	.11	
Board Outsider Ratio	-.04	-.19	
Board Technology Experience	.17	-.28	
Board Accting Experience	.38	-.02	
Board Finance Experience	.11	.32	
Variance ³	.11	.08	.19
<hr/>			
Canonical correlation	.62***	.57**	
Sqr. Canonical Correlation	.38	.33	

1 2 3 see footnotes in Tabl

Knowledge co-creation for urban services innovation

Emma Puerari *, Grazia Concilio, Antonio Longo

Dipartimento di Architettura e Studi Urbani
Politecnico di Milano
Via Golgi 39, 20134 Milano

** Corresponding author*

Structured Abstract

Purpose – More and more cities are challenged by the general ineffectiveness of the public spending programme management and by the economic crisis. This affects the quality of urban services and the quality of urban lives. Coherently with this trend an international discussion started on the governance model behind urban service production: a model shift from public-private partnership (3P model) towards public-private-people partnership (4P model) is observed which is not yet analysed in depth (Majamaa et al., 2008; Zhang and Kumaraswamy, 2012). New urban initiatives are growing in number, which consider people relevant actors of the service ideation and creation aiming at developing effective environment for urban service co-creation (Sibukele et al., 2012).

Within the perspective above, the main purpose of the paper is to highlight the role of co-creation in urban service provision (Jégou, 2011; Manzini et al. 2008; Manzini and Rizzo, 2011). The paper wants to demonstrate how the 4P model represents a possibility to foster and drive large-scale changes in which different stakeholders can play meaningful role (Concilio, 2010; Fischer, 2006; Kernaghan, 2009). In particular it analyses what is the role of knowledge creation in idea generation for innovating urban public services.

Design/methodology/approach – Considering the main scope of the paper, the authors carry out a case-based analysis and report the results of a long process in the urban environment of the Milan municipality experience in rethinking urban green areas growth and management. The co-creation process is described considering its bottom-up nature and its interaction with the local administration when moving from deliberation to decision making. In particular it is analysed in order to envision how some small (self-organized) criticalities/opportunities (Puerari et al., 2013) emerged in the city of Milan can be captured, coordinated and amplified to play a meaningful role in defining/envisioning possible futures that can enhance larger changes. Hence, some specific co-creation sessions are described (with the use of cognitive mapping tools) and analysed in terms of knowledge contents and dynamics relevant for the shift from deliberation to decision making and the kind of governance models arising from the co-creation process.

Originality/value – The originality of the paper stays, first, in focussing on the role played by co-creation in the creation of knowledge and in the generation of ideas for the innovation of urban public services. Second, the methodological aim of the paper is

exploring the potentials arising when integrating co-design tools and methodology with knowledge mapping tools.

Practical implications – Cities are looking for new ways to create and produce urban services that can respond to citizens needs in a more effective way. Practical implication of the proposed paper are specifically related to the lessons learnt from the described experience and analysis of the Milano case within the framework of urban green areas development and management.

Keywords – urban services, innovation, private-public partnership, urban governance models.

Paper type – Academic Research Paper

1 Public Service Innovation

1.1 Why?

The general topic of innovation has inspired a vast amount of research, theorizing, speculation and wishful thinking (Kimberly, 1981), it has become one of the key “buzzwords” beloved by policy makers and practitioners around the world (Borins, 2001; Eshima et al., 2001; Albury, 2005). Innovation is different from changes that are gradual improvements and developments of existing services, provided by a public service organization, and/or their organizational context. Changes represent continuity with the past, whereas innovation represents a specific form of change: the introduction of new elements into public service, like new knowledge, new organization and/or new management or procedural skills; it represents discontinuity with the past. When the change represents a discontinuity, the supply of public service requires new structure, new skills and competence, it might involve the creation of a new organization and the meeting of a new need. Unfortunately, it is not possible to predict changes, assess their impact upon organization and service and develop adequate change and innovation; therefore producers, managers and suppliers of public services need to be able to deal with emergence, which is a phenomenon that can not be foreseen; changes and innovation in public services are transformational and evolving entities influenced by the context, composed by different layers as institutional, global, national and local arena (Osborne, 2005). Indeed, innovation is a very attractive concept that combines a determination to reform and improve public services (Osborne & Brown, 2013), with a perspective that

aims to a sustainable public service implementation and delivery.

Starting from this assumption, the White Paper *Innovation Nation* argues that innovation in public services “will be the essential to meet the economic and social challenges of the 21 century” (Department of Innovation, Universities and Skills (DIUS) 2008, p.8; see also Audit Commission, 2007), as increasing growth, performance, employment, knowledge and skills (Stephen & Lush, 2008; Tether, 2003). In fact, services are the fundamental tools for value creation and exchange, as well as their considerable implications for research, practice, societal well-being, public policy and new governance framework.

It is worthwhile to explore possible renewal of urban services within urban environments, due to the fact that cities and urban areas offer a critical mass experimentation in a large-scale open and citizens driven innovation environments; in fact cities are considered as innovation drivers in areas such as health, environment, inclusion and business (European Urban Agenda of the European Commission, 2010) and have to be considered as true containers of flows and exchanges among residents and other stakeholder attending the urban system itself (Dvir, 2005).

Cities are facing challenges to maintain and upgrade urban infrastructures and establish efficient, effective, open and participative innovation processes to jointly create the innovative applications and services able to respond to citizens’ needs. In particular in this time of growing complexity, due to the crisis of representative democracy, the globalization of culture and the economy, the rising cost of energy, the financial crisis and the subsequent economic crisis, the problem of fragmentation (diversity), the ageing of the population, the increasing interest (at all scales from local to global) in environmental issues (Albrechts, 2013).

1.2 What governance model? From 3P to 4P model

Traditionally, the supply of public services is associated with two types of agents: public or private. On one end the *bureaucratic Leviathan* (Hardin 1978) and the welfare state, on the other the contractual governance (Foldvary, 1994).

In the last decades it has been suggested that it is possible to establish *public-private partnerships* (PPPs) for services supply so integrating the potentials of both the sides of traditional services supply, imagining a situation in which the different parts are combined each time in different ways, according to the context (Ostrom, 1990). It is

possible to consider that “the concept of partnerships is generally described as a ‘mechanism allowing the mobilisation and co-operation of a great number of actors in order to mould the necessary political and operational consensus to affect directly the everyday life of all members of society’” (Paskhaleva, 2001, p.7), partnerships are believed to embody many advantages which are coincident with the presently acknowledged main criteria for sustainability – it requires consideration of multiple stakeholders’ interests, it implies a long term perspective based on common goals, and can accommodate a wide range of conflicting perspectives. Moreover, in order to define and classify the different type of PPPs it is necessary to understand (1) what they are seeking to do, what is their purpose and what are their focuses; (2) who is involved in this relationship, what are the key actors and how is their relationship defined; (3) the timing or stage of development of this process and the changing relationships and activities over time; (4) where this relationship has been built, considering the national and the policy context for each partnership (Osborne, 2000).

Therefore, the PPPs have been addressed as a key tool of policy across the world (Osborne, 2000; UNECE, 2008; Osborne & Brown 2011). Not only they have been seen as a cost-efficient and effective mechanism for the implementation of public policy across a range of policy agendas, also they have been articulated as bringing significant benefits in their own right, particularly in terms of developing socially inclusive communities. The main arguments that sustains PPPs are mainly three:

1. The withdrawal of the welfare state, which reduces the resources allocated for public services (social services, health, education, infrastructure, etc.) (Taylor et al. 1999; Avi-Yonah & Reuven S., 2000; Blomberg et al. 2000).
2. The ineffectiveness of public sector that are delivering low quality services, whereas private sector or private-public partnerships could be able to deliver better services at the lower cost (Dunleavy & Hood, C., 1994).
3. The bureaucratization of the public sector, which are undermine by a certain inertia due and its inability to innovate and to address new needs (Thiel & Leeuw, 2002).

Likewise, more recently many criticisms have been raised against PPPs that are charged to not be a real occasion of cooperation aimed to add value and share risk of public service provision, but rather to be a way to revert to traditional forms by contracting out and by separating responsibilities (Klijn & Teisman, 2003; Miraftab,

2004). The main critics to PPPs can be described along with five concepts:

- a) Accountability: some scholars pointed out some shortcomings in the accountability of many PPPs. (Willems & Van Dooren, 2011; Swingendouw, 2010).
- b) Autonomy and capacity: other problems could be related to the loss of autonomy and capacity of both stakeholders. There could be the risk of a loss of responsiveness to citizens needs instead of a marketization (Andrews & Van de Walle, 2013) and, on the other end, the risk for private actors of a loss of ability for independent public action and difficulties in the implementation of the partnership itself (Batley & Rose, 2011).
- c) Trust: there could be a need of rules and regulation mechanism aimed to maintain trust, due to the fact that synergy requires partners willing to look for new solutions for joint ambitions and for the exchange of information and ideas (Entwistle & Martin, 2005).
- d) Efficiency: it could occur a loss of capacity in responding to people needs and an inability to produce and deliver efficient public services (Börzel & Thomas, 2005; Hodge & Greve, 2007).
- e) Legal basis of the modern state: another important risk could be the blurring of the demarcation between public and private law (Osborne, 2000).

2 The 4P model

Developing from the criticism arose against the PPPs, and shortly described above, the most recent research begins to consider the possibility of potential new partnerships, stressing the need to improve the value of people in the implementation of urban services (Denhardt & Denhardt, 2011, p.42) through a vision of governance that includes the three main sectors (government, the private sector and civil society) and emphasizes process between many actors with different and sometimes conflicting priorities. People are not only recognized as drivers for shortening the distance between one problem and the way the service response to it is conceived and implemented; they are also viewed as creative communities that can activate processes of radical innovation in services conception and production (Alam, 2004; Boyle & Harris, 2010; see the idea of participatory and collaborative service systems by Manzini et al., 2008 or Baek et al., 2010). A reformulation of existing models is actually founded on the participatory governance

principles (Fischer, 2006) and, when dealing with participatory governance, partnerships are the fundamental structures to consider; therefore, it is necessary to investigate the possibility to reshape the existing types of partnerships. Following this vision, the literature is trying 1) to show how PPP projects have failed to produce certain characteristics, expressed in purchasing processes, which instead appear desirable, and 2) how it is possible to develop a new partnership involving the public and the private sector and people (Private, Public, People partnerships, the 4P model).

In fact, it is necessary that public purchasers and private providers understand the limitations of current practices in order to develop PPP in the future production of services geared more to the needs of users (Ahmed, 2006; Bovaird, 2007; Majamaa, 2008; Majamaa et al., 2008; Kernhagan, 2009; Zhang & Kumaraswamy, 2012). The *4P model* can represent an opportunity for innovation in the practices of urban services production and delivering, within an urban innovation engine (Dvir, 2005; De Witte & Geys, 2013). The public administrations should be able to take advantage of the ability of people to self-organize (Puerari et al., 2013) also using the technologies¹, capturing their needs to foster sustainable communities. They should take advantage from events of collaboration between citizens and institutions, using them as opportunities for a long-term local change, reaching common goals through dialogue, knowledge and resources sharing. The public administration, within these arenas (Denhardt & Denhardt, 2011), which represent the places (physical or not) where the exchange and the interaction between the different actors in the process of supplying urban services can occur, no longer represent the producer or the user; they can rather be, for example, simply the facilitators of the service creation and production, or the actors involved in the service management. The role of the different actors within these processes is flexible, fluid; it may have temporary value, it is determined by the specific context and time in which these innovation engines develop (Periphèria 2013).

Therefore, there is not an optimal model, in which public and private actors together with citizens can be combined to activate and maintain innovation engines, rather there is an infinite set of possible solutions established and defined by the context in which the innovation processes develop. The innovation itself becomes the continuous interaction between the different actors who collaborate in the production of urban services. The

¹*It is interesting to note how the available, accessible and collaborative technologies web 2.0, as blogs, Wikipedia, social-networks, can represent not only different ways for social interactions, but also a new type of citizen involvement in urban life, in the community and in the space of the city itself (Foth et al., 2011).*

stakeholders' engagement strategy has to follow different approaches in every city, defined by the specific context of services production. This includes both the number of additional stakeholders to be engaged and their specific power or ability to involve others that are strictly related to their institutional profile and cultural context.

3 Rethinking urban green areas: the case of Milan

3.1 The case of Milan

The reason for considering the “green areas” case of the Milan Municipality is threefold: 1) “green areas” represent a very traditional urban public service that a municipality is asked to supply and maintain to assure a high quality of life in the city, a good quality of the urban environment, sports, and *loisir* but also good urban ecosystem; 2) in many cities green areas maintenance is challenged by the economic crises so asking for innovation not only in the way maintenance is carried out but also in the service conceptual framework; 3) the whole Parks and green open spaces structure of Milan is currently under discussion and the deliberation process is highly participatory.

Moreover an on-going European project (<http://my-neighbourhood.eu>; <https://www.facebook.com/MyNeighbourhood.eu?fref=ts>), aimed at service co-design in neighbourhood environments, has recently conceived a support for citizens who want to take care of collective (even public) green open spaces; Quarto Gardening is the name of this initiative. In order to guarantee the public and collective value of the Quarto Gardening initiative a long interaction with the public administration has been activated that is producing new hypotheses about the way green public areas can be managed and maintained.

Finally inside the city of Milan many initiatives are emerging that show a increasing civic engagement of the citizens towards whatever has a public value: many social streets are being activated, many public areas are re-qualified by autonomous initiatives of the citizens. Citizens in Milan are showing their will of becoming operational owners of public spaces and start initiatives that are even challenging regulations and praxis of public spaces uses and transformations.

3.2 The material welfare of parks and green open spaces of Milan

The material welfare of Parks and green open spaces in Milan is characterized by the absence of a system that structures both the public and the protected areas, although the presence of rich facilities, that can be effectively used and maintained, and the variety of initiatives aimed at the care of green areas of the city.

Hence, the picture that composes the green open spaces of Milan is hardly to be recognized due to its fragmentation (Balducci et al., 2011). The city is confined in the administrative borders, but the associated social and economic dynamics belong to a mega-city-region of five million inhabitants, extended between Po River and Switzerland. This situation creates an overlapping of powers and the presence of peripheral conditions regardless of the distance from the centre of the city, with a state of multiple identities and centralities, expression of many new forms of citizenship of urban populations. The green open spaces swing between over-use, care without full recognition, abandonment and decay. For example there are overcrowded and over-exposed historical spaces interested to an excess of multitude uses and pressures as the historical parks, able to host the multiple needs of free and organized expressions of public life, as sports and music events and seasonal festivals, intensive use by old and new citizens, foreign population (as *Sempione Park*, *Porta Venezia public garden*, *Ravizza Park*, *Solari Park*, *Forlanini Park and Lambro Park*). On the other end there are wide areas of public properties or public entities or subsidiaries by the public bodies, often situated in the periphery of the city, free of projects that provide a future availability by the use of citizens that are in a state of decay or, in the best cases, assigned to the care of third parties, as farmers. They are considered as 'no men's land', not equipped and not inserted in the lists of project of the public administration. Furthermore, there are some areas, treated outside the ordinary structured management and administrative practices. These are large and very minute areas, built through different processes and often with the 'distraction of the institutions' (see *Giambellgarden*, *viapadovaseminaviapadova*, *Isola pepe verde*, etc.).

Observing the green spaces of Milan it is possible to recognize the structure of a parallel city through the trigger of technical and cultural engagement process aimed to realize the objectives through a designed project, but, also, through partial initiatives that are part of an ecology, where each person or institutions (City Council, parks administrations, committees, associations and people) can give the best contribution of ideas and actions.

Moreover, in Milan recently revealed in his evidence, but actually matured in very different forms over at least 40 years a new idea of collaboration between citizens, associations, committees and the public administration is being developed, which is strictly related to the need of people/association/public entities for better green public spaces. It is an element of great interest since it seems to represent a way not usual and not strictly institutional to activate a process of construction and reform of public spaces equipment that integrates aspects of tangible and intangible welfare, which mobilizes multiple energies and civic resources (Munarin & Tosi, 2012). This active and prolific environment, as a primordial soup, could become an urban innovation engine (Dvir, 2003, 2005) and trigger, generate and catalyse innovation that could restore Milan Green Areas.

In particular, many initiatives aimed to the green areas management, are proliferating in the Milan territory. This complex constellation of urban innovation epiphanies (Puerari et al., 2013), composed by a rich environment of initiatives and associations, each of them characterized by a different management model, different level of institutionalization and maturity (i.e. *Cura e Adotta il verde pubblico*, *viapadovaseminaviapadova*, *isola pepe verde*, *Quarto Gardening*, see Table 01, but also some institutional entities as the representatives of *Parco Nord*, *Parco delle Cave*, *Parco Sud*, *Media Valle Lambro*, etc.), is becoming a viral trigger for the public administration for rethinking new possible modes to provide the management of the public green areas.

Table 01. Some of the initiatives aimed to the green areas management that operates in the Milan territory

Name	What	References
Cura e adotta il verde pubblico	It is an initiative promoted by the public administration that gives the possibility to private enterprises and citizens to participate in the maintenance of green areas of the city. It provides different ways for the care of the green areas (the technical sponsorship, the financial sponsorship, agreement of technical cooperation, etc.). Each care action is allowed by official contracts between the adopter and the public administration.	http://bit.ly/1bff55k https://maps.google.it/maps/ms?msid=209401580085820538987.0004e36cc28727f0fc930&msa=0&dg=feature
viapadovaseminaviapadova	It is a grassroots initiative promoted directly by the citizens of a specific neighbourhood situated in the North East of Milan. They decided to join the “environmental committees for Milan”, aimed to the environmental rehabilitation of the green areas.	https://www.facebook.com/viapadovaseminaviapadova?ref=ts
Isola pepe verde	It is an initiative promoted by a group of citizens living in the neighbourhood “Isola” that decided to found an Association in 2011. Their motivations	https://www.facebook.com/pages/Isola-Pepe-

	come from the lack of green spaces of the neighbourhood, a situation stressed by the closure of a near garden in 2007. The association aims to maintain a small area, mostly fenced, owned by the City Council, which includes a green area and a parking area. In May 2012 the public administration provided the regulation related to the “shared garden initiative” aimed to regulate situation like this one and in May 2013 the area became an official “shared garden”.	Verde/125389367522362?fref=ts https://isolapepeverde.wordpress.com/
Giambellgarden	It is a grassroots initiative, located in the south west of Milan, which was born thanks to the help of a specific project aimed to the creation of new urban gardens around the city, thanks to the help of a foundation. It is aimed to maintain some orchard and a small green area around them. This project represents a possibility of socialization for foreigners and people with low income that lives the near neighbourhood.	http://www.progettopuntoelina.it/giambellino/index.php/laboratorio-di-quartiere/81-giambellgarden.html
Quarto Gardening	It is a service aimed to the care of public and collective green open spaces of the Quarto Oggiaro neighbourhood. It is the result of an on-going EU-Project (my-neighbourhood) that involves the public administration and citizens, searching for a new solution for the maintenance of the green areas.	http://my-neighbourhood.eu/c/contacts/ https://www.facebook.com/MyNeighbourhood.eu?fref=ts

3.3 The “Green Table” initiative

In this active environment, another important collective actor was born in 2011, within the “*ChiamaMilano*” initiative, which aims to provide communication tools for the citizens of Milan, to discuss various topic of interest for the city and to promote citizens participation and access to the decision taken by the local institutions in order to improve their quality of life, the “*Green Table*”. Its main goal is to improve the maintenance of the green areas of Milan and it has the important role of catalysing needs, suggestions and priorities of some association and other important actors that operate for the maintenance of the green areas with regard to innovate their management. This peculiar actor has activated a process of civic activism and awareness aimed to a structural change and innovation of the structural vision and management of the green areas.

At the current stage, it is possible to identify four different steps in the development of this long and complex process (see Table 02).

Table 02. Key Actors and related cognitive roles

	What	Actors	What Knowledge
Step 01	Physical and structural vision	Activist joining the “Green table“	<ul style="list-style-type: none"> • Spatial Planning • Landscape Design
		Representatives of the associations joining the “Green table“	<ul style="list-style-type: none"> • Experiential on park management. • Ecology • Agriculture
		Coordinator of the “Green table”	<ul style="list-style-type: none"> • Coordination • Participation processes
Step 02	New vision for a green Milan	Counsellor (Milan environmental system)	<ul style="list-style-type: none"> • Administrative
		Academic consultant of the Counsellor	<ul style="list-style-type: none"> • Spatial Planning • Landscape Design
		Officers of the (Milan environmental system council)	<ul style="list-style-type: none"> • Spatial planning • Administrative
Step 03	Strategic Document of “Green Table”	Representative of the associations joining the “Green table“ (1)	<ul style="list-style-type: none"> • Experiential on park management • Territorial Development • Ecology
		Representatives of the associations joining the “Green table“ (2)	<ul style="list-style-type: none"> • Experiential on park management • Agriculture
		Academic consultant of the “Green Table” (1)	<ul style="list-style-type: none"> • Spatial Planning • Geographic Information System
		Academic consultant of the “Green Table” (2)	<ul style="list-style-type: none"> • Spatial Planning • Territorial Development
Step 04 (on going)	Map	Academic consultant of the Counsellor	<ul style="list-style-type: none"> • Spatial Planning • Landscape Design
		Academic consultant of the “Green Table” (1)	<ul style="list-style-type: none"> • Spatial Planning • Geographic Information System
		Representatives of the associations joining the “Green table“	<ul style="list-style-type: none"> • Experiential on park management. • Ecology • Agriculture

The first step is characterized by a totally grassroots character, during which the representatives of the associations, an activist joining the “Green table“ and its coordinator have collaborated to define a new Physical and Structural Vision, justified by the environmental system of Milan. At first, this Vision consisted of the Environmental System in Milan, which at this time included all the green areas existing in the mega-city region and which was twofold: the *ecological system of Milan* that including the *shape and measures dimension* (dimension, shape and location), influenced by the *management dimension* that comprising the *management actors* (institutions, municipality, private actors) (see Figure 01).

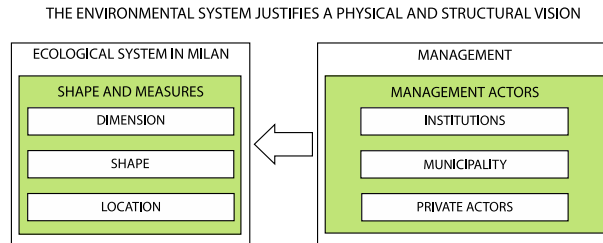


Figure 01. Step 01. Physical and Structural Vision

This step was necessary because the previous existing plan of the Milan green areas (Annex of the PGT 2010 of Milan), which was meant to foresee the creation of a green belt around the city and eight green beams that were supposed to connect the periphery to the centre. This plan was restricted to the administrative boundaries of the municipality of Milan, without taking into account the metropolitan dimension of the Milan environmental system. The final stage of this first period was the presentation of this vision to the citizens and to the public administration, in particular to the Counsellor of Milan environmental system and to the Counsellor of Milan Urban Planning, during an official event that took place in the City Council on April 20th 2013. This was the occasion for the Public Administration to recognize the role of the “Green Table” as the link between the public administration and the citizens, useful to capture contributions and suggestions in order to learn from people and organizations that operate onto the environmental system of Milan.

Triggered by this event, the process went on with the Counsellor of Milan environmental system assuming the responsibility, with the help of an academic consultant and of the officers of the Milan environmental system, to elaborate a document, which showed the changes and the enrichment of the perspective (see Table 02, Step 02). A document was elaborated (“The new vision for a green Milan”) and presented to the “Green Table” (October 10th 2013) during an official meeting, held at the Urban Center of Milan and also attended by the Counsellor of Milan Urban Planning, and then approved by the Milan City Council (November 29th 2013) (Deliberazione della Giunta Comunale n.2400 del 29/11/2013).

This new document extended the perspective and enhanced the process toward the metropolitan area: the environmental system of Milan matches with a vision for the whole

city (see Figure 02). The *management* of the green areas was based not only on the recognition of a plurality of subjects and actors, but also on the *management praxis* (agronomic principles, landscape conservation, care techniques, ecological principles, reduction of financial costs) that were influenced by the *property regime of the areas*. This structure of the management dimension was based on a continuous process of sharing between these areas under the regulatory role of a vision coordination played by the municipality. This process would be facilitated by the assumption by the Counsellor of Milan Environmental System of various positions within the City Council (Territorial Welfare Policies, Policies for Human Resources, Promotion of Sports and Sport Associations, Development of events, General Services, Protection of Animals, Relations with Local Institutions).

Moreover, this document underlined how the relation between the *management dimension* and the *ecological system* was no longer univocal, but mutual: the two dimensions are interrelated and affect each other. The ecological system included not only the *shape and measures dimension*, but also the *components of the ecological network* (simple green areas, gardens, agricultural areas, parks, water network). This vision assumed the landscape as a fundamental element that influences the Milan ecological system through a unitary vision. Similarly, the accessibility and usability of the existing areas influenced and were influenced by the ecological system, aiming at the reconnection of the existing heritage that only need to be visible and connected with the all green areas.

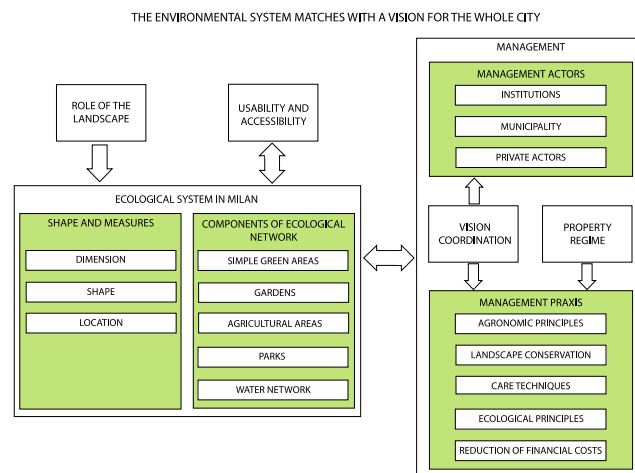


Figure 02. Step 02. New Vision for a Green Milan

Starting from this vision, the Counsellor, recognizing its bonding nature between the municipality and the citizens that operate in the green areas, invited the “Green Table” to continue its work in the offices of the Milan City Council to enforce the relation and to elaborate a strategic document that would be useful for the public administration to better know and understand the wills and the necessity of these various stakeholders (see Table 02, Step 03). This third step started in January 2014 and, within the action of the whole “Green Table”, involved four fundamental actors: two representatives of the association that operates in the green areas and two academic consultants. This process ended in the first days of March 2014 and pushed further the vision proposed by the public administration. The delivered document stressed in particular the idea that it would be the citizen’s participation that helps in build the environmental system of Milan, assuming that the green areas are a constrain for the city growth: in fact not only the existing green heritage of the city has to be part of the environmental system, but also the missing links between the existing green areas have to be recognized and protected as fundamental elements together with the necessary reuse of the abandoned areas (see Figure 03).

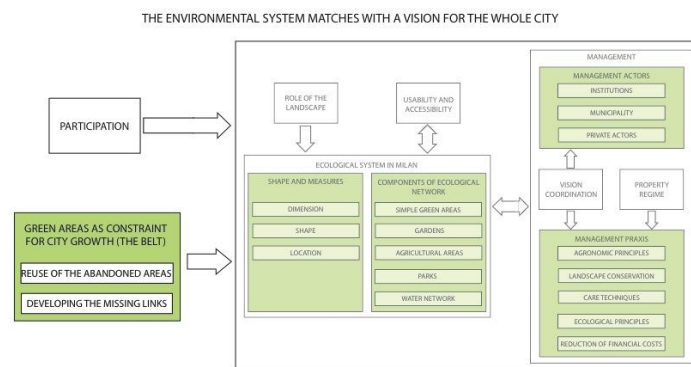


Figure 03. Step 02. Strategic Document of “Green Table

The strategic document of the “Green Table” shows how a mapping activity is required to drive the process further to identify other associations and movements that are working and experimenting new ways of managing green areas in Milan to increase the participation and the awareness of the public administration about these topics, but also to identify the existing abandoned areas useful for a reuse and the areas where there are missing links between the existing and already recognized green areas. The map will

show what are the current uses of the different green areas, the use recognized by the existing plan, but also what are the dimensions and the actual management activity and the rules provided for each area. This fourth step is still in progress and is involving the representatives of the association joining the green table, the academic consultant of the Counsellor and an academic consultant that is participating at the “Green Table” (see Table 02, Step 04).

4 Conclusions

The case analysed in this paper allows some considerations that may have a general value considering that many cities are nowadays rethinking their modes to provide public services. The maps developed in the previous paragraphs represent the evolution of the Milan “green infrastructure” concept and show how the concept enriched throughout the interaction process in a way that moved from considering the simple shape and extension dimension up to including procedural, maintenance and governance elements. It moved from the spatial quality of the green areas system to the whole public service conception; from a simple list of the green areas to the mapping of a complex service system including spatial, actors and procedural resources and the way these can become a value for a territorial system that is even larger than the Milan municipality.

The governance model that emerges from the analysis is not simply a PPPP one; it is not simply considering the diversity of the actors involved and their possible roles. The governance model is based on the 4P model but it is richer than that: it shows that the governance is the result of a learning process that involves knowledge in action, or better action as knowledge. Many of the actors involved in the making of the governance are transforming their own experiences into a cognitive infrastructure of the emerging governance.

While the service is innovated, its governance is reshaped, thus showing this is not a simple change in the service production and supply, it is rather a significant innovation process able to reframe the whole vision, urban vision, behind the service and the way it is created and produced.

Many innovation forces are active in urban environments; such forces are often aligned with the most recent concepts of innovation and suggest very far looking modes for service supply which involve citizens in the activation of changes, sometimes also radical changes, asking for public administrations to act as enabling, legitimation, and

supportive agents. Within these changes, new and original forms of government and governance are suggested which an innovation oriented urban administration has to “sense” and “capture” to capitalize their innovative cognitive capital into the innovation of public services. In the Milan case the “sensing” was effective and transformed a bottom-up initiative into a innovation process that is affecting the way the public administration is conceiving the green areas and also the whole urban system of public spaces.

Note: This paper is the result of a collaborative work. Nevertheless paragraphs 1, 2 are by Emma Puerari; paragraph 4 is by Grazia Concilio; paragraph 3 is the result of a collaborative writing by Puerari and Concilio. Antonio Longo contributed to the article with his knowledge and information about the case study

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My Neighbourhood

<http://my-neighbourhood.eu/contacts/>
<https://www.facebook.com/MyNeighbourhood.eu?fref=ts>

Chiama Milano

<http://www.chiamamilano.it/it/index.html>

Green Table

<http://verdegrandemilano.wordpress.com>

Annex of the PGT 2010 of Milan

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Cura e Adotta il verde pubblico

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Quarto Gardening

<http://my-neighbourhood.eu>

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Parco Nord

<http://www.parconord.milano.it>

Parco Sempione

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<http://www.milanocastello.it/ita/visitaVirtualeEsternoUscita.html>

Parco Teramo

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Corporate governance and economic sustainability: some thoughts based on the Albanian case

Amali Çipi *

Department of Business Administration, University of Vlora “Ismail
Qemali”, Sheshi Pavarësia, 9401 Vlorë, Albania

Shyqyri Llaci

Department of Management, University of Tirana
Rruga Elbasanit, 1016 Tiranë, Albania

Fernando A. F. Ferreira

ISCTE Business School
University Institute of Lisbon & University of Memphis
Avenida das Forças Armadas, 1649-026 Lisbon, Portugal

* *Corresponding author*

Structured Abstract

Purpose – Corporate Governance (CG) is considered an important element in improving firms’ long-term financial performance, increasing their asset values and, as such, it can be of benefit to society at large. This paper aims to analyze CG within the Albanian context. Given its importance, Albanian companies face an urgent need to assess CG standards and promote CG reforms in order to improve their performance and become able to attract foreign direct investment. This paper explores the specific transformations that Albanian managers face in the current dynamic and complex business environment, and the need for sustainability based on “good” CG practices.

Design/methodology/approach – The Delphi technique is adopted. This technique is based on the rational principle that ‘n’ human minds are better than one when confronting lack of precise knowledge about a certain problem/research question (*cf.* Ferreira and Monteiro Barata, 2011). In this approach, a sequence of successive individual questions is asked and then supplemented with information and advice, to correct the first stages of the process and, under certain parameters, generate consensus. The overall characteristics of the Delphi process are anonymity, controlled feedback, and statistical treatment of the group responses. The Delphi technique is typically applied in situations where the problem under discussion cannot be resolved by precise analytical techniques, because there are no historical data or relevant information available (*cf.* Ferreira and Monteiro Barata, 2011; Çipi *et al.*, 2014).

Originality/value –This paper delves into the relatively unexplored topic of CG practices in Albania, regarding which there is currently very little research or information. Furthermore, it does so by studying the application of a methodology (the Delphi technique) which has not, to the best of our knowledge, been applied to such a context before. Empirically, our investigation involves a panel of CEOs from Joint Stock Companies’ (JSCs) from the most representative cities in Albania.

Practical implications – The outcomes of our study should serve as reference for further efforts aimed at enhancing CG in Albanian companies. They should also serve as catalyst for international comparisons and, from a benchmarking perspective, for the adoption of internationally recognized CG best practices by Albanian companies. This can be seen as a “key to sustainability”, meaning that a broader perspective should be adopted in future CG reforms in Albania to support sustainable economic development. Indeed, a better awareness of the long-term benefits of CG best practices can help Albanian JSCs attract powerful foreign investors and, thereby, boost the country’s development.

Keywords – Corporate Governance, Development Prospects, Sustainable Growth, Albania, Joint Stock Companies.

Paper type – Academic Research Paper.

1. Introduction

The implementation of good Corporate Governance (CG) has been argued to generate numerous positive consequences for the company and society as a whole. Good governance has been shown to contribute to: i) improved performance and operational efficiency; ii) better access to capital markets (as investors are typically more willing to invest in firms with effective governance); iii) lower costs of capital; iv) increased asset values; and v) positive image and reputation effects among both internal and external stakeholders (Çipi *et al.*, 2014). Empirical evidence shows that CG even matters for achieving sustainable economic growth. Good CG in large companies can further serve as an example and standard for Small and Medium Enterprises (SMEs), thus leading to a more favorable business environment overall. It has a long-term influence on the development of financial markets, economic risk and tends to lower the degree of corruption and mismanagement in businesses and political circles, thus influencing sustainable economic growth.

This suggests that CG is not only important in developed markets but also in transition economies such as Albania. The challenge of CG in Albania is to generate a

favorable business environment in which SMEs can devise effective governance frameworks that will boost their sustainable growth. Therefore, there is an urgent need for Albanian companies to assess good CG standards and promote CG reforms in order to improve future perform and attract foreign direct investment. Despite the efforts made in Albania in this regard, with significant changes to company law in 2008, in-depth investigations of CG practices at the firm level are largely lacking. This study seeks to fill this gap by means of a Delphi-based questionnaire survey. The aim is thus to understand the evolutionary patterns of CG practices in Albania, based on the perceptions of a panel of Albanian Joint Stock Company (JSC) CEOs. Methodologically, the Delphi technique has been shown to be particularly suited to situations where there is a lack of relevant information. As this is the case of CG in Albania, we believe there is considerable scope for the exploration of this methodological approach in this particular context. We know of no prior work using the Delphi technique to analyze the evolutionary patterns and provide development prospects for CG practices in this particular context. In this sense, this study contributes to current research by offering empirical results related to the application of the Delphi technique and forecasting CG practices evolutionary trends in the Albanian context.

The remainder of the paper is set out as follows. The next section presents a review of the literature review and highlights the benefits of CG. Section three presents a brief methodological background of the Delphi technique and justifies its application in the context of the present study. Section four presents the results of our study, and the final section concludes the paper.

2. Sustainable benefits of corporate governance

According to the OECD (2004: 11), CG can be defined as “*a set of relationships between a company’s management, its board, its shareholders and other stakeholders. Corporate Governance also provides the structure through which the objectives of the company are set, and the means of attaining those objectives and monitoring performance are determined [...]*”. This definition is consistent with the one presented by the Cadbury Committee (1992: 14), according to whom “*Corporate Governance is the system by which companies are directed and controlled. Boards of directors are responsible for the governance of their companies [...]. Thus shareholders’ role in governance is to appoint*

the directors and the auditors and to satisfy themselves that an appropriate governance structure is in place. The responsibilities of the board include setting the company's strategic aims, providing the leadership to put them into effect, supervising the management of the business and reporting to shareholders on their stewardship. The board's actions are subject to laws, regulation and the shareholders in general meeting [...]". Research suggests that there are a wide range of advantages arising from the implementation of CG mechanisms in firm strategies. These benefits can be classified into *monetary* (i.e. direct financial effects) and *non-monetary* (which do not directly lead to cash flows but can still be measured in monetary terms) (Weber, 2008); and have been variously empirically demonstrated.

CG variables can affect firm performance and firm performance can, in turn, affect CG (Denis, 2001; Hutchinson and Gul, 2004; Minnick and Noga, 2010; Wintoki *et al.*, 2012). It has been shown, for instance, that there is an iterative relationship between CG and firm performance, such that CG variables can positively affect firm performance, but this in turn also affects the quality of CG. Hutchinson and Gul (2004) demonstrate that CG variables related to monitoring and incentives, such as higher levels of non-executive directors on the board, management share ownership and managerial remuneration, weaken the negative relationship between a firm's investment opportunities and its performance. According to Bhagat and Bolton (2008), the incentive effects of board stock ownership are positively related to both future operating performance and to the probability of disciplinary management turnover in poorly performing firms. Furthermore, improvements in operating performance are greater among firms that have higher average total and active institutional ownership, as well as concentrated ownership (Demiralp *et al.*, 2011). Active family control is associated with higher profitability (compared to non-family firms), whereas passive family control does not affect profitability even in different legal regimes (see also Maury, 2006); and there is an inverted "U-shaped" relation between bank performance and board size, and between the proportions of non-executive directors and performance (Andres and Vallelado, 2008).

Other evidence is also reported in the literature: board size is positively associated with firm value and firm financial performance (Chen, 2011); and there is a positive relationship between post-issue changes in institutional ownership characteristics and long-term stock price performance. Furthermore, firms experience higher productivity growth when operating in markets with intense competition and under control of a strong

ultimate owner (Januszewski *et al.*, 2002); there is a negative correlation between firm value and stockholder dispersion as well as between firm value and the presence and total ownership stake of stockholders (Konijn *et al.*, 2011); and there is a positive relationship between CEO compensation and firm performance as measured by return on equity (Sigler, 2011).

According to Black (2001), firms can greatly improve their share values and, thus, reduce the cost of raising equity capital, through a determined effort to improve their CG practices. The author also suggests the potential value of minimum quality regulation, which can reduce the scope for adverse selection and, thus, enhance all firms' market values. Supporting this line of research, Gompers *et al.* (2003) find that firms with stronger shareholder rights have higher share values and higher stock returns. Ashbaugh-Skaife *et al.* (2006) focused on the value of CG from bondholders' perspective as an important determinant of credit ratings, and argue that a firm that possesses desirable governance characteristics from the bondholder's viewpoint approximately doubles its likelihood of receiving an investment-grade credit rating. Tian and Twite (2011) found that internal CG – more efficient boards and greater CEO stock-based compensation – have a positive impact on the firm's total factor productivity, especially in less competitive product markets or less active takeover markets. Furthermore, it has been variously argued that Corporate Social Responsibility (CSR) mechanisms, as an important component of conceptual value added, can shape the mission and vision of companies beyond shareholder value maximization (Gyves and O'Higgins, 2008), and impact on values by reaffirming the need to have codes of conduct and ethical standards in place (Solomon, 2007; Van Dijken, 2007; Rezaee, 2009). It has been shown that firms that spend on CSR have greater firm value (Ammann *et al.*, 2011).

These findings are not without consequences, even in emerging and developing market. Indeed, Omran (2009) argues that ownership concentration and ownership identity, in particular foreign investors, appear to have a positive impact on firm performance, while employee ownership concentration has a negative one. It has been proposed that the greater proportion of outside directors and the change in board composition following privatization in developing markets have a positive effect on firm performance. Giroud and Mueller (2011) found that firms in non-competitive industries benefit more from good governance than do firms in competitive industries; and that firms with weak governance have lower labor productivity, higher input costs, make more

value-destroying acquisitions, and are more likely to be targeted by activist hedge funds, which suggests that investors take actions to mitigate such inefficiency. In addition, better-governed firms exhibit significantly greater stock price increases and higher rates of physical capital accumulation following equity market liberalization (Bae and Goyal, 2010). Establishing an effective and efficient legal configuration is central to understanding that firms with better shareholder protection raise more funds from potential shareholders than others (Bruno and Claessens, 2010). Indeed, the level of firm-level governance is strongly related to country-level measures of investor protection: firms with large needs for outside financing have more incentives to adopt better governance practices so as to lower their cost of capital (Klapper and Love, 2004).

Despite the cost associated with the implementation of CG policies, CSR mechanisms should be seen as a fundamental opportunity and/or a tool in developing and redefining winning strategies and overcome the turbulence of the competitive environment (Fernández and Souto, 2009; Giannarakis and Theotokas, 2011).

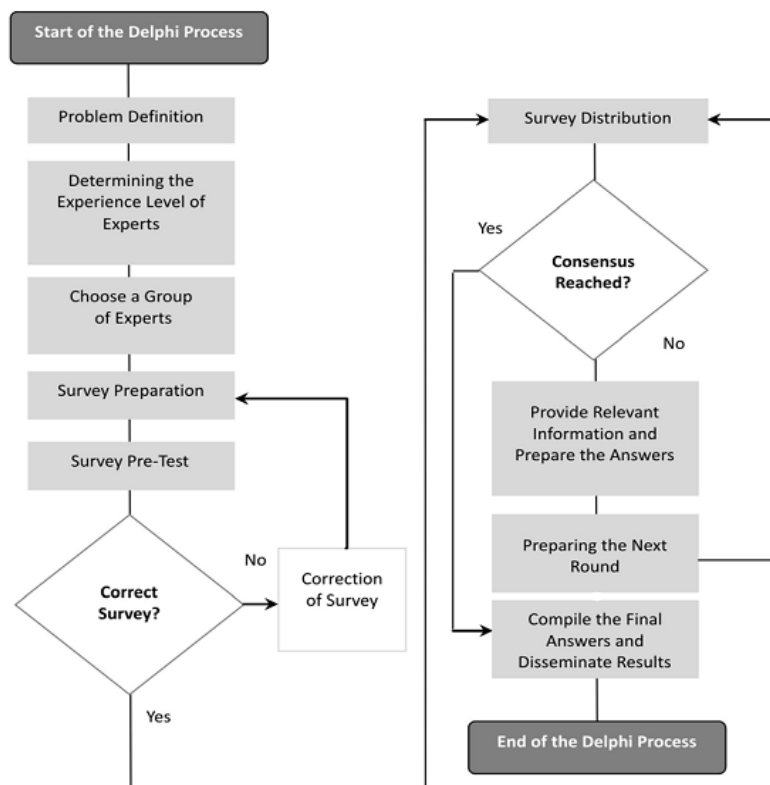
CG should therefore be an ever evolving and proactive concept; and it can be expected to be influenced by differences in the national context (Matten and Moon, 2008), stakeholder requirements, customer and emerging business needs and the constant changes in the business environment (Jones *et al.*, 2009).

3. Methodology framework

In 1950s, the RAND Corporation developed the Delphi technique to investigate USA Air force problems by using the expert judgments on a specific issue. As stated by Ferreira and Monteiro Barata (2011: 246), the technique is “*a well-established sequence of successive individual questions supplemented with information and advice, which permits correcting the first stages of the process. [...] it is a tool, which, under certain parameters, enables consensus. [...] and is based on the rational principle that ‘n’ human minds are better than one when confronting the lack of precise knowledge about a certain subject*”. In essence, the Delphi approach begins with the development of a survey, to be completed individually by experts on a specific topic. It then continues through a repeated sequence of successive individual questions (by interview or questionnaire) (Dalkey and Helmer, 1963; Ferreira and Monteiro Barata, 2011), with the aim of obtaining “*the most*

reliable consensus of opinion of a group of experts” (Dalkey and Helmer, 1963: 458).

The operational structure of the Delphi technique is given in Figure 1.



Source: Ferreira *et al.* (2013).

Figure 1. Operational structure of the Delphi technique.

The Delphi technique is thus based on three basic principles: (1) *anonymity*; (2) *controlled feedback* of the information and knowledge contributions; and (3) *statistical treatment of the group responses*. The method is mainly used when the problem under discussion cannot be resolved by precise analytical techniques, due to a lack of relevant data information about the problem, as is the case of CG practices in Albania.

As with any method, the Delphi technique has strengths and weaknesses. The literature highlights a considerable number of advantages: (1) the technique is simple to

use because its application, design and scrutiny do not require advanced mathematical skills (Yousuf, 2007); (2) the confidentiality of the technique allows many communication barriers to be overcome (Yousuf, 2007); (3) information can be obtained from a large group of experts that are geographically widely dispersed (Yousuf, 2007); (4) physical presence is not required, and direct confrontation between the experts is avoided (Dalkey and Helmer, 1963; Ferreira *et al.*, 2013); (5) anonymity helps participants freely express their ideas and convictions without being under pressure (*e.g.* from the organizational hierarchy or dominant individuals or groups) (Dalkey, 1972; Ferreira *et al.*, 2013; Worrell *et al.*, 2013); (6) the analysis through statistical tools allow for a valid and fair analysis and summarization of the collected data (Dalkey, 1972); and (7) it allows different topics to be discussed (Ferreira *et al.*, 2013).

Despite these advantages, the Delphi technique also has its limitations or challenges. For instance, it may be difficult to motivate the panel members to participate in the Delphi, and keep participating throughout its various rounds. Indeed, the existence of several rounds means that respondents may drop out of the process, either because the survey is always the same or because it becomes perceived as too time-consuming (Ferreira *et al.*, 2013; Worrell *et al.*, 2013). Furthermore, the scope of the technique's application may be limited by the availability of experts on the topic (Ferreira *et al.*, 2013); and the fact that the method does not require participants' physical presence can lead questions to be misunderstood (Ferreira *et al.*, 2013). Indeed, the implementation of the Delphi method is highly dependent on the response rates in each round, and the control of irresponsible feedback can be difficult, especially if panelists are interested in manipulation (Goluchowicz and Blind, 2011). Despite these potential weaknesses, several studies demonstrate the power of the Delphi technique in increasing our knowledge of previously poorly understood topics. The results of our study are presented in the next section.

4. Results analysis

Considering the research purpose outlined for this empirical investigation, the initial Delphi panel was composed of 80 CEOs representing different types of JSCs, from banking, insurance and other financial services; both private and state-owned. These were located mainly in the largest cities in Albania (*i.e.* Tirana, Durrës, Fier, Vlorë, Shkodra,

Tropoja, Elbasan, Gjirokastër, Lushnje and Saranda). After the first round, the number of panel members decreased to 53 and, and after the second round, only 37 panelists provided their responses to the survey. It should be noted, however, that “*there is no ideal number of experts for the application of the Delphi technique*” (Ferreira and Monteiro Barata, 2011: 246), and that the reduction in the number of panel members is anticipated by the methodology. The responses from the 37 panel members in the final round provide the basis of our analysis.

4.1. Sample characterization

The characterization the panel of experts (*i.e.* the 37 respondents of the 2nd round) is provided in *Table 2*, which shows that most respondents were *male* (70.3%) and between 43-47 years old (40.6%). Most of the panel members held a *higher academic degree* (67.6%), predominantly in *economics or management* (67.6%).

Table 1. Characterization of the respondents [second round].

		Delphi Panel	
		N	%
Gender	Female	11	29.7
	Male	26	70.3
	Total	37	100.0
Year of Birth	1952-1956	3	8.1
	1957-1960	3	8.1
	1961-1965	8	21.6
	1966-1970	15	40.6
	1971-1976	8	21.6
	Total	37	100.0
Qualifications	4-Year diploma	12	32.4
	MSc, MBA	20	54.1
	Ph.D.	5	13.5
	Other	0	0.00
	Total	37	100.0
Area	Economics/Management	25	67.6
	Engineering	8	21.6
	Other	4	10.8
	Total	37	100.0

Table 2 shows that the most representative firm owners in the sample possessed more than 2/3 of the company shares, while minority shareholders held only 2% or less of the company shares, indicating specific agency problems related with the direct involvement of owners in many important decisions and daily monitoring of the company.

Table 2. Number of shareholders per owning shares [n=37].

Owning shares	%
More than 2/3	39.8
From 1/4 to 1/2	34.9
From 2% to 10%	19.3
2% or less	6.0
Total	100.0

The data obtained according to the structure of the questionnaire are presented in the next subsection.

4.2. *Development prospects*

In order to obtain a generalized view of the future trends of CG in Albania, we tried to collect the respondents' opinions on the direction in which CG practices are moving, and the current level of knowledge and willingness to apply contemporary international standards of CG best practices. According to Table 3, and based on most panelists' responses, there is a tendency for an increase in CG "culture". Almost 46% of the respondents considered CG as *one of the top three future priorities* (45.9%); and 21.6% said it was a *top or top ten priority*. Only 10.8% considered it was *important but not a management priority*.

Table 3. The CG rating in the company's list of priorities [n=37].

Benefits	%
It's the top priority	21.6
It's one of the top three priorities	45.9
It's among our top ten priorities	21.7
It's important but not a management priority	10.8
Other	0.0
Total	100.0

The next question asked the panelists to rank, by order of importance (*1 = first most important, 3 = third most important*), the three main goals they considered most important for CG practices to achieve in the future. According to *Table 4*, the majority of the responses focused on *improving the company's market position* (67 points), followed by *increasing annual turnover* (45 points), and ranked in third place, *increasing the outcome* (38 points). The advantages deemed least important were *protection of shareholders' rights* (4 points) and *coordination improvements between shareholders and administration* (1 point). It should be noted that attracting investment, especially foreign investment, accumulated only 18 points, which suggests a low level of knowledge of the potential long-term benefits of the CG best practices.

Table 4. The CG rating in the company's list of priorities [n=37].

Benefits	Points
Improved market position	67
Increased annual turnover (company's economic activity)	45
Increased of the outcome	38
Attract investment	18
Improved decision-making	14
Improvement of the company's reputation	14
Increased efficiency in the operations of the company	14
Lower cost of capital	9
Increase the transparency of the activities	4
Protection of the shareholders' rights	2
Improving coordination between shareholders and administration	1
Total	226

The next question related to experts' perceptions of the three main barriers to CG improvement (*1 = main impact, 3 = third main impact*). The final ranking was the following: first, *insufficient legislation* (42 points); second, *costs of implementing and communicating CG policies* (41 points); and third, *lack of information or knowledge and lack of qualified specialists* (40 points respectively) (*Table 5*). Interestingly, *lack of financial understanding on the part of senior executives and the board* was not perceived to be a significant barrier, indicating that the board is perceived to have a good level of knowledge about the company's strategic issues.

Table 5. The barriers faced by the company for governance improvement [n=37].

Barriers	Points
Lack of qualified specialists	42
Cost of implementing and communicating corporate governance policies	41
Lack of information / knowledge	40
Insufficient legislation	40
Lack of business understanding on the part of external auditors	23
Information on governance issues of the company harms competition	21
Lack of business understanding on the part of the board	11
Lack of financial understanding on the part of senior executives	3
Total	221

According to the panelists, and as shown in *Table 6*, training and consultancy are needed in order to improve governance (83.3%), a point with which few (16.2%) failed to agree.

Table 6. Need for training and consultancy for improving governance [n=37].

Benefits	%
Yes	83.8
No	16.2
Total	100.0

For the next question, we were seeking to understand panelists' opinions about what CG tasks can be the most effective in providing high-quality CG practices in Albania. Panelists were asked to rank, by order of importance (*1 = first most important, 6 = sixth most important*), the CG mechanisms that are likely to most affect the effectiveness of CG in Albania. *Table 7* presents the aggregated scores.

Table 7. Most effective tasks for better CG practices in Albania [n=37].

Mechanisms	Points
To make internal corporate mechanisms work better	166
Enhancing the standards of accounting, audit and disclosure	151
Conducting and publicizing corporate governance ratings	140
Prohibiting or tightly controlling some types of related-party transactions	114
To select the most effective external mechanisms	108
Reducing ownership concentration	95
Total	774

According to *Table 7*, the final ranking was: (1) *making the internal corporate mechanisms work better* (166 points); (2) *enhancing the standards of accounting, audit*

and disclosure (151 points); (3) conducting and publicizing CG ratings (140 points); (4) prohibiting or tightly controlling some types of related-party transactions (114 points); (5) selecting the most effective external mechanisms (108 points); and (6) reducing ownership concentration (95 points). The reduction of the ownership was given the lowest importance, which suggests, consistent with Çipi *et al.* (2014), a strong need for concentration of ownership in developing countries such as Albania. “Concentrated owners”, who cannot rely on other institutions and arrangements designed to monitor management, have both the power and incentives to do this themselves. The level of ownership concentration in Albania is strongly associated with the development of the financial market; and agency problems in such countries develop different features due to the direct involvement of shareholders in many important decisions and in the daily monitoring of the company.

Using a Likert scale from 1 to 5 (*1 = not important, 5 = decisive importance*), Table 8 shows the respondents’ evaluation of the future tasks of the board in order to improve the performance of outside directors.

Table 8. Important tasks for better performance of outside directors [n=37].

Measures	Mean	Median	Standard Deviation	Coefficient of Variation
Better attendance at the board meetings	4.04	4.00	0.956	0.237
Better awareness of fiduciary duties to all shareholders	4.17	4.00	0.878	0.211
Better knowledge of the business of the firm	4.69	5.00	0.577	0.123
Better preparation for and more active participation in board discussion	4.42	5.00	0.770	0.174

Based on Table 8, and according to the respondents, *better knowledge of the business of the firm* and *better preparation for and more active participation in board discussion* have a considerable impact, with median scores of 5 (critical importance). The remaining items (*i.e. better attendance at the board meetings* and *better awareness of fiduciary duties to all shareholders*) assumed good level of importance.

Through the next question, we attempted to obtain the panelists’ opinions regarding the readiness of Albanian companies for listing on the stock exchange. Table 9 provides a general overview of the results.

Table 9. If it is the time for the Albanian JSC to be listed on the stock exchange [n=37].

Responses	%
Yes	56.8
No	43.2
Total	100.0

Although most respondents (56.8%) affirm that Albanian companies are ready to be listed, a relevant number (43.2%) think that it is not yet the moment for them to initiate this process. The main reasons for this disapproval are presented in *Table 10*.

Table10. Obstacles to the listing process in Albania.

Influential actors	Points
Lack of information and knowledge	31
Lack of “tradition”	28
The lack of efficiency of the market regulatory institutions	27
Failure on the introduction of the standards in general	25
Insufficient legislation	18
The low need for capital	6
Total	135

According to *Table 10*, and by order of importance (*1 = first most important, 7 = seventh most important*), the obstacles to the listing process are *lack of information and knowledge* (31 points), followed by the *lack of “tradition”* (28 points), *the lack of efficiency of the market regulatory institutions* (27 points), *failure on the introduction of the standards in general* (25 points), *insufficient legislation* (18 points), and *the low need for capital* (6 points).

These results suggest a cause-and-effect relationship between the development of CG at the firm level and Albanian capital markets. If Albanian companies believe that the time has come for them to be listed in the stock exchange trade they must be aware of and prepared to make significant improvements to the CG mechanisms they use. Furthermore, there is a need to implement more “good” CG practices and to increase the CEOs’ level of knowledge about their real benefits.

5. Conclusions and policy implication

CG has become an issue of interest to an increasing number of companies and governments. Good governance is in some ways related to the implementation and

promotion of commonly accepted CG values such as: *equality* (fair and equal treatment of all company stakeholders by the management in the process of operating the firm); *transparency* (periodic disclosure of financial and non-financial information to the public and shareholders); *accountability* (the board's obligation to monitor management and be accountable to the company's shareholders); and *good citizenship* (complying with the expectations of, and developing a good relationship with, the community in which the company operates). This assumption seems to be true not only for firms that operate in developed or emerging countries but also for firms that operate in ex-centralized economies such as Albania. For Albania, it is a paramount issue to find a CG model that is adapted to its institutional and cultural landscape. Despite the attempts made by the government and companies to implement good standards of CG, there is still need for improvement. Thus, in this study we aimed to analyze, based on a Delphi investigation, the evolutionary patterns of CG practices in Albania, and to suggest development prospects for them based on the perceptions of CEOs of Albanian JSCs.

Taking a holistic view on the trends towards CG practices towards which Albanian JSCs are moving, our findings offer some optimistic notes. Albanian JSCs are improving their level of knowledge of (and willingness to apply) internationally accepted CG standards. A "more or less friendly environment" regarding reforms or activities required to improve CG is gradually emerging in Albania. These general conclusions are supported by the evidence: (1) Albanian JSCs appear to be increasing their self-commitment to the application of the best standards of CG practices. Executives rated CG as one of their top three future priorities. Because the implementation of CG practices can improve a firm's market position, increase annual turnover and increase firm outcomes, executives are recognizing the real need for training and consultancy in order to improve governance issues. Furthermore, most of them affirm the need for planning and training funds for supervisory boards and administration on governance issues; (2) there is a predisposition for the implementation of international financial reporting standards. This finding may relate to legal requirements (2008 company law) and it is a consolidated practice at financial JSC which are brands of foreign firms; (3) there is an increasing tendency for a "CG culture". This is illustrated by the growing knowledge on CG issues, for instance. However, the perceived need to foster this culture seems limited to the current concepts that CEOs have, which associate governance improvements in the company's reputation or, business operations, and less with investment attraction; (4) JSCs are recognizing the

need for more knowledge and information about CG concepts. They think it is necessary to attract qualified specialists in the field; (5) Albanian CEOs believe that company legislation is not a significant obstacle to a good level of governance, but some obstacles remain, such as the lack of specialists in the field and the low level of awareness and understanding of the real importance of good CG practices; (6) the panel of experts reacted in a relatively positive manner to the potential opportunity for a listing process in an organized capital market. This trend is most significant within the financial group (mainly banks and insurance companies), which are the first candidates for listing. As entities operating in financial markets and subject to regulatory requirements, they are suitable candidates for a successful listing process; and (7) the panel was quite critical to a functioning organized capital market. They identified these barriers as being lack of information and knowledge, lack of tradition and the low level of efficiency of regulatory institutions, and the failure to introduce standards in general.

Given these results, we recommend further effort on the part of market regulatory institutions and administrative structures for the efficient implementation of this market by providing incentives for the listing process. Furthermore, the on-going CG reform efforts should be continued to encourage the Albanian companies to pay more attention to “content” rather than “form” (*e.g.* enhancing the effectiveness of boards by selecting better qualified and truly independent directors, assuring adequate and timely information to board members). More specifically, priority should be given to making internal CG mechanisms work better and enhancing the standards of information disclosure, accounting, and auditing. Critically important for these tasks are the roles of supervisory and financial agencies, professional associations and independent board directors. There is a need for CG reforms in terms of better awareness on the real and unique agency problems faced by Albanian JSCs (which are related to the concentration of ownership and the underdeveloped financial market). Further, the introduction of good laws is not a guarantee for the implementation of CG best practices. As such there should perhaps be enforcement mechanisms to ensure that companies truly comply with best practices. It is worth noting that the first and only non-mandatory code of CG was introduced recently in December 2011. A broad perspective should be adopted with regard to future CG reforms in Albania based on the stakeholder approach, which helps the development of sustainable economy. A better awareness of the real long-run benefits of CG best practices will help Albanian JSCs to attract important powerful foreign

investors. Furthermore, the need for Albania to be part of the European Union can be a good incentive for the adoption and improvement of practices, in order to be competitive in global trade.

There are several potentially fruitful research opportunities with respect to CG in Albanian firms. In particular, a deeper understanding of specific cultural features, and the level of institutional development in the country, will allow researchers to identify the model of CG that best suits the Albanian context. Such deeper understanding can also help researchers find the weaknesses of the Albanian CG model and help Albanian firms to identify the real benefits of CG and make strategic use of them to grow and thereby to affect the country's sustainable development.

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Dynamic Modelling of National Healthcare System

Miroslav Jankuj*, Daniela Kandilaki

Institute of HealthCare Management, Faculty of Management
University of Economics, Prague, Czech Republic

Jan Voracek

Department of Electrical Engineering and Computer Science
The College of Polytechnics Jihlava, Czech Republic

** Corresponding author*

Structured Abstract

Purpose – Our paper deals with the design of dynamic model of national healthcare system of the Czech Republic composing from the qualitative and quantitative part. We use the tools of system dynamics because of its holistic approach that helps unlike the simple math and static analyses to take into account the complexity of the health system. This approach can help to verify the design of new health policy and thus achieve effective problem-solving and improving the overall health system.

Design/methodology/approach – Presented problem represents a macro level strategy planning task. To preserve its clarity and applicability, understandable tools and procedures must be adopted in all related analysis and design stages. Our basic methodology consists of four generic stages, including (i) problem formulation, (ii) conceptual specifications, (iii) computational modelling and (iv) experimentation.

Originality/value – We see the innovativeness of presented research in assumption that strategic concentration on quality in healthcare sector can solve the majority of its current bottlenecks. According to our interpretation, qualitative aspects include primarily the non-clinical activities, such as management, marketing, external relations or staff development. Knowing the historical data, we can estimate future total costs, generated by the existing system and define alternative, sustainable, quality based policies. Viable alternative policies must preserve the major existing characteristics and introduce new processes, leading to the reduction of costs within five years long time horizon.

Practical implications – The proposed model can be very useful especially for current and future policy makers as a tool for decision making. They can create better decisions based on the knowledge of a wide variety of factors influencing the system and achieve the public health objectives more effectively. Thanks to its complexity, transparent representation of the different relationships and their interactivity, this model is suitable for strategic planning, group decision making, learning and sharing knowledge. With such strategic and long term decision we can assure the sustainable development of healthcare system especially better control of health expenditure.

Keywords – simulation, healthcare system, national health policy, public health, system dynamics.

Paper type – Academic Research Paper

1 Introduction

As it is seen worldwide healthcare is one of main issues in many countries. For example these problems are related to funding (sustainability), quality and accessibility of health care and efficiency of invested resources (Tchouaket et al., 2012). This theme takes on importance mainly due to the nature and perception of healthcare. Financial significance is captured in the annual statistics which shows national expenditures on health care and their share in GDP.

Demand for health services is derived from the demand for health (Grossman, 1972). These aspects together with the psychological component put pressure on the demand for accessible and affordable quality health care. Such conditions are becoming a powerful political tool in two ways. First, allow politicians to get support in the election, and secondly, they create barriers for implementation of major changes to the healthcare system (eg. direct payments, out-of-pocket, fee for service). The aim of this paper is not to predict the future of our system but to recognize its complexity and to examine different strategies of national health policy.

2 Purpose

As already mentioned, health care is significantly associated with politics. This disables natural development of the system. Policy makers very often present healthcare as a system but their approach is much different. They do not reflect the nature of system with all of its relations and elements, their interaction. Therefore using a simple analysis to develop a functioning system is not adequate. These simple analyses are typical to consider very little variables and ignore the impact of accumulations as results of interaction between all the elements, time delay, resource limits and other managerial issues.

However, the current trend is that the ruling party cannot conceptually use the challenges and solve the problems that are associated with this given the long term horizon. Often it is decided separately regardless of each elements or subsystems of the whole health care system. This approach it is strictly administrative and bureaucratic

(Shortell, 2006). This is the basis to implicitly set up the variables of the system, which covers reimbursement mechanisms (which does not reflect the market price, real quality, etc.), structure of delivered health services, and distribution of providers, etc.

Our aim is to present a model based on system dynamics because of its holistic approach. It is necessary to take into account that strategic modelling is not intended for future prediction but to help us (and policy makers) to realise the complexity of health system (Millstein, 2010). The use of strategic modelling for the understanding of complex systems confirms Sterman (2006). The final model helps with critical thinking and can help to verify the design of new health policy and thus achieve effective problem-solving and improving the overall health system. To obtain this we have to develop a casual diagram based on policy oriented simulations.

3 Dynamic modeling and its relevance in *Czech healthcare system*

3.1 *The Czech healthcare system*

The Czech healthcare system has its roots in the base of Bismarck approach to financing healthcare. This system is based on compulsory public health insurance. The insurance is paid by employees and employer and state. The employees give out 4, 5 % of their gross wage and employers contribute by 9 % of employees' gross wage. The state is the payer for states' insured (e.g. students, pensioners, maternal leave). In 2014 there were 7 insurance companies, with the major position of General Health Insurance Company, which has 60 % of the market.

Healthcare sector takes a substantial part of national economy in developed countries worldwide. There is no different situation in the Czech Republic. In comparison with other countries, Czech healthcare systems contributes by 7, 5 % GDP, which is less than European average (based on OECD data average expenditure is 9 % of GDP). Even though healthcare expenditures are rising there is a relatively stable level in the quality care provided. This trend is unsustainable in the long run. The cause may be hidden in the management and the planning process of health system.

Table 1- Health expenditure in the Czech Republic

Czech Republic statistics	2006	2007	2008	2009	2010	2011
Total expenditure on health, % GDP	6,7	6,5	6,8	8,0	7,4	7,5
Total expenditure on health, /capita, US\$ PPS	1 555	1 658	1 765	2 039	1 884	1 966

The current strategy is reactive and focused primarily on the quantity. Policy makers use to deal with public health problems simple analysis and solve the problems in isolation despite the fact that many of them are related with a high level of complexity.

3.2 Main elements of healthcare system model

In order to model healthcare system it is necessary to define the basic elements and their relationship typical for concrete country. Our model is based on the substance of the six basic objectives of a quality health care system. These have been defined by the Institute of Medicine, Washington, USA (Saxton, 2009; Shortell 2006) and reflect assumptions of necessity of safety, timely, effective, equitable, efficient and patient-oriented healthcare system.

In our approach (due to simplification) we combine these six goals to three main elements – quality, access, costs. Health policy tools are represented by assurance of resources, reimbursement mechanisms, organization, regulation and persuasion (Hsiao, 2007).

These five tools of health policy are based on previous research (Roberts, 2004). Available resources or *financing (1)* are characterised by the process of obtaining resources in the healthcare system. Ultimately, this directly affects the patient, because the tools are set as direct payments, insurance, out-of-pocket payment, etc. *Organization (2)* refers to creation and adaptation of organization of healthcare market (competition, ownership, centralization). *Payment (3)* in the Czech environment is especially represented by reimbursement mechanism.

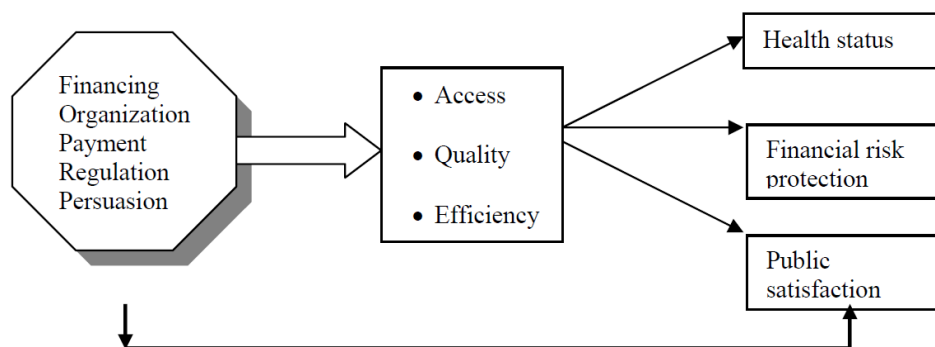


Figure 1: Health policy tools and objectives

This is administratively agreed set up which influences economic development and possible functioning of healthcare providers. But generally this instrument is focused on the distribution of resources (methods and amount).

The tool of *regulation* (4) is used to set boundaries and rules for the operation of providers, organizations and individuals within the healthcare market. Last but not least is the tool of *persuasion* (5). This is concerned on influencing the population. This primarily involves the prevention and pressure to change behaviour that would lead to improve health status of the population.

Tab 2 serves as an example of possible interventions and resulting effects. It is selected due to actually situation in Czech healthcare system. Many countries are considering responding to the above-mentioned aspects through reforms. However, to enable us to contemplate changes we need to understand the individual elements of the system, their roles and relationships and interactions between them.

Table 2 - Examples of health policy intervention and its effect

Tool	Intervention	Effects
Financing	Out-of-pocket payment	positive effect - an increase in income in the health system, regulation unnecessary care negative effect - the social impact
Organization	Change of ownership of healthcare organizations	positive effect - managerial ownership and responsibility resulting in effective functioning negative effect - difficult political implementation

Payment	Motivation in primary care	positive effect - increasing emphasis on prevention (better health status) - negative effect - growth of financial resources needs
Regulation	Definition of health care standards	positive effect - clear rules for reimbursement negative effect - the definition above standard care resulting in increase of financial burden
Persuasion	Increase of information	positive effect - avoiding health risk behavior negative effect - the cost of information campaign

Possible solution may be dynamic modeling of the system or its parts, which is based on systems thinking (Milstein, B. et al., 2008). Dynamic models allow verifying the functionality and impact of the proposed changes before they are implemented in practice.

4 Quality based interventions

Due to the fact that in the initial analysis, it was found that the aspect of quality is a promising way to improve the system, while reducing cost in the long term (Voracek et al., 2014) this paper will focus on quality based interventions. In the Czech healthcare sector it is very difficult to measure or to choose a healthcare provider in accordance with quality aspects or results of its care provided.

It is not very common to find any available rankings which would provide information about quality status of healthcare provider. Czech legislative partly highlights the need of internal evaluation of the quality in health care; however, these tools may not correlate with objective quality achieved. Some of the healthcare providers tend to certificate their services and thus obtain various certificates. It is important to mention that quality is not the only aspect essential for healthcare providers but it is the most perceived by the patient.

4.1 Coordination of care

State of the art health system put a great emphasis on improvement of health care services coordination (especially on continuity of care). In another words continuity of care in primary sector with ambulance specialists followed with aftercare will improve the overall efficiency of the health care system (Tjerbo and Kjekshus., 2005). It is assumed

that integration of care will increase cost-efficiency and the outcome of the treatment in long term (Wan et al., 2001).

Coordination of care is a relatively complex process that requires formal support. To make the change to a system-wide basis can be quite challenging. In this case, it is possible to start with a gradual integration as for example special patient groups, cancer patients, elderly or psychiatric patients (Romøren et al., 2010). The example of this tool can serve a disease management programme (vertical chronic disease management). The results from Germany show a better care process as well as improved clinical outcomes (Schlette et al. 2009).

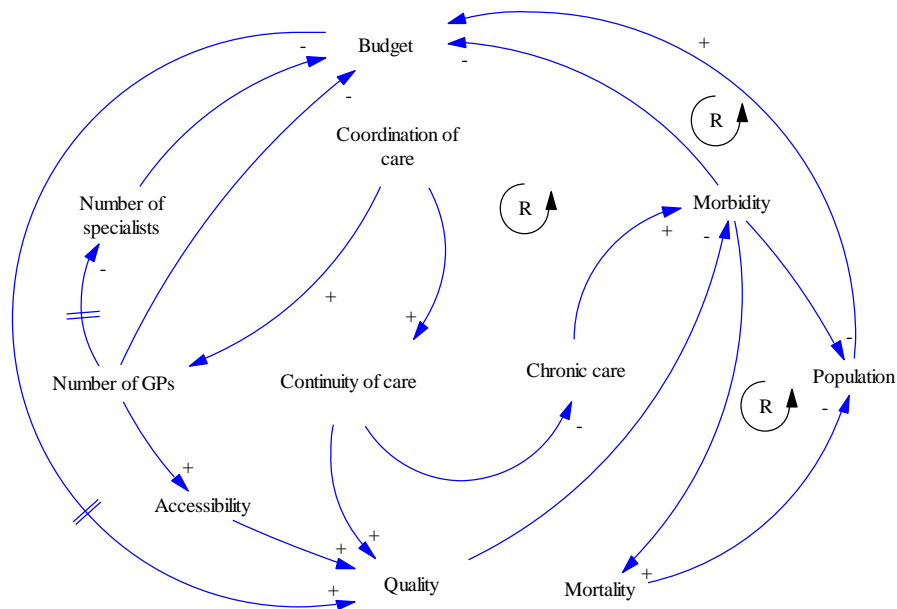


Figure 2: Causal loop diagram of coordinated care

4.2 Causal loop diagram

From the example above, we have created a diagram of causal relationships (Figure 2). The assumption of coordinated care is that the system would need higher number of primary care providers (number if GPs). These would have the gate-keeper function. Such a set up would result into to lower usage secondary care (specialist) a

therefore lower number of these doctors. The secondary aspect of this would be the lower cost on the segment of specialists (decrease of budget drawing).

We suppose that coordination of care would result in initial raise of cost due to increase of reimbursement rates which would serve as a motivational factor for GPs. This step would simultaneously lead to rising of health care quality through continuity of care and accessibility assurance. Better quality would result in better health status (in terms of lower morbidity). Increased coordination of care would result in better continuity of health care provided which would have direct impact on lower level of delivered chronic care.

As it seems in the diagram changes on the budget side have an impact on the quality of care but we have to take into account the delay of this effect. Quality has an impact on population through the changes in mortality/morbidity. The positive effect of lower morbidity would lead to lower mortality and therefore to more healthy and wealthy population. Due to our system setup this will cause increase of contributions to budget.

5 Methodology

Complex problems can be hardly understood and coordinated with traditional tools. Surrounding dynamic environment requires high quality planning, fast responses on frequent changes as well as sophisticated development of resources. Consequently, dynamic simulators form a promising class of tools, capable to enhance possibilities of traditional planning and controlling methods, adopted from mathematics, statistics or economics. This is namely because the computational simulations can expose emergent behavioral features, identify counterintuitive patterns or simplify and visualize multidimensional nonlinear relations. Realistic transformation of real world problems into a software form also allows safe and cheap training or experimentation.

Although any type of simulation cannot replace the final statement of humans, innovative tools definitely can improve efficiency and quality of their decisions - either as a user-friendly artificial micro-worlds, flexible rapid prototyping tools or falsifiers of improper mental models. Practically applicable simulators must be:

- Holistic and systemic, i.e. working with completely defined and properly bounded problems,
- Knowledge-based, i.e. including visible artefacts of organizational and individual knowledge,

- Heterogeneous, i.e. represented as a set of the particularly convenient computational paradigms,
- User-centered, i.e. preserving users' friendliness, usability and applicability,
- Scalable and expressive, i.e. easy to extend and combine particular solutions to more complex, truth-preserving structures.

From the methodological point of view, simulators also act as validators of dynamic hypotheses, i.e. either confirm or reject initial considerations regarding the temporal behavior of multivariate systems (Serman, 2000). Our hypothesis states that additional investments to the quality of healthcare must (later) break its currently growing financial demandingness and turn falling satisfaction of domain stakeholders.

Instead, sustainable level of expenditure will be reached, altogether with reasonable satisfaction and health status of population. The contextual research questions are how long, how much and where to allocate these finances. Another challenge is to find a reasonable balance between the portion of efficient re parameterization of existing system and ratio of its necessary restructuring.

There are also numerous implementation matters, incorporating, e.g., transparent selection and quantification of qualitative attributes, straightforward identification of model leverage points or formulation of convenient utility functions. To validate our research hypothesis and grasp the overall complexity of this problem, we realized system dynamics prototype of national healthcare system in accordance with traditional research methodology (Mitroff and Kilmann, 1978) in the following four phases:

Problem formulation (1), resulting to a structured, verbal description of processed problem. It must provide enough information concerning internal structure, attributes and functionality, as well as apposite specification of surrounding environment. As the major technique in this stage, we used Analytic hierarchy process (AHP), described in (Saaty, 1980). This is a widely used tool for Multicriteria decision making problems (MCDM), which can be considered as static variants of dynamic planning tasks. Beyond the desired problem formulation itself, AHP outputs can provide also approximate stationary solutions, convenient for consecutive validation. Typical MCDM problems have the following four stages with selectively interconnected adjacent levels:

- Alternatives, represented with set of selected attributes, characterizing quantitatively and qualitatively interesting configurations of modeled system.

Concrete values of these state variables and parameters fully determine dynamic behavior of modelled interconnected sectors of population, healthcare policy, insurance companies and healthcare providers. For example, an alternative can structure and enumerate healthcare utility, business models of insurers or selected performance drivers of healthcare providers.

- Criteria, i.e. quantities, based on which the output impacts of single alternatives are evaluated, like costs, quality of life or health status of population.
- Expert opinions areas, combining and summarizing outcomes of particular criteria, for example to a form of individual, organizational, qualitative and quantitative aspects.
- Final objective, i.e. resultant policy function, evaluating experts' contributions.

We found this prototyping based way of knowledge elicitation efficient, especially because of its goal oriented nature and quantitative support of creative thinking.

Conceptual modeling stage (2) transforms previously collected results and elicited knowledge to a set of diagrams, convenient for further computational processing. Although the system dynamics implementations start traditionally with mind mapping, terminology standardization and system diagramming, due to the adopted AHP startup, it was possible to omit these techniques and concentrate directly on dynamic features, represented with hierarchy of Causal loop diagrams.

Computationally (3), our problem is modeled with System dynamics (SD) language, based on paradigm of multiple stocks of resources – state variables interconnected with parametrically adjustable flows (Sterman, 2000; Warren, 2007). Such notation is very intuitive, because stocks can be filled and drained both with quantitative and qualitative variables. For example, flow of patients is processed with services, derived from managed flow of medical staff. Mutual interaction between patients and doctors contributes to the level of public health stock and consumes money from financial reservoir. Consequently, shortage of diagnostic tools, doctors' knowledge or improper insurance plans, act as bottlenecks, cumulating patients inside the system and decrease the levels of their individual satisfaction and quality of life stocks. Global dynamics is composed from sequential nature of modeled phenomena and topological complexity of their relations,

forming complex, delayed loops. As it is impossible to obtain analytic solution of such systems, in parallel with interactive graphical structural design, set of corresponding difference equations is created and solved numerically during the execution of simulation. Block structure of our simulator in SD like notation is in figure 3.

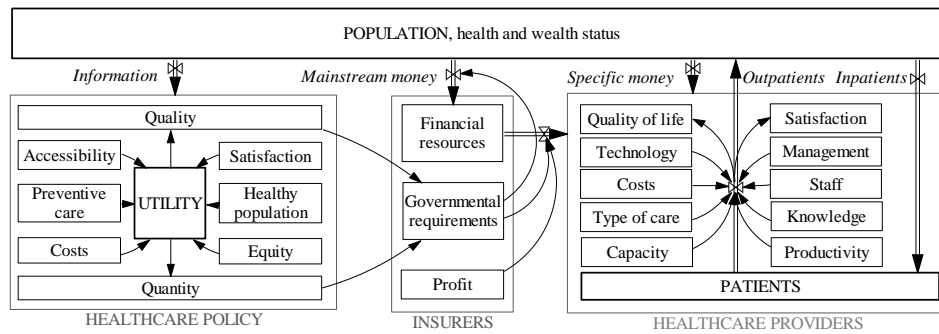


Figure 3: Simplified structure of presented problem

From the behavioral point of view, we can notice there that the population is characterized with its basic health and wealth metrics, such as morbidity (measure of diseased or unhealthy part of population), mortality (measure of dying part of population) and gross domestic product. These rates roughly determine basic inflows of money and patients to the system. Quality vs. quantity balancing policy, derived from public needs and preferences, considers and evaluates numerous wellbeing aspects from their financial demandingness point of view. Resultant governmental strategy represents a mandatory statute for health insurance collecting companies.

The healthcare providers' category is the most complex part of our model. It joins all practical stages, i.e. general practitioners, hospitals and post-acute care facilities, guaranteeing different types, speeds and acuteness of treatment. Both patients and medical staff are represented as aging chains with specific transfer conditions. Complex throughput of patients inside a facility is given by the level and structure of locally developed qualitative and quantitative features.

Left column in this box roughly represents the quantity, the right one is more concerned with quality. The level of patients' stock or the rate of their outflow is affected by any of the depicted categories. As a side effect beyond the retrieved health, outpatients returning back to population are also provided with long lasting, complex intangible

outcomes, called quality of life and overall satisfaction with health care. It is evident that these secondary features considerably affect any kind of their future interactions with this system. Moreover, satisfied discharged patients do not consume any healthcare resources and actively contribute to governmental budget.

6 Results and discussion

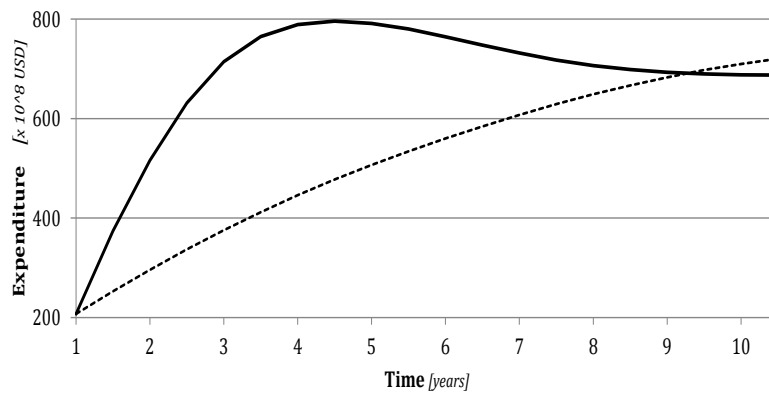
Overall dynamic behavior of presented prototype of quality driven national healthcare policy system is shown in Figure 4. Policy level of SD model was calibrated with public data of Czech Republic. The healthcare providers' part was implemented as array of structurally similar, but parametrically differentiated hospitals, interconnected with arrays of general practitioners and subsequent care providing facilities. All concrete parameters were derived from data, provided by selected local hospitals, municipal healthcare departments and the General Health Insurance Company.

The majority of core and advanced processes in this sector is financed directly from the mainstream money, coming either from governmental budget or from other regular private or public contributors. Although the utilization of such cash flow must obey numerous regulations, there is also space for profit generating activities of single insurers. We believe that the desired fundamental changes can be realized only by means of additional finances, dedicated entirely to systematic and sustainable inclusion of quality.

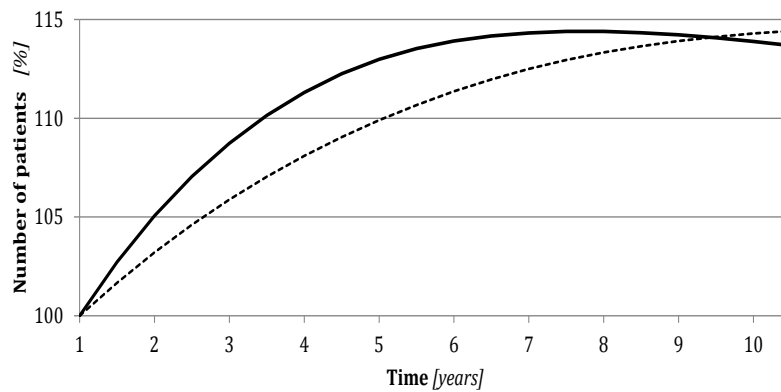
Their estimated amount over time is shown in figure 4a. According to basic scenario, amount of extra funding can be in certain periods of restructuring even higher than standard yearly healthcare expenditure. Focused finances develop infrastructure of providers, educate their staff and establish better managerial practices. Consequently, hospitals become more productive due to increased efficiency. Institutionalized managerial frameworks like Lean, Six Sigma, Total Quality Management or Theory of Constraints (Dahlgard and Dahlgard Park, 2006; Gareth and George, 2010) can minimize waste, standardize internal processes, make flows smoother, support teamwork, establish organizational learning, shift traditional management towards knowledge utilization, drop workload and enhance motivation.

According to basic parameterization, our model outperforms the original one after nine years. From then on, it requires non increasing expenditure and generates better health status of population, expressed in terms of life expectancy (figure 4c). Interesting is initially increasing amount of patients, served by the new system. One explanation is that

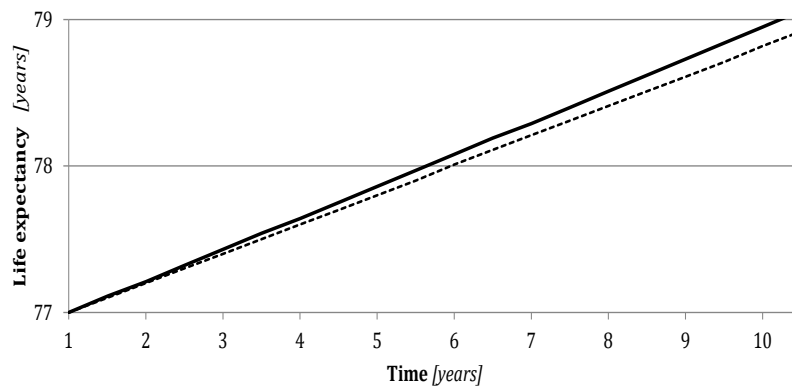
the quality driven care must naturally address more people than the original system. It is also probable that quality standards disallow discharges of not fully treated patients. Although the qualitative extension is expensive, total expenditure start to fall already in the fifth year of its operation.



a) Health expenditure



b) Number of patients



c) Life expectancy

Figure 4: Sample simulated courses of selected characteristics of suggested changes in national healthcare system (solid lines) and their comparison with simply interpolated outputs of its past behavior (dashed line).

System efficiency is visible from the comparison of curves on graphs a) and b) in figure 4. Although the new system serves growing amount of patients till the year seven, its overall costs drop already from the year five.

7 Conclusions

We proposed and through a computational prototype also validated idea of strategic orientation of national healthcare system on quality. This research hypothesis is based on assumption that high quality processes cannot lead to faulty outputs. Many studies confirmed that such assumption works well in general services or IT industry, where customers get their value only at the end of particular core process. Similar principles are applied also in electronics, where exhaustive testing of every single complex element is impossible. These neighbouring achievements suggest the reuse of applicable methodological features also in healthcare, because there are many similarities.

Perception of health services is subjective and can be affected in many stages of treatment. Quality, perceived by patients is very fragile phenomenon and its recovery is generally long-time and demanding procedure. Consequently, systematic and sustainable inclusion of quality to everyday healthcare practice can minimize these risks and make the concept of quality more deterministic.

Preliminary simulated results show that decomposition of national healthcare system into qualitative and quantitative part, followed by sophisticated development of the latter is a promising way how to improve this sector. As the proposed simple prototype behaves in accordance with available historical data and experts' opinions, we plan to refine the existing diagrams and study detailed behavioural features.

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Contexts of Knowledge Management in Psychiatric Nursing

Elisabeth Noehammer *, Ute Tscherne

Department of Public Health and HTA
UMIT – University for Health Sciences, Medical Informatics and
Technology, Academic Center Vienna
Faulmannngasse 4, 1010 Vienna, Austria/Europe

** Corresponding author*

Structured Abstract

Purpose – Hospitals are the central institutions in our public health system and are an important economic factor. The required collaboration of a large number of different occupational groups necessitates efficient knowledge management. In the workplace, knowledge transfer occurs in all directions and involves the risk of not ideally making use of expert knowledge, process-related knowledge and know-how. The aim of the study was to analyse and depict the general framework of knowledge management in the health care sector. The study's main purpose is to raise awareness of the current situation in order to ensure an efficient transfer of knowledge.

Design/methodology/approach – Both a comprehensive survey of up-to-date literature and qualitative research methodology were utilised in this study. The qualitative research data consisted of ten in-depth interviews with graduates of the health and patient care sector in Austria. The interviews were evaluated with the qualitative content analysis method according to Mayring (2000).

Originality/value – The results of the interviews revealed that the respondents had a differing approach to the concept of knowledge in general. The situation in the health care sector as well as the importance of efficient knowledge transfer was given varying degrees of significance by the respondents. A unification of the approach towards knowledge management and transfer is needed.

Practical implications – It was found that adequate evidence-based knowledge management requires sensible and sensitive handling of health care staff in respect to individual, general and organisational knowledge. If these requirements are met, staff contentment will increase and patient care will improve.

Keywords – Knowledge Management, Hospital, Nursing, Psychiatric Nursing

Paper type – Academic Research Paper

1 Introduction

Hospitals as such are the central institutions in our public health system and have developed into an important economic factor over time. A hospital is an organization with a broad basis of knowledge, and structured in a way that creates many opportunities and challenges for knowledge management. Various professional groups work together to offer a variety of services on the basis of their competences, abilities, and knowledge (Glouberman and Mintzberg, 2001a, 2001b). Since the medical and paramedical professions are strongly oriented on best-practice and evidence based adaptations of procedures and treatments, there is a constant change inherent to the delivery of services and the services themselves. Moreover, constant cost-pressures and reorganizations require attention. This together creates dynamic conditions within the hospital as an organizational system, for the work groups, and for each individual.

For Haasis (2007), the employee's knowledge is one of the company's fundamental resources for the optimization of processes and is mainly created through combination in certain situations where acting (in a potentially new way) is required. The required collaboration of a large number of different occupational groups necessitates efficient knowledge management. However, in the workplace knowledge transfer occurs in all directions and involves the risk of not ideally making use of expert knowledge, process-related knowledge and know-how.

While the literature on knowledge management in the hospital is multifaceted and reaching from solely theoretical works to very specific empirical studies, general knowledge management contexts in nursing so far were not in the main focus. A systematic, well-functioning knowledge management in this profession, however, is highly relevant for ensuring patients are treated in the best way possible. In the context of nursing, this is especially relevant in the quality discourse, as this goes hand in hand with the question of how to bridge the theory-practice-gap. Many models were developed (Katenkamp, 2003), and Nishikawa and Kazuko (2007) even pose the question whether nurses are knowledge workers.

The objective of this paper is to portray the general condition of knowledge management in the health care sector of hospitals, and which ones prosper knowledge transfer between and within occupational groups leading to collective, organizational knowledge. According to Drucker (1994), taking care of providing accessible knowledge resources is fundamental for making flexibility, adaptability and innovation possible. The

main focus will be put on the nursing profession's perspective. The crucial question is how knowledge transfer can be improved, how new scientific developments can be reflected on, shared, and incorporated into daily practice. As the context in which nurses work is very varied and hard to generalize, we chose to focus on one background only. For this paper, we studied psychiatric nurses working in a hospital in Austria. With qualitative interviews, key opinions of ten experienced psychiatric nurses regarding these issues are examined in detail to create an entry point for creating a sustainable knowledge management system.

2 Background

Knowledge sharing can be regarded as an extra-role behaviour that is only shown when the conditions are favourable, i.e. in cases where the individual feels this behaviour would also benefit themselves. However, due to the complex conditions in hospitals outlined above, this situation cannot be taken as an automatic given. Knowledge sharing is more likely to be a matter of organizational politics. The latter is defined as „shared perceptions about the strategic or tactical use of power and influence (both formal and informal), networks, relationships, and knowledge (under conditions of uncertainty, ambiguity, or competing interests) in the service of decision-making, resource allocation and the achievement of individual, team and organizational goals“ (Albrecht and Landells, 2012, p. 5).

According to Glouberman and Mintzberg (2001a, 2001b), a hospital consists of four “worlds” or cultures: cure (physicians), care (nurses), control (management), and community (trustees). All these worlds employ other principles and sometimes have diverging goals, but have to be aligned in the service for the patient. However, due to the amount of ambiguity created, some potential for organizational politics can be expected. Therefore, knowledge management or knowledge protection will not only play a role between, but also within professional groups or worlds in the hospital. The focus in this paper is on the nursing profession, “care”, as Glouberman and Mintzberg (2001a, 2001b) put it.

Knowledge of employees in hospitals is often implicit (see Polanyi, 1966), experience based. It can be categorized as process, patient, service, and organization related knowledge. Process related knowledge refers to organizational processes and clinical paths, patient related knowledge is all data known about the patient. Service related

knowledge comprises all professional knowledge relevant for providing medical or paramedical services to the patient (it consists of theoretical plus experience based knowledge). Organizational knowledge refers to clinical practices, guidelines, etc. required for keeping up the hospitals' operation. (Bohnet - Joschko and Bretschneider, 2006).

Knowledge in nursing, according to Carper (1978), can be differentiated into four types or aspects, which are all equally important: empirical knowledge, intuition, personal knowledge, and ethics.

- (1) Empirical knowledge is based on systematically, rule-based collected, analyzed and interpreted scientific data. Data can be derived from measurements, sensations, interviews, reports, etc. The aim of this knowledge is to describe, explain and predict incidents relevant for nursing. Therefore, it is imperative that the analytical procedure is intersubjectively transparent.
- (2) Intuition is an implicit knowledge based on experience and empathy, a feeling which action would be right in a given situation. Externalisation is only possible in a retrospective way, for example by interviewing experienced nursing and analyzing their reports on specific occasions.
- (3) Personal knowledge also is considered to be implicit and is based on reflection on the own personality and on the individual's personal history in combination with their effects on interaction. The focus here is creating value congruence – the individual nurse's beliefs, values and actions have to be consistent (see also Verplanken, 2004)
- (4) Ethics refers to the moral aspects of nursing. Frequently, there is ambiguity of values, interests, goals – not only due to the different “worlds” in the hospital (see above). Nurses then have to take moral decisions based on explicit and implicit ethical knowledge.

(Carper, 1978)

How this knowledge can be put into action depends on the organizational context (organizational structure and culture, power issues, technical possibilities, access to information), the group context and individual issues like motivation and abilities. Rosenstiel and Comelli (2003) cluster these determinants of individual behaviour in the organization as individual ability and motivation, social desirability and situational possibility. Only in cases where the individual can and wants to show a specific

behaviour – here i.e. using and sharing knowledge – and the group of colleagues supports that behaviour and the situation allows for it regarding resources, the likelihood is high that the behaviour will really be put into practice.

How these factors interrelate and which aspects are highlighted by the employees themselves is subject of the following chapters.

3 Method

3.1 Data collection

Both a comprehensive survey of up-to-date literature and qualitative research methodology were utilised in this study. The qualitative research data consisted of ten in-depth interviews with graduates of the health and patient care sector. The interviewees were recruited in one hospital in the south of Austria and are experienced psychiatric nurses with diverse professional backgrounds to ensure a broad perspective. All interviews were done in German.

All participated voluntarily and were informed about the purposes of the study and that their replies would be quoted using a pseudonym (a number.). Using an interview outline based on the research interests, the individuals were asked about (1) how knowledge transfer takes place in general, (2) when and where knowledge is shared or new knowledge created, (3) which problems occur, and (4) which improvements were suggested. By doing so, we followed the tradition of the problem based interview, which is *“a theory-generating method that tries to neutralize the alleged contradiction between being directed by theory or being open-minded so that the interplay of inductive and deductive thinking contributes to increasing the user's knowledge. The appropriate communication strategies aim firstly at the representation of the subjective approach to the problem, secondly the stimulated narratives are enriched by dialogues employing imaginative and semi-structured prompts.”* (Witzel, 2000)

3.2 Sample

Three out of 10 were male, which is roughly also the percentage in the general population of (psychiatric) nurses. Five individuals were between 20-30 years old, one between 31-40 years old, the rest between 41-40 years old. One person already worked in nursing over 20 years, two between 15 and 20 years, three between 6 and 10 years, the

rest between 2 and 5 years. Before taking their degree in psychiatric nursing, three interviewees had worked as assistants in psychiatric departments.

3.3 Form of analysis

The interviews were evaluated with the qualitative content analysis method according to Mayring (2000, 2004, 2007). The concept comprises nine steps:

- (1) Definition of the material: only parts relevant to the research objective are used
- (2) Analysis of the interview situation: one-on-one situation, four interviews lasted less than half an hour, the longest 74 minutes
- (3) Definition of formal characteristics of the material: transcript of interview; dialect was corrected to regular German; in a second step superfluous parts were deleted (breaks, thematically irrelevant issues, etc.)
- (4) Direction of Analysis: the focus was to analyze how the interviewees experience knowledge transfer in their professional surrounding
- (5) Theory-based differentiation of research question: four major issues were investigated – (a) how knowledge transfer takes place in general, (b) when and where knowledge is shared or new knowledge created, (c) which problems occur, and (d) which improvements were suggested
- (6) Definition of Type of Analysis: the replies were pre-categorized by (a)-(d), where applicable new categories were defined.
- (7) Definition of Entities for Analysis: typically, sentences were the smallest entities for analysis
- (8) Analysis: see (6), the replies were categorized and then abstracted
- (9) Interpretation.

In the next section, the results of step 8 are presented.

4 Results

In a first step, 13 categories were created by analyzing the content of the interviews:

- (1) Definitions for knowledge sharing and transfer (KST) ,
- (2) Current Situation,
- (3) Importance of KST,
- (4) Situations of KST,
- (5) Types of shared and available knowledge,
- (6) Knowledge acquisition,
- (7) Handling of KST,
- (8) Reactions to KST,
- (9) Barriers to KST,
- (10) Benefit of KST;
- (11) Consequences of lack in KST,
- (12) Emergence of know knowledge,
- (13) Suggestions for improvements.

In a second step, these categories were assigned to the basic aspects of knowledge management processes. Categories (1)-(4) relate to the procedural context, categories (5) and (6) to the input, categories (7) - (9) refer to the process design, categories (10) - (12) refer to the effects, whilst category (13) remains the same.

4.1 Procedural context

The interviewees' own definitions for knowledge sharing and transfer (KST) ranged from simply stating that there are various ones (Int. 7 / L 14), to learning from others (Int. 3 / L 4-5), communication between students and professionals (Int. 1 / L 13), interactions in the course of shift changeovers (Int. 4 / L 3), and the note that how knowledge is transferred is highly influenced by hierarchical issues (Int. 7 / L 9-10).

Interestingly, most state that KST is of high importance to them (Int.1 / L 15; Int. 4 / L 6; Int. 5 / L 3; Int. 6 / L 10; Int. 7 / L 19; Int. 8 / L 11; Int. 9 / L 14; Int. 10 / L 14, 129), but of rather less for their (especially older) colleagues (Int. I / L 16-17; Int. 5 / L6; Int. 6 / L 12; Int. 10 / L 18), and of even less relevance for the organization (Int. 6 / L 14; Int. 9 / L 22; Int. 10 / L 22). Others mention the opposite regarding colleagues and organization, which is also obvious in the subjective evaluation of the current KST practices.

Regarding situations for KST, team meetings and shift changes are mentioned frequently (for example Int. 3 / L 116; Int. 7 / L 17), also breaks (Int. 2 / L 118 - 119), errors (Int. 3 / L 30 - 31), or new situations (Int. 3 / L 55). Nevertheless, time, attention and interest (Int. 9) as well as the own obligation to ask (Int. 5 / L 37 - 38) are stressed as determinants for creating situations of KST. The obligation to inquire seems to be highly important as "being asked" is mentioned by four interviewees, and "when asking someone" is stated by nine as occasion to share knowledge. However, this is not regarded as a matter of course, since (new) knowledge is often acquired during free time (Int. 8 / L 70 - 71). Evidently, there are also situations where knowledge is shared without a trigger question – some regard the situation itself to induce KST, whether others want to listen or not (Int. 4 / L 38-39).

3.2 Input

Regarding available knowledge, experience is rated very highly (see for example Int. 7 / L 59; Int. 10 / L 54), but also additional courses (see for example Int. 1 / L 48; Int. 7 / L 40). However, frequently the fact is lamented that the latter have to be attended during

off-time and are not even paid (Int. 3 / Z 90; Int. 4 / Z 51; Int. 6 / Z 29; Int. 8 / Z 21 - 22; Int. 8 / Z 44; Int. 10 / Z 63). Therefore, the interest of the organization in continuing education of the nursing staff is questioned.

3.3 Process Design

KST in the hospital is in a very early stage for some (Int. 5 / L 13; Int. 10 / L 19), leading to everyone creating their own knowledge anew (Int. 8 / L 76 - 77). As for reactions to KST, some state that asking may lead to being perceived as ignorant (Int. 5 / L 30 - 31), that some (thus) never show not knowing something (Int. 2 / L 20-21), and that colleagues can be envious to knowledge (Int. 1 / L 54). In Int. 6, low interest of others is mentioned, in Int. 10 the lack of value put on “school” knowledge is highlighted since experience is more praised.

Barriers to KST are lack of time (Int. 1 / L 90 - 91; Int. 2 / L 121; Int. 7 / L 19; Int. 9 / L 80) and shortage of personnel (Int. 1 / L 89; Int. 3 / L 213, Int. 7 / L 100 - 101) as well as lack of interest (see above), knowledge protection (Int. 2 / L 88), and too little communication (Int. 4 / L 66; Int. 6 / L 17; Int. 7 / L 64 - 65; Int. 10 / L 69 and L 95). Moreover, certain structural issues (general: Int. 6 / L 61; shift plans: Int. 7 / L 84) and lack of organizational interest in knowledge acquisition and transfer regarding nurses make KST difficult to coordinate (Int. 7) and thus unstructured (Int. 8 / L 62). Also, there are no incentives for practicing KST (Int. 10 / L 93).

3.4 Effects

The benefit of KST is stated to be better (Int. 1 / L 101) and quicker (Int. 4 / Z 82; Int. 6 / Z 77) patient care, or simply keeping the current services up (Int. 1 / L 25). Also, an improvement of collaboration (Int. 7 / Z 93), higher employee satisfaction (Int. 1 / L 100) and a quality boost for both patient and personnel (Int. 2 / L 104-105) are possible. In Int. 3 and 8, learning from colleagues is stressed as being helpful since time-saving (Int. 8 / L 86) and providing security (Int. 3 / L 73-74).

Inexistent or limited KST would lead to harmful individual consequences: the feeling of not being informed enough is regarded as strain (Int. 3 / L 144; Int. 7 / L 89 - 90) that could even lead to burn-out (Int. 2 / L 97 - 99). Negative effects are also expected for the patient (Int. 4 / Z 77; also: Int. 5, Int. 9), for example due to longer stays at the hospital

(Int. 2 / L 101; Int. 6 / L 74) or because the patient also receives too little information (Int. 10 / L 98 - 99). At the group level, tensions are expected due to the experienced strain (see before; also: Int. 5; Int. 9) and less synergies created (Int. 8 / L 76 – 77). Also, there are organizational dangers, for example in case errors occur due to lack of communication.

3.3 Suggestions for improvements

The suggestions for improving KST practices are manifold and can be subdivided into individual aspects group issues organizational matters and leadership. Interaction, participation and communication play central roles next to time management requirements. The ideas are highly practical and focus on creating more possibilities for KST as well as a new positive understanding of it. As they focus very much on the context of the specific hospital, they are presented only in short here. A major issue was providing more time for KST by changing shift times and structures plus implementing fixed times for team meetings, which was mentioned by almost all of the interviewees. This has to be backed up by the leadership (Int. 8 / L 95; Int. 9 / L 116; Int. 10 / L 107 and 120 – 121; see also Int. 2 and Int. 3), and the necessary physical structures (meeting rooms) are needed. Moreover, the organization should promote continuing education. Also, a bonus system was discussed to reward active KST (Int. 8).

5 Discussion

Both a comprehensive survey of up-to-date literature and qualitative research methodology were utilised in this study. The qualitative research data consisted of ten in-depth interviews with graduates of the health and patient care sector. The interviews were evaluated with the qualitative content analysis method according to Mayring (2000).

The results of the interviews revealed that the respondents had a differing approach to the concept of knowledge in general. This may be one of the reasons why the implementation of a knowledge management system is difficult: in when it is unclear what should be shared and transferred, the system cannot reach its potential (Howaldt et al., 2004) The situation in the health care sector as well as the importance of efficient knowledge transfer was given varying degrees of significance by the respondents. Many of the respondents' comments contain specific suggestions for improvements, for example regarding shift design.

Lack of time and sometimes interest in communication is a major barrier to an efficient KST. Also, the organization itself is not perceived to be highly supportive. One approach to incorporate more aspects into one intervention would be to implement mentoring systems (Swap et al., 2001). By doing so, the organization would show the value and importance of KST, those who have experience would feel valued and their knowledge wanted. The necessary structural issues would have to be provided for by the organization and the team (time, rooms). By ensuring one-on-one communication, fear of being perceived as ignorant would be reduced by the formalized setting (see also Coiera and Tombs, 1998) of an experienced and less experienced nurse. Eventually, the sharing would become mutual, as the newer knowledge (out of adapted study programs) of the younger ones would naturally be discussed, so all could profit. A further approach would be to incorporate more multi-professional teams working on problems, like in cancer boards. That way, and also in mentoring systems, the members of the organizations feel their own relevance in the KST process much more, which increases the likelihood of it to happen (Kvarnström and Cedersund, 2006).

6 Conclusions

It was found that adequate evidence-based knowledge management requires sensible and sensitive handling of health care staff in respect to individual, general and organisational knowledge. If these requirements are met, staff contentment will increase and patient care will improve. As this qualitative research has shown, findings from interviews can shed light on the major obstacles to efficient KST in organizations. In the context of the hospital where this study took place, a common definition of KST is required, which has to be created in a shared process started by the management. By doing so, the organizations' interest in the knowledge of its employees would become apparent, increasing motivation and the feeling of being heard and valued. For future research, the main findings of this study should be analyzed on a broad quantitative level in order to analyze the most important issues so an adaptation of the current knowledge management system can be carried out efficiently.

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Delayed Discharges and Hospital Performance: System Dynamics Modelling the Role of Clinical Social Workers

Jan Voracek *

Department of Electrical Engineering and Computer Science
College of Polytechnics
Tolsteho 16, 586 01 Jihlava, Czech

Marketa Dubnova

Department of Social Work, College of Polytechnics
Tolsteho 16, 586 01 Jihlava, Czech

* *Corresponding author*

Structured Abstract

Purpose – Undesirable blocking of bed capacity by non-acute patients because of systematically unresolved ways of their transfer to convenient external facilities gradually restricts instant availability of local healthcare services and evidently requires systematic solution. In the presented research, we propose and analyse different scenarios, according to which the clinical social workers (CSWs) can influence the overall hospital throughput.

Design/methodology/approach – We propose two-stage system dynamics model of hospital, distinguishing between acute medical and discharge related activities. According to our research hypothesis, CSWs could contribute both internally or externally. As hospital staff members, they extend HR capacity and decrease workload of medical workers. Outside the hospital, they can negotiate the real necessity of admission or allocate appropriate post-acute capacity. Because of complex dynamics and inherent complexity, we consider interactive computational modelling as convenient tool, supporting analyses, planning or design of healthcare and social policies.

Originality/value – Delayed discharges are usually presented as suboptimal capacity problem with related managerial constraints, striving to administratively relocate patients to momentarily free facilities. We are specific in the following ways: (i) orientation on psychiatric patients with high risk of relapse in case of discharge to inappropriate social conditions, (ii) explicit introduction of CSWs to discharging processes, which enhances this problem with social aspects and (iii) utilization of intuitive language of stocks and flows, which is understandable for all involved parties.

Practical implications – This research transforms topic related knowledge and data to the form of interactive strategic planning simulator. Presented studies were realized in close cooperation with psychiatric hospital, where CSWs form inherent part of

multi-professional teams, altogether with doctors and nurses. All findings were thoroughly discussed with practitioners and their feedback promptly incorporated to model.

Keywords – Social work, hospital performance, dynamic modelling.

Paper type – Academic Research Paper

1 Introduction

Average length of patients' stay is essential, but still rather misleading indicator of hospital performance. The reason is that this metrics incorporates two naturally uncertain phenomena - duration of medical treatment and unnecessary time, spent by improved patients in hospitals. Although the first one can be hardly modelled, not to say optimised, the latter is an excellent candidate for redesign. Thorough investigations of multiple aspects of delayed hospital discharges are subject of research interest for decades. The reason why structural and behavioural features of differently occupied hospitals are so intensively analysed, discussed and improved is generally high price and limited capacity of hospital beds, accompanied with shortage of qualified resources and still unclear relations between hospital and surrounding environment. The following findings represent the most frequently repeating conclusions from reviewed resources:

- Keeping treated patients in hospitals or their strict discharge are strategically and ethically unbearable. There is a need for multi-professional hospital teams, dealing with social matters of patients, discharged from acute care (Costa et al., 2012; McDonagh et. al., 2000; Mur-Veeman and Govers, 2011; Victor et al., 2000),
- Systematic institutionalization of discharging process requires design of new working positions, providing additional assistance in social domain (Challis et al., 2014; Connolly et al., 2009; Godfrey and Townsend, 2009; Majeed et al., 2012),

- Special emphasis during the transition from hospital must be given on socially weak and psychiatric patients (Allen and Read, 1997; Capdevielle and Ritchie, 2008; Carpenter, 2002; Heng-Ching and Hsin-Chien, 2008; Huntley et al., 1997; Maone and Rossi, 2003; Ryu et al., 2006),
- There must be transparent internal interfaces between the hospital front-end (treated) and back-end (discharge planning) patients and defined external bridges between hospital precedent and subsequent stages (Bachman, 2011; Bruce et al. 2005; Huby et al., 2004; Paradis, 1987; Shepperd et al., 2009),
- Post-hospital capacities must be timely synchronised with amount and diagnoses of patients, planned for discharge to post-acute care (Allen, 2012; Golden, 2011; Goldman, 1982; Kiesler, 1982; McMillen et al., 2005).

These recommendations can be implemented by financially feasible extensions of deficit capacities or through particular improvements of efficiency. The following examples characterise some viable strategies:

- Hospital at home (Mottram et al., 2007; Shepperd and Illiffe, 2002; Young et al., 2012), i.e. service, in applicable cases providing active medical treatment by health care professionals in the patient's home for a limited period. The eventuality can also serve as a hospital bypassing bridge between general practitioners (GPs) and post-hospital facilities.
- Holistic discharge management, incorporating this activity to everyday planning, structuring, leading and controlling processes (Combes, 2002; McKenna et al., 2000; Parkes and Shepperd, 2003). This option assumes the existence of multi-professional, rapid response teams, interacting with patients continuously from admission and planning discharges in close connection with actual health status. Such systematic support results in deterministic and predictable internal flow of patients

There are also promising findings concerning the improved clinical care. The motivation behind is that high-quality medical processes produce less amount of post-hospital care requiring patients (Chung et al. 1997; Pavlin et al., 2002). Another researchers study possibilities of single roles, administratively involved in discharge process. For example, GPs can limit delayed discharges by lowering the hospital admission rate (Kendrick and Conway, 2003). In some hospitals there are discharge liaison nurses, responsible for related administrative, advisory and policy-making matters.

(van Emden et al., 1999). Nurses, however, cannot take full responsibility for discharges, because their official duties are limited to the hospital itself (Armitage and Kavanagh, 1996). According to our opinion, important but still not fully recognized role in discharge process can play also clinical social workers (CSWs). This specific type of non-medical hospital staff focuses mainly on social aspects of patients' treatment (Beder, 2006; Clarkson et al., 2009; Cnaan and Kang, 2011; Gibelman, 1995; Gil et al., 2013, Tendai, 2008; Watkins et al., 2012). Even if the role of CSWs is declared by law, range of their practical duties and competencies differs from one hospital to another. Standardized and efficient institutionalization of CSWs is problematic especially in countries with disjoint administration of health and social services.

2 Hospital productivity and its structural components

The main goal of our research was to identify, design and justify viable and transparent ways of inclusion of CSWs to everyday hospital operations. The convenience of such arrangement was analysed with respect to hospital productivity, combining its quantitative and qualitative characteristics (Davies and Davies, 2011). This one-shot organization-wide measure can be informally defined as a degree of ability to produce defect-free goods or services. In the simplest steady form, productivity is a ratio of cumulated outputs to cumulated inputs, e.g. *patients/labour*. Consequently, the desired growth of productivity can be achieved either by increasing the number of outputs with the same amount of inputs, by reducing the number of inputs with unchanged outputs or by any applicable combination of the both strategies. There are the following two major approaches, how to realize such adjustments:

- Quantitative, i.e. add more resources (people, money) and extend infrastructure (capacity, technology),
- Qualitative, i.e. harmonize and optimize both core and advanced processes, identify and minimize waste, educate people and actively employ organizational knowledge.

Usually, managers improve the both components simultaneously in a form of integrated frameworks like Lean, Six Sigma or Theory of Constraints (Jones and George, 2013). Beyond the simplifying *output/input* interpretation, productivity can be also expressed as a generally nontrivial function of effectiveness and efficiency. The former quantifies activities, contributing to the final effect or output,

i.e. healthy and satisfied patient in our case. The latter express the ease of effect creation. For example, patient can be clinically successfully treated in a slow, expensive and frustrating way. According to our understanding, such process is neither effective nor efficient, although there is still a discharged and possibly healthy patient at its end. The hospital treatment process could be called as effective if the discharged patients and their relatives feel comfortable in all its stages. In accordance with such assumptions, we split the presented CSW problem into three stages and two internal sub-stages as follows:

- Pre-hospital, i.e. input part, where prospective patients are examined by GPs and in justified cases sent to hospitals,
- Hospital treatment, applied to all admitted patients. Because our interest is focused mainly on treated and ready to leave patients, we divided this stage into the following two phases:
 - Front-end, consisting of hospital admission, assessment and acute treatment,
 - Back-end, incorporating post-acute treatment and discharge planning,
- Post-hospital, i.e. output part, considering discharges to home, home care, residential care or any other locally available type of post-acute care.

Consequently, productivity of hospital can be affected by changes in any of these stages or their interfaces. Health and social care, in contrast to for-profit domain, maximize utility of stakeholders rather than own earnings. Because of existing fragmentation of the both sectors and fragile nature of healthcare utility, we believe that governmentally legitimated and properly institutionalized CSWs can safely accompany patients through all the above-defined stages and continuously maintain appropriate level of their satisfaction. Resultant value for patients is evident, so the related key question is how to break the existing structural, functional and temporal complexity in order to built-in CSWs into the existing system in the right way.

3 Methodology and experimental design

Considering all outlined aspects, we decided to analyse the problem of hospital discharges by means of interactive computational model, developed in the language of system dynamics (Forrester, 1961, Warren, 2007).

This powerful tool belongs to family of systems science methods and has numerous successful applications in economy and management. Prior to model realization, we created corresponding conceptual model, the key part of which is the Causal loop diagram (CLD) (Sterman, 2000), summarizing the overall dynamics of presented problem. In accordance with figure 1, behaviour of proposed model is determined by four loops, three balancing and one reinforcing. Limiting effect of fixed hospital capacity and staff workload, slowing down the discharge rate, are generic internal behavioural patterns. What is not visible in the diagram, but is fully implemented in the model, are complex relations between workload, management and productivity. Computationally they are represented with nonlinear functions of teamwork, leadership, motivation, improvement and quality.

Analysed role of CSW is expressed with the additional two balancing loops. The left one limits the admission of new patients in the pre-hospital phase, i.e. on the level of GPs, external social and non-acute medical care providing institutions. The right loop matches the discharge rate with available external capacity. Stabilizing effect of both control mechanisms is evident. With early corrective actions, CSWs-induced loops can suppress capacity disturbances and relief internal pressures.

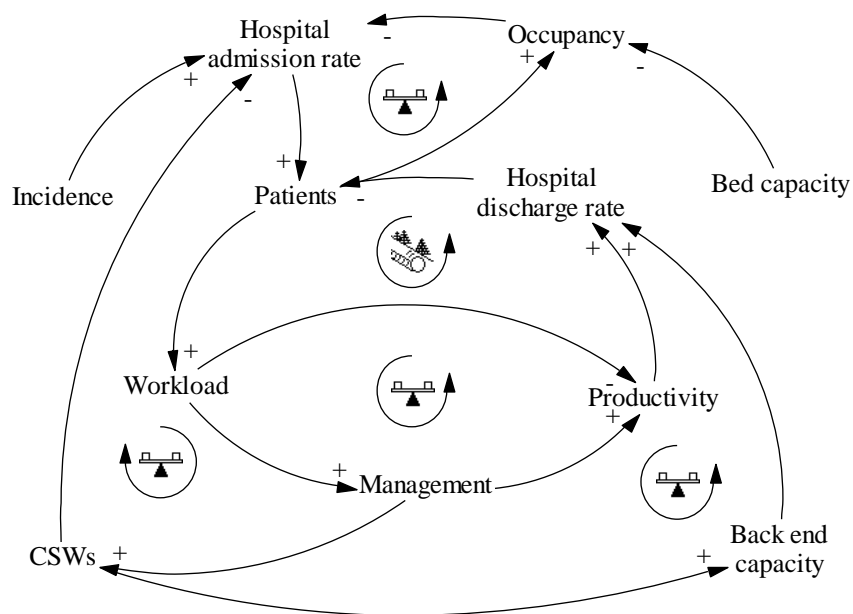


Figure 1 Conceptual Causal loop diagram of CSWs role in hospital

Resultant system dynamics model of patients flow is composed from the major diagnosis-dependent pathways, temporally divided into stages of introductory, acute, intermediate and post-acute care. Each phase is represented as a dynamically filled and drained stock of patients, controlled with parametrically adjustable valves. Similar formalization was proposed, e.g., by Wolstenholme et al (2008) or McKelvie (2013). In the desired stable configuration, the flow of inpatients is constant and equally distributed close to hospital effective capacity, i.e. admissions are approximately equal to discharges. If reasons for delayed discharges arise, patients start to cumulate in the affected stage. Such bottleneck slows down admission of new patients, which has multiple social and economic consequences.

Simplified functional diagram in SD-like notation is in figure 2. All valves (“sandglasses”) excepting the incidence rate are accessible also by CSWs. The flow of prospective patients from their homes or care facilities is primarily determined by incidence rate and partially also by readmission rate. CSWs, in cooperation with external medical and social workers, can partially close the upper left valve or even establish a hospital bypass. Thus the appropriate non-acute candidates for hospital care can be treated continuously in their original locations or moved directly from homes to any post-hospital type of care. Internal activities of CSWs, aiming to maximize the flow of patients through the hospital are oriented towards both its front-end and back-end stages. As a part of entry assessment team and based on knowledge of medical records, experienced CSWs can estimate future evolution of treatment and start to work on appropriate discharge option. Or, alternatively, from the very beginning they can prepare individual patients for the most convenient post-acute eventuality.

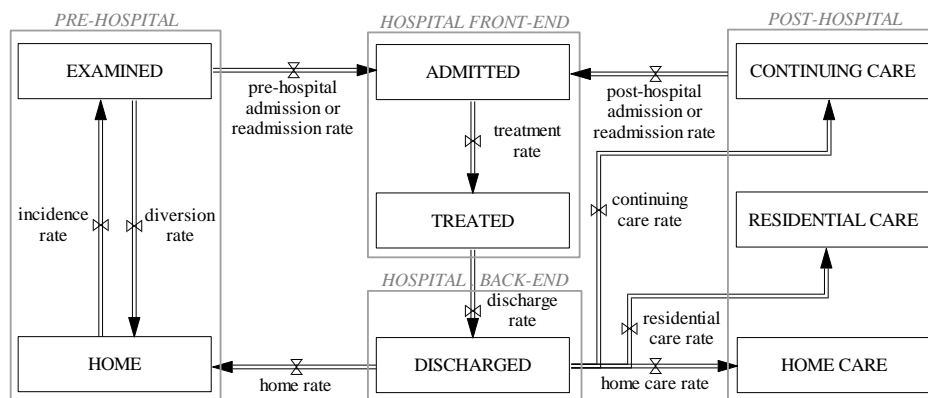


Figure 2 Simplified Stock and flow diagram of hospital in a wider context

Meanwhile, CSWs can play active role in post-hospital stage, either in planning of future capacities, prioritizing the waiting lists or participating in strategic development of this sector. Any long-time policy-making can be, however, realized only on the basis of exactly specified rules and responsibilities and in a close cooperation with local governmental both social and healthcare authorities.

4 Experiments

In the following experiments, quantity is characterized especially by numbers of patients in single stages and average durations of significant events, supposing fixed physical and process layout structure. Qualitative, i.e. efficiency related aspects, include satisfaction of patients and staff workload. In industries, dealing with specific services or intangible outputs, the quality of product is usually achieved through the quality of internal processes. Practically this means that sufficient number of motivated, relaxed, properly managed and continuously educated staff, equipped with appropriate tools and facilities can produce not only healthy, but also satisfied patients. In case of constant inputs, hospital operates around dynamic steady state. In adopted SD notation, this situation means smooth flow of patients through all its internal stages. Levels of patients' stocks are constant and reasonably below particular maximal effective capacities, derived during the structural design phase from historical data and with respect to maximisation of economies of scale. In practice, amount of incoming patients is time-varying. These changes are either inevitable, for example as a result of epidemically or seasonally increased incidence or induced, e.g. by slowed down medical processes or delayed discharging. The way of processing of external changes depends primarily on available infrastructural and HR capacities. Small fluctuations can be managed parametrically, i.e. through readjustment or redistribution of existing resources, supported with applicable extension of capacity. In such case, changes of stocks levels are managerially reflected shortly and without undesirable effects on patients' health status. Larger differences, however, cannot be handled in such way and require more complex restructuring, which is out of scope of this paper. Consequently, presented research deals with the typical case, when hospital operates just with a small reserve of capacity and any emergent changes must be solved with improved efficiency. The following cases analyse several typical scenarios, reflecting wide spectrum of applicable configurations.

4.1 Operations with constant input, appropriate constant capacities and without any contribution of CSWs

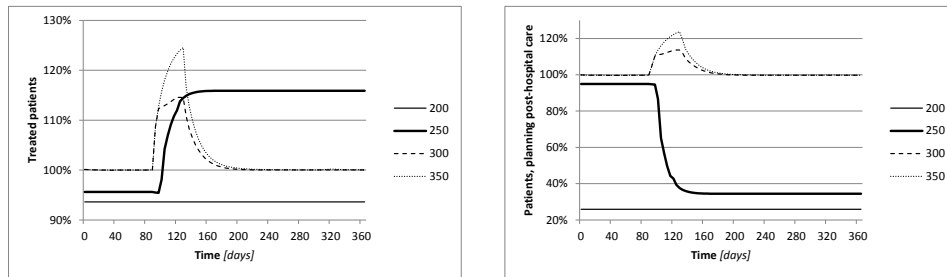
This example assumes ideal throughput, when all admitted inpatients are smoothly discharged to post-acute facilities. Input and output flows are equal, which leads to the constant levels of single stocks and minimal waiting times, workload and readmissions rate. Because all the below-presented graphical outputs are relative, it is useful to pinpoint their absolute, time-constant values here:

- Number of concurrently treated patients $N_T = 185$,
- Number of patients ready for discharge: $N_D = 25$,
- Number of patients, waiting for any non-acute post hospital care: $N_W = 30$.

It is evident, that in case of appropriate financing, there is no need for any changes.

4.2 Operations with bar input change, varying capacities and without any contribution of CSWs

To evaluate dynamic behaviour of hospital model, we increased amount of admitted patients for approximately 10% between days 80 and 120. Such rather unrealistic change is strong enough to discover system limitations and demonstrate its recovery possibilities. To study the role of capacity, we also performed system sensitivity analysis of this parameter. Because the effective capacity $C = N_T + N_D + N_W = 240$, we simulated behaviour for $C = 200, 250, 300$ and 350 with proportionally changing numbers of beds in all stages. Graphical representation of amount of treated and discharged patients is in figure 3. For insufficient capacities (i.e. $C < 240$), system is fully limited and cannot accept any additional inpatients. Logically, there are also no changes concerning the discharged patients. Their amount and resultant hospital productivity are low, because hospital back-end manages to distribute all treated persons to post-hospital facilities continuously. Curve for $C = 250$ shows such typical transient behaviour. Gradually loaded system cannot shortly incorporate additional patients and starts to cumulate them in the front-end. Their treatment is naturally delayed because of missing resources which, in turn, affects the hospital back-end similarly as in previous case. For higher capacities, however, the smooth long-time throughput is preserved, although there are capacity-dependent differences concerning the total number of processed patients. This happens because hospital with higher capacity can admit more patients, which lead to the sharp peak on corresponding graph. There is also clear capacity limitation effect for $C = 300$.

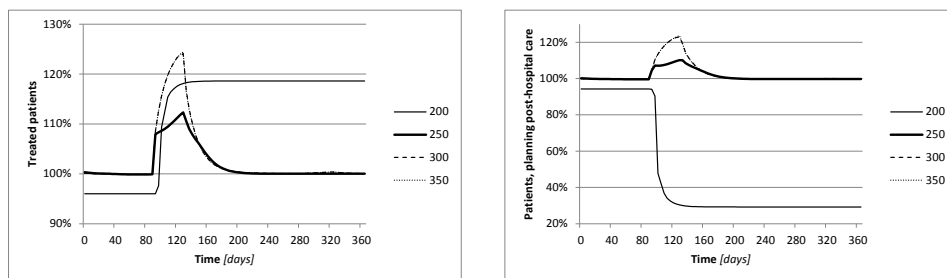


a) b)

Figure 3 Amount of patients treated (a) and discharge planning (b) with respect to available bed capacity and without involvement of CSWs

4.3 Operations with bar input change, varying capacities and entirely internal activities of CSWs

This analysis aims to recognize consequences of potentially rich internal role of CSWs, consisting - in accordance with figure 1 - of (i) partial extension of internal capacity with qualified undertaking of “social” duties of medical staff and minimization of related workload, (ii) active support of quality of care by establishment of partnerships with patients (clients) and their relatives, as well as (iii) distribution of collected findings among the remaining staff members. Figure 4 documents the achieved results. Positive role of CSWs recovers the previously lost throughput of patients - compare, e.g. graphs of treated patients for 250 beds in figures 3 and 4. The main positive is that this significant change is caused mainly by higher efficiency, because medical and structural resources remained unchanged.



a) b)

Figure 4 Amount of patients treated (a) and discharge planning (b) with respect to available bed capacity and with purely internally operating CSWs

4.4 Operations with bar input change, fixed capacity, internal and pre-hospital activities of CSWs.

Beyond the previously introduced internal duties, CSWs are active also prior to the hospital front-end, where strive to optimize the admission ratio through negotiations with GPs, because not every practical doctor is aware of other locally available medical facilities, than the hospital. Such effort can partially decrease the amount of inpatients.

4.5 Operations with bar input change, fixed capacity, internal, pre- and post-hospital activities of CSWs

This scenario maximizes possible utilization of CSWs with extension of their operations also to post-hospital area. There they observe free capacities and partially contribute to corresponding planning and management. Thus, requested non-acute places are available in the right time.

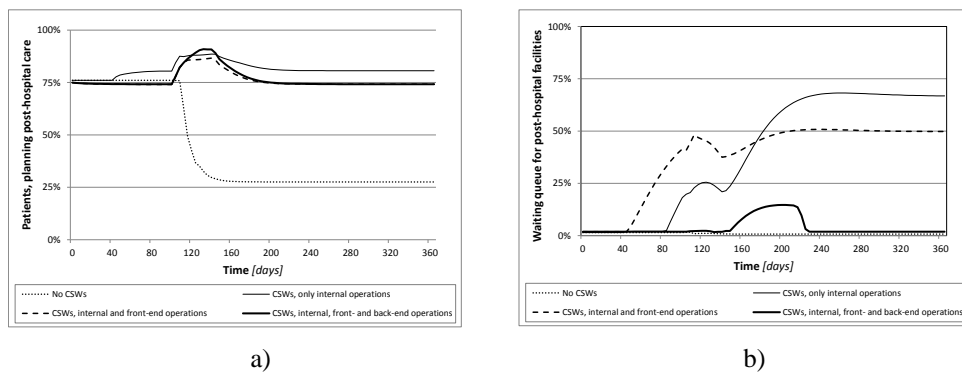


Figure 5 Amount of patients planning discharge (a) and waiting for available post-acute places (b) with respect to different involvement of CSWs. Total capacity $C = 250$

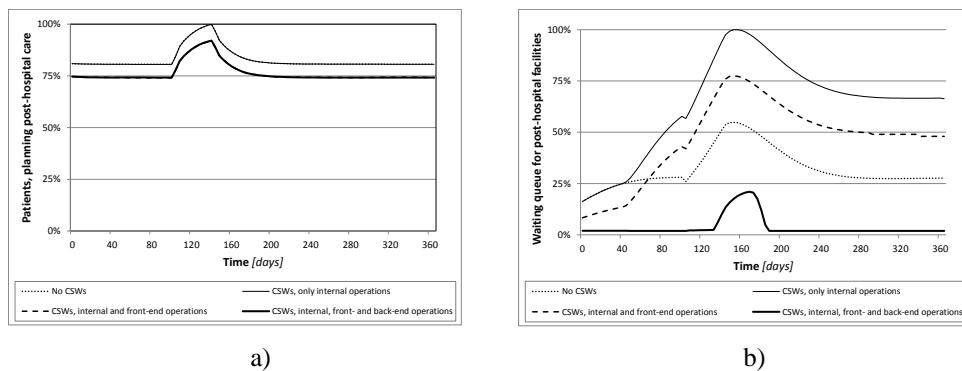


Figure 6 Amount of patients planning discharge (a) and waiting for available post-acute places (b) with respect to different involvement of CSWs. Total capacity $C = 300$

Comparison of effects of different types of CSWs utilization on amount of treated patients for different capacities is in figures 5 and 6. For clarity, all graphs have the same scale. In figure 5 with boundary capacity we can notice gradually summing positive effects of CSWs, compensating originally sharply falling throughput. In graphs of patients, planning post-hospital care, there is also visible the step difference in bed occupancy, given by pre hospital interventions of CSWs. Graphs of lengths of waiting queues visualizes the total instant availability of post-hospital facilities. Figure 5 a) gives approximately similar information as figure 4 a), i.e. that heavily loaded front-end resources cannot serve more incoming patents, which leads to considerable draining of back-end. As soon as CSWs start to act, the desired flow is recovered and demand for external post-acute services starts to grow. One can also notice that pre-hospital activities of CSWs don't have any real effect on waiting queue. This metrics can be improved only by active post-hospital operations, which are then able to serve the majority of demand (bolded solid lines in figures 5 and 6 b)). Figure 6 depicts efficiency of recommended arrangements for satisfactory capacity, quickly balancing input changes. Smooth flow always generates proportional excess of candidates for post hospital care. Supportive internal role of CSWs logically contributes to this trend. That's why their pre-hospital engagement just shifts down the whole waiting curve and only the active post-hospital operations can solve the problem of cumulation of waiting patients completely. Changes in post-hospital end are approximately two times slower, because of complex management of this part and low amount of dedicated resources.

4.6 Economic considerations

Acceptable amount of CSWs for given parametric configuration is also possible to estimate experimentally. Figure 7 illustrates the situation, when new CSWs are gradually included to hospital with fixed capacity $C = 250$ and indicates that optimal *CSWs:patients* ratio is between 1:30 and 1:50. From graphs b) in figures 5 and 6 it is evident that properly engaged CSWs can increase discharge rate up to 70% of patients, waiting for external post-acute placement. Let's suppose that in our concrete case this represents 15 patients. The costs difference between one day spent in hospital and in post-hospital bed can be estimated on 5% of monthly costs of one CSW position. The optimistic *CSWs:patients* ratio 1:30 says, that this hospital needs altogether 8 CSWs for assumed 240 patients.

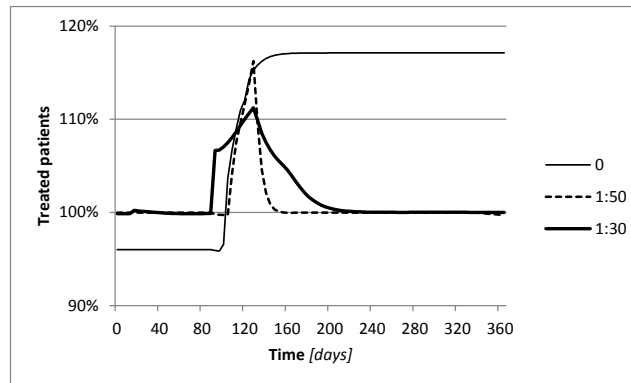


Figure 7 Amount of treated patients with respect to amount of CSWs

As the additional monthly costs of unnecessarily occupied hospital beds, expressed in terms of CSWs expenses, are $15 * 30 * 0.05 = 22.5$, we can conclude, that CSWs services are also cost-effective.

5 Conclusions

We analysed the role of clinical social workers in problem of delayed hospital discharges. According to its system dynamic model, CSWs involved in multi-professional hospital teams can contribute to overall productivity by the following three strategies:

- Harmonization of internal operations, leading to (i) relief of socially oriented workload of medical staff, (ii) facilitation of transfer or treated patients' between hospital front-end and back-end and (iii) increase of satisfaction of patients and their relatives,
- Involvement in pre-admission stage, searching for applicable alternatives to hospital treatment,
- Demand driven planning and allocation of post-hospital capacities and contribution to development of related cross sector policies.

Our experiments justified positive effects of all these strategies on hospital productivity. Moreover, engagement of CSWs introduces also other, yet unquantified outcomes, arising from holistic character of our solution and shifting the task of discharges from purely hospital problem to the level of joint municipal and governmental health and social care planning. Transparent and interactive system dynamics framework contributes conveniently to practical applicability and user friendliness of developed computational model.

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A prospective and participatory approach towards 'responsible' health research and innovation

Petra Wagner-Luptacik*, Manuela Kienegger, Eva Buchinger

Innovation Systems Department
AIT Austrian Institute of Technology
1220 Vienna, Donau City Strasse 1

* *Corresponding author*

Structured Abstract

Purpose – Non-publication of health research data results has serious negative impacts on people's lives. Ben Goldacre diagnoses and popularizes in "Bad Science" (2008) and "Bad Pharma" (2013) a vital "systemic failure" with many stakeholders and counterproductive practices involved so that information about randomized controlled trials (RCTs) are not put in the public domain to the extent that drug innovation is sufficiently effective. This paper presents a conceptual framework for understanding and supporting transformative knowledge-based change aimed at overcoming publication bias in clinical trials guided by the concept of 'Responsible Research and Innovation' (RRI).

Design/methodology/approach – When faced with high levels of uncertainty and complexity regarding future, scenario-based foresight offers itself as a promising system of inquiry. A 'system foresight' approach (Andreescu 2013) is based on the assumption that, firstly, inquiring into the future provides freedom to distance oneself sufficiently from the present; secondly, the future should be approached systemically; and thirdly, the processes whereby the future is explored should be participatory, i.e. as inclusive as possible.

Originality/value – The proposed methodology puts in evidence that in areas where complex decisions involving the coordination and the commitment of many different institutional systems and (large) organizations are at stake for transformative change, a strong prospective and participatory component is needed in order to provide a robust framework for 'responsible' governance of research and innovation.

Practical implications – The conceptual framework proposed was empirically applied as a structured stakeholder-based prototyping process within the context of the EU-funded project "UNCOVER". A value-based vision was laid out, together with procedural arrangements of feasible measures leading to pathways towards responsible future research and innovation in the realm of clinical trials.

Keywords – Responsible Research and Innovation; health innovation process; clinical trials, prospective approach; participatory prototyping

Paper type – Academic Research Paper

1 Introduction

1.1 The diagnosis: 'systemic failure' in health research and innovation

Results from clinical studies are an essential body of knowledge determining health research and policy making. Distortions in the publication and the dissemination of health research results have serious detrimental effects on people's health. Non-publication (i.e. not distributing results properly to stakeholders) may decisively reduce the advantage of systematic reviews of drugs, medical devices or procedures. It affects the knowledge base, patient value per outcome, and the level of public health. A recent review (Song, Parekh et al. 2010) concludes "that studies with significant or positive results are more likely to be published than those with non-significant or negative results." Non-publication of clinical trial results may lead to false conclusions about benefits and harms of medical interventions.

The sources of publication bias¹ are manifold. Song, Parekh et al. (2010) find that publication bias is often due to individual investigators' failure to write up and submit, which can be affected by pressure from research sponsors, preferences of journal editors, and the requirements of the research award system. Some scholars label "under-reporting research as scientific misconduct" (Rotonda 1990). Thus, the research system as a whole seems to fail to sufficiently consider ethical and societal effects of (non-) publication.

The available methods to prevent, reduce or detect publication bias target registration and publication of clinical trials to improve transparency and accessibility, primarily for systematic reviews. Self-regulation, voluntary agreements, good practice guidelines, and the like proliferate, yet the impact is limited (Glasziou, Altman et al. 2014). According to Strech (2012), the reasons against the obligation of complete registration and publication of trials lie in the protection of private data and commercial interests. This is particularly the case with industry-sponsored research (Melander, Ahlqvist-Rastad et al. 2003; Viereck 2009).

¹ *Publication bias occurs when the publication of research results depends on the nature and direction of the results. Because of publication bias, the results of published studies may be systematically different from those of unpublished studies. Publication biases can have different forms e.g. non-publication (never or delayed), incomplete publication (outcome or abstract bias), limited accessibility (grey literature, language or database bias), or other kinds of biased dissemination (citation, duplication or media attention bias). [Source: UNCOVER project]*

As Goldacre popularized in “Bad Science” (2008) and “Bad Pharma” (2013), there is a vital “systemic failure” with many stakeholders (public and private) as well as counterproductive practices involved so that information about randomized controlled trials (RCTs) are not put in the public domain to the extent that drug innovation is sufficiently effective and ultimately provides the best available treatment for patients.

1.2 In search for ‘treatment’

There are evidently systematic constraints on the consideration of societal needs and ethical aspects in the health research and (drug) innovation system which requires extending the scope and going beyond the research realm and addressing the whole “research and innovation process value chain”. The search for viable solutions to counter publication bias thus moves the attention towards future-oriented dimensions of responsibility that offer greater potential to accommodate uncertainty and allow reflection on purposes and values (Stilgoe, Owen et al. 2013). The necessary transformative shift in the governance of health systems towards more ‘democratic’ innovation calls for advanced approaches and methods of knowledge generation, use and exploitation with a stronger focus on participatory principles, i.e. engaging with a broader array of stakeholders.

This paper presents a conceptual framework for understanding and supporting change of current practice in (non-)publication of clinical trial results, guided by the concept of Responsible Research and Innovation (Von Schomberg 2011). The challenge is to adequately address a complex societal issue which encompasses several societal subsystems (health, science, economy, law, etc.). A transformative shift is called for and can be tackled by taking a prospective and participatory approach system approach. In the following, the general conceptual and methodological design will be presented and then its prototyping application for the case of publication bias in clinical trials.

2 Methodology and Design

We will first introduce the concept of Responsible Research and Innovation (RRI) as normative guidepost. Then system foresight, transformative scenario-building and participatory prototyping are proposed as systems of inquiry and vehicles for profound change towards more responsible policies and practices in health-related research and innovation processes.

2.1 Responsible Research and Innovation

Responsible Research and Innovation refers to the comprehensive approach that allows all stakeholders involved in the processes of research and innovation at an early stage (a) to obtain relevant knowledge on the consequences of the outcomes of their actions and on the range of options open to them, (b) to effectively evaluate both outcomes and options in terms of societal needs and moral values, and (c) to use these considerations as functional requirements for design and development of new research, products and services (van den Hoven 2013).

The RRI approach has to be a key part of the research and innovation process and should be established as a collective, inclusive and system-wide approach. So far, there is no coherent approach or guideline on how to integrate aspects of RRI in research and innovation processes (van den Hoven 2013).

2.2 System foresight

When faced with high levels of uncertainty and complexity as is the case with Responsible Research and Innovation in health, system foresight and transformative scenario-building offers itself as a system of inquiry.

Foresight is essentially a process of better understanding and preparing for the future. It explores what events or changes may occur and prepare accordingly to reduce risks and maximize opportunities. Whereas foresight is a broad concept which covers a wide array of prospective practices (Miles, Harper et al. 2008), larger-scale transformative change calls for 'system foresight'. System foresight (Andreescu, Gheorghiu et al. 2013) describes "a type of practice that

- has, as its object, large social institutions and the associated systems of organizations (such as education or Research, development and innovation);

- entails a participatory process involving diverse categories of actors and stakeholders; and

- aims to deliver, among others, a shared normative narrative of the future (often, a vision) as a guide to action. This normative narrative usually emerges as the result of some form of consensus among participants and therefore claims for itself a degree of representativeness or, at least, of inter-subjective agreement."

2.3 Transformative scenario-building

Scenario development comprises a set of methods for envisaging and exploring different potential ways the future may unfold. Scenario-building typically presupposes long-range futures in order to allow for structural, and hence more ‘profound’ change. A scenario-based foresight approach (cf. Andreescu 2013) relies on the following assumptions:

- In inquiring into the future, one must distance oneself sufficiently from the present to gain freedom which leads to better anticipation of the former.

- The future should be approached systemically and holistically with no part of the future system being considered as a priori more important than any other; and

- The processes whereby the future is explored should be participatory, i.e. as inclusive as possible. Distancing naturally makes room for a participatory and activist approach to the future. Whereas near, predictable futures are arguably sometimes best handled by experts, the latter’s role in the imagining or creation of futures appears less dependable.

Scenarios are thus convenient tools in the context of future thinking because several of their features enable broad participation (Bradfield 2005; cited in Andreescu 2013): they do not presuppose advanced technical skills from most participants, can accommodate a variety of inputs into the process, are quite flexible as a technique and format, and can be convincingly interpreted as a process-oriented endeavor.

Transformative scenario planning is a method or process to work with complex problematic situations that actors want to transform but cannot transform unilaterally or directly (Kahane 2012). It is thus useful for dealing with actors faced or associated with publication bias (see below) because of the following characteristics (Kahane 2012):

- Actors view the situation they are in as unacceptable, unstable, or unsustainable.

- Actors cannot transform their situation on their own or by working only with their friends and colleagues. Even if they want to, they are unable to impose or force through a transformation. The larger social-political-economic systems within which they and their situation are embedded is too complex – it has too many actors, too many interdependencies, too much unpredictability – to be shifted by any one person or organization or sector.

- Actors cannot transform their situation directly. Any attempt to implement a solution directly would only increase resistance and rigidity. So the transformations

must be approached indirectly, through first building shared understandings, relationships, and intentions.

2.3 Stakeholder Mapping and Participatory Prototyping

Scenarios rely on creative dialogue and participation. They should not only deliver fresh or original or heuristically useful insights, but also command the assent or the recognition of stakeholders (and often also of the communities whose voices they represent). Whether or not the transformative scenarios are actually followed by strategic commitments or policy action is less significant for their normative status.

Due to the weaknesses in clinical trial-related health research and innovation, the full potential of research and innovation is not tapped and which affects various actors as stakeholders at different levels and stages. Stakeholders are thus a central source for identifying feasible strategies associated with non-publication and its consequences, acting as barriers or facilitators. Stakeholder mapping identifies the relevant actors in a systematic manner. In the case of clinical trials, the mapping (Buchinger 2012) resulted in the following actor categories: journal publishers and editors, ethics committees, pharmaceutical industry, funding agencies, research institutions, trial registries, regulatory agencies, patient organizations, and political decision-makers. This landscape describes the “whole system” of stakeholders potentially involved in producing publication bias in the drug research and innovation process.

Based on ideas from participatory design, new constellations, issues and ideas are assumed to evolve from bottom-up co-creation amongst stakeholders. In participatory design, participants are invited to cooperate with researchers and developers during a creative process. They potentially participate during several stages of the process: they participate during the initial exploration and problem definition both to help define the problem and to focus ideas for solution, and during development, they also help evaluate proposed solutions.

4. Results

4.1 Prospective - participatory design and prototyping

The combined prospective and participatory approach for profound change was translated into a scenario-based multi-stakeholder dialogue and consequently

implemented as a prototype with the aim of identifying novel yet feasible measures to change practice towards producing robust health knowledge (Wagner-Luptacik et al 2013).

A small stakeholder team of about a dozen insightful and interested actors representing the “whole system” (cf. stakeholder mapping above) was convened. Due to the challenge of receiving positive response from all stakeholder groups, it was necessary to adapt the method and also include experts not directly involved yet sufficiently knowledgeable in the field to cover for absent stakeholder perspectives (e.g. industry).

The first step in scenario building with stakeholders was to observe what is happening and construct stories (= scenarios) about what could happen given a desirable long-term future vision. Scenarios are thought experiments or “heuristic devices” to break away from conventional thinking. As such, scenarios help identify threats, recognize opportunities and make choices about strategically important issues. Initial visioning about a desired distant future revolved around the questions: How kind of world do we want to live in? What kind of society do we want to create? The co-created vision can be described as guided by collaboration and communication (technologies), embedded in a clean and green environment with work-life balance and incremental changes. This reflects the notion of responsible innovation as “an endorsement of public values” (Taebi, Correljé et al. 2014). The vision served as the common basis for building scenarios on the focal question: „How can we minimize publication bias to maximize patient well-being, with a time horizon 2035?“ The resulting images present snapshots of possible futures - sketching boundary issues rather than fully characterizing all possible outcomes (Wagner-Luptacik et al. 2013).

In a second step, scenario enrichment aimed at discovering what can and must be done by whom to achieve a “systemic” solution for overcoming the detrimental effects of publication bias. Generating new insights about collaborative initiatives that might be pursued between stakeholders if this scenario 'world' became dominant – and considering how relationships might need to change to enable success. It thus had the specific purpose of helping to close the gaps between the current practices with the future vision. For this purpose, participants first developed options for separate action lines. They also drew conclusions about what each stakeholder will or can do and then explored opportunities and pathways for collaboration and joint actions. Though coming from different working

groups, the various activities converged towards one preferred scenario which ultimately tested positive for robustness and resilience.

During the next step – scenario consolidation - the various interventions produced in the previous scenario enrichment were clustered by an expert into several ‘blocks’. These blocks were classified into three major intervention types – ‘hard policies, ‘soft policies’ and general institutional context (Buchinger 2013). Whereas hard policy indicates public governance on the basis of legislation (including taxes, standards and other forms of binding rules), soft policy means public governance by guidelines, recommendations, declarations, self-commitment, voluntary agreements etc. Whereas hard policy changes behavior by immediately changing the choice set of addressees (i.e. hierarchical approach), soft policy changes behavior without (immediately) changing the choice set of addressees (i.e. market approach).

The co-created scenario resulted in the following measures to reduce publication bias: Hard policy basically refers to Mandatory Clinical Trial Registration with Facilitator WHO linking to Clinical Trial Registration Standards as complementary soft policy. Additional soft policies encompass Funding Policy and Journal Policy, both linked to Open Science & Web 2.0 as relevant institutional context, as well as Reward Policies linked to Empowerment as relevant institutional context.

The fourth and final step - scenario verification - allowed for final stakeholder participation by evaluating the consolidated scenario. Participants were invited to provide feedback on the three major intervention types and the various measures. They were also asked to rank the latter according to importance resp. power in changing undesired publication practice in clinical trials.

4.2 Practical implications

Responsible Research and Innovation features both a product and a process dimension (von Schomberg 2013). The participatory approach aimed to develop a deeper understanding of each other’s roles, concerns and potential for future action. The process facilitation focused on taking and maintaining a productive, adaptive and transformative stance throughout the process. The scenario-building process thus achieved two major outcomes. Firstly, by looking in a sustained and collaborative way into the future, it enabled novel insights about how needs for providing transparency about clinical trials and their outcomes might be addressed more appropriately and effectively in the future.

Secondly, the process provided a mechanism for considering the robustness of ideas in a range of possible futures - and in so doing might have helped build confidence in future collaborations between various stakeholder groups.

5 Conclusions

There is ample evidence that the non-publication of clinical trials results has serious detrimental effects on patients' treatments and consequently on society's health. "Problem space" and "solution space" involves many institutional systems and (large-scale) organizations as key stakeholders. This paper presents a combined future-oriented (= prospective) and stakeholder-oriented (= participatory) approach to prototype the necessary transformative shift. Whereas the prospective dimension emphasizes the long-term orientation and the potential of shaping a desired future, the participatory dimension emphasizes the adequate and timely inclusion of values by representative stakeholder 'voices'.

Contrary to thinking and acting in 'empty futures' (Groves), the concept of Responsible Research and Innovation (RRI) incorporates ethical and societal dimensions and thus opens pathways for 'desired futures', i.e. deliberate normative stances. RRI may thus be considered as a 'design' element (von Schomberg 2013) in research and innovation policies, programmes and practices. By laying out a clear vision and the procedural arrangements for governing future strategic conversations around issues of transparency and accountability in providing vital medical data, we hope to contribute towards (a) turning a 'problem' into a promise for more robust health-related knowledge, and (b) providing an exemplar of a coherent approach on how to integrate aspects of RRI in the governance of research and innovation processes.

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The Role of New Media in Election Campaigns – Features in the Era Web 3.0

Eleonora Gabriela Baban *

Department of Marketing
The Bucharest University of Economic Studies
University Address: Piața Romană Street 6, Bucharest, Romania

Structured Abstract

Purpose – Currently in the “era of information” when information and technology represent “power”, the economic, political, social and business environment and not only these, have to adopt the challenges arising from the knowledge-based economy. In the contemporary context, information and technology have a decisive role in every individual's life, influencing his/her whole behaviour. When it comes to the political world, it may be mentioned that the use of new technologies in election campaigns (new media and social dialogue) have radically changed politics.

Design/methodology/approach – I propose an approach of new media in the context of the era Web 3.0. The paper is based on qualitative research, the main objective being that of investigating the impact of new media on social dialogue in the context of the era Web 3.0. By addressing a number of 10 questions already established to a group of 100 people (students at a University from Bucharest aged between 19 to 33 years) the role of new media in the context of the Web 3.0 is analyzed.

Originality/value – This methodology puts in evidence the role and importance of using new media in election campaigns by the actors of political life in the context of knowledge based economy. The main objectives of the study are: presenting new media in the context of Knowledge-based Economy (KBE) ; the definition of marketing in the contemporary context; highlighting the role and importance of political communication in the contemporary context; the analysis of the role of new media in the context of era Web 3.0. These objectives will serve as a basis for future research.

Practical implications – The outcomes of the application highlight the importance of using new media by political actors in order to obtain the electoral success by influencing directly the individual behaviour. Through the marketing research presented in this paper some ideas regarding the impact that new media have in the context of knowledge-based economy are presented. It is important to mention that some advantages and disadvantages of using new media in election campaigns have been identified, these issues being important for a campaign manager who aims at carrying out an election campaign.

Keywords –knowledge-based economy, new media, era web 3.0, political marketing

Paper type – Academic Research Paper

1 Introduction

The paper aims to make a brief presentation of the main features of new media in the context of era Web 3.0. In a contemporary context, information and technology have a decisive role in every individual's life, influencing his entire behavior. If we are referring to the political world, it can be mentioned that the use of new technologies in election campaigns (new media and social dialogue) has radically changed politics. In the last part of the paper the impact of using new media on voter behavior will be analyzed by presenting a qualitative research, because it is very important that “in an election campaign, it is essential for the candidate / party to know how to use the political communication tools, because this is the only way to get closer to voters, who need to be encouraged to grant the final vote” (Baban, 2013, p.435).

Depending on how the technology is used the Internet can be classified in “web 1.0, web 2.0, web 3.0, new media, etc.” (Toader, Grigorași and Frunză, 2011, p 179).

Toader, Grigorași and Frunză (2011) believe that in web 1.0 the website was just a tool, the information circulating unidirectional, and in Web 2.0 the Internet has become a virtual space “in which users interact and generate content” (Toader, Grigorași and Frunză, 2011, p 179). According to literature review, it can be said that nowadays web 3.0 aims at the dynamic framework of expressing communication, public relations and social dialogue.

By comparison, in the sphere of marketing one can also discuss about marketing 1.0, 2.0 and 3.0. Kotler, Kartajaya and Setiawan (2010) in the book entitled “Marketing 3.0: From Products to Customers to the Human spirit” present the “road” that the science of marketing has made in time. Thus, a shift has been made from an approach of marketing 1.0 (product oriented) to marketing 2.0 (consumer oriented) and marketing 3.0 (values oriented) (Kotler, Kartajaya and Setiawan, 2010, p 20).

Major changes in the last century have significantly influenced human behavior. If in the past they bought products to satisfy basic, elementary needs, now they purchase those products to satisfy their most sophisticated needs at a superior level.

It appears that the emergence of marketing 1.0 was favored by the Industrial Revolution and marketing 2.0 manifested due to technical development and technology. Currently, marketing 3.0 occurs due to the new wave in technology (Kotler, Kartajaya and Setiawan, 2010, p 21). But what is the new wave in technology?

Hogg, Howells and Milman (2007) consider that “some of the crucial issues which characterize consumers in the KBE relate to resources, firstly, to the new skills which they need in order to participate in the KBE; and secondly, to the assets, such as computers, that are needed to participate fully in many of the “virtual” aspects of the modern marketplace. Many of the electronic and technological tools needed to participate in the KBE require consumers to develop new technical skills” (Hogg, Howells and Milman, 2007, p. 153).

Kotler, Kartajaya and Setiawan (2010) believe that “technology allows people to express themselves and collaborate with other individuals” and “the new wave in technology gives people the opportunity to transform from consumers into proconsumers” (Kotler, Kartajaya and Setiawan, 2010, p. 21). But where can we find a proconsumer? A proconsumer can be found on Facebook, Twitter, YouTube, etc., becoming “both producer and consumer of information” (Sălcudeanu, Aparaschivei and Toader, 2009, p.28).

2 Overview of new media in the context of Knowledge-based Economy

Parent, Roy and St-Jacques (2007) believe that “knowledge is quickly becoming the prime source of wealth in the world, not only for corporation and individuals but also – and perhaps even more so – for nations and societies” (Parent, Roy and St-Jacques , 2007, p.81).

Becla (2012) considers that “the knowledge-based economy can be treated as an element of information society” (Becla, 2012, p.127). The same author presents several features of the KBE and information society, such as: (1). “the development of the information and telecommunicational infrastructure”; (2) “the advancement of the information sector”; (3) “the participation of information sector (information services) in the creation of the gross national product (GDP)”; (4) “the creation of useful information (scientific knowledge)”; (5) “the skilfulness level of filtering system to information by people”; (6) “the preparation of the educational system to information excess”; (7) “the range of information exclusion in society”; (8) “range and techniques of the effective interpersonal communication” (Becla, 2012, p.127).

In knowledge-based economy, information is “power”, the solutions of an effective communication being those organizational and technological conditions within organizations that rely on flexibility and rationality. Applying modern management the information gains more value which contributes to the effective achievement of

organizational communication. In KBE, information and knowledge as economic resources can be capitalized and improved. The main managerial challenges of information society are: the information offer is vast, what matters is people communicating with other people at great distances, with low costs, their number increasing significantly in recent years; consumption of information increases gradually, but surely; information is constantly used, however the offer is higher than the demand, which could lead to misleading potential users.

Gerstlé (2002) considers that political communication is currently “a field of knowledge in which the competition of main paradigms of political thinking and social sciences is fully reflected“; it is worth mentioning that “the behavior, the system, the interaction and dialogue allow labelling logics of analysis of political communication (Gerstlé, 2002, p 32).

In the literature review is presented the concept of “Internet – based services”, concept which “consider applications such as social networking websites (public or private), peer –to-peer networking, wiki applications, blogs, microblogs (e.g. Twitter) (..)”(Munive-Hernandez and Taticchi, 2012, p.1203). In the last decades, Webblogs (blogs) has gain popularity, being a new form and source of political news and information.

According to Kim (2011) “the Internet has been regarded as an important source of political knowledge and engagement in this line of research because the Internet has easily and cheaply available information” (Kim, 2011, p.976), because “new media is a growing force in the study of civic engagement” (Conroy , Feezell and Guerrero, 2012, p. 1535).

According to Touri (2009) “blogs offer an effective combination of expertise, real-time collective response to breaking news, and public-opinion barometer” (Touri, 2009, p.172). Campbell (2009) notes that “beyond a few specific examples of deliberate attempts at using new media for democratic communication, often on quite small, highly localised scales (...), an emergent focus of attention has been the increasing prevalence of blogs in number, content, and apparent impact on political communication” (Campbell, 2009, pp. 139-140). The same author notes that “in some developed democracies, the existence of vibrant and extensive political blogging networks is demonstrable, but their impact on wider political communication, even in election campaigns, is less so” (Campbell, 2009, p.140).

Jun (2012) considers that “political discussion in contemporary online environment may rather be interaction that generates exchange of political messages. Through such interaction among politically homogeneous Internet users, people can expose themselves selectively to political information” (Jun, 2012, p. 1452).

3 Analysis of the role of new media in the context of era Web 3.0

Jaffrin (2003) considers that “the Internet is bringing new means of communication. It is global, it is fast, and is growing rapidly. Reaching each corners of the earth, the Internet is making the world at once smaller and more connected, transmitting information at nearly real – time speed” (Jaffrin, 2003, p. 25). Also, Miller and al. (2006) quote by Neffati (2012, p. 245) notes that “the evolution of information depends on the nature of the economic, political, geographic, social, cultural and ethnic interactions which are strengthened by globalization and information network”.

A qualitative research was carried out in order to analyze the impact of using new media on voter’s behavior. A semi-directed interview was conducted on 100 people, with a discussion guide consisting of the following questions:

1. Do you believe that through websites candidates / political parties maximize their communication with the electorate in an election campaign? Please explain your answer.
2. Do you believe that new media (social networks, political blogs, etc.) provide the possibility of creating a direct connection between political actors and the electorate? Exemplify your answer.
3. Do you believe that this connection depends on how both voters and political actors adapt to communications means in the online environment? Please explain your answer.
4. Do you believe that political actors and voters need to follow certain rules of behavior in the online environment? Exemplify your answer.
5. Do you believe in an election campaign the Internet is a dynamic environment for sending electoral messages? Please explain your answer.
6. Do you believe that posts that candidates put on their blogs influence voter’s behavior ? Exemplify your answer.
7. Do you believe that those candidates who create their campaign message to voters according to their aspirations and values emotionally identify with them? Please explain your answer.

8. Do you believe that social dialogue between individuals is facilitated by the new wave of technology? Please explain your answer.

9. Do you believe that candidates, who promote technological innovation in an election campaign, can influence the final voting decision? Please explain your answer.

10. Please list what are the advantages / disadvantages of using new media by candidates / political parties in the era Web 3.0.

In the qualitative research gender structure is as follows: 17 % male respondents and 83% female respondents. Respondents are part of the following age groups: 1 % - 18 years old, 50 % - 19 years old, 37 % - 20 years old, 4% - 22 years old, 4% - 21 years old, 1 % - 24 years old, 1 % - 25 years old, 1% - 29 years old, 1 % - 33 years old.

Analysis of answers to the first question: At the first question respondents agreed that through websites candidates or political parties in an election campaign maximize their communication with voters; the following relevant opinions were distinguished:

“Yes , because communication becomes much easier and the information is transmitted faster” (Diana, 20 years old); “Yes , because now, political parties, candidates, supporters have accounts on different social networks and benefit from specialized websites that make information much cheaper than traditional methods of communication” (Simona, 20 years old); “Yes, as the Internet nowadays plays an important role in everyday life; people use it to get information on certain issues, for example, if a political party or a candidate has a personal blog, the voter can access that website and the communication does becomes effective given that both voter and candidate can transmit ideas quickly, with immediate feedback” (Cristina , 20 years old); “Yes , because it is an accessible method to those interested in finding out information about candidates / political parties, but it should not be the only source of communication with the electorate” (Georgiana , 20 years old); “Yes, because parties / candidates present their political offer more clear and in a more structured way, improving the communication with the electorate” (Marius , 19 years old).

Analysis of answers to question number two: 11% of respondents did not agree with the fact that new media offer the possibility of creating a direct connection between political actors and the electorate, and 89 % answered yes; the following relevant opinions being outlined:

“No, I don’t believe that new media offer the possibility of creating a direct connection between political actors and the electorate; indeed, through these media means

a connection is established, but an indirect one from my point of view, because one cannot compare an article on a candidate's blog, for example, with a dialogue face-to-face between the candidate and the voter" (Ionut , 22 years old); "No, because it takes a real interpersonal relationship and not a virtual one to create a direct connection candidate – voter" (Marius, 19 years old);

"Yes , I believe that new media offer the possibility of creating a direct connection between political actors and the electorate; through political blogs or Facebook voters can interact directly with politicians expressing desires and discontent" (Andrew, 19 years old); "Yes, because the ease and speed of sending messages online and in social networks creates the perfect environment for the transmission of personal thoughts and ideas" (Adrian, 19 years old).

Analysis of answers to question number three: 16% of respondents agreed with the fact that the connection created between candidate - voter depends on how both political actors and voters adapt to online communication means; 84% of respondents answered affirmatively; the following views were outlined:

"Yes , this connection depends on how both voters and political actors adapt to online communication means because through blogs they can invite political actors to direct conversations, through social networks, they can receive feedback at their posts, which can mean an approval, a positive response, support" (Marilena , 20 years old); "Yes, for this communication to be beneficial, people should be receptive and keep pace with technology in order to face the challenges coming from society, but also willing to seek relevant information" (Georgiana , 20 years old); "Yes, this connection depends on how both candidates and voters adapt to communication means because the more pieces of information they are willing to provide, the more the connection is stronger" (Claudia , 20 years old); "I believe that this direct connection depends on how the two sides adapt to online communication means , because if one party does not adapt in a positive way to online communication (nowadays, this type of communication being essential) then poor communication occurs between the parties, the connection created thus disappearing at some point" (Rodica, 20 years old); " No, I don't think that this connection depends on how both voters and politicians adapt to online communication means environment because I don't think there can be a direct connection, as long as there is only an exchange of ideas on a website, not a face-to -face confrontation" (Luana, 19 years old).

Analysis of answers to question number four: all respondents agreed that in the online environment, and not only here, political actors and voters need to follow certain rules of behavior; the following opinions were revealed:

“Yes , I think a certain decency must be preserved, namely adequate language” (Denisa , 24 years old) ; “Yes, I think that both online and in other case both political actors and voters must have a certain conduct” (Raluca, 25 years old); “Yes , they have to follow certain rules of behavior in order to strengthen a connection based on respect, so that the two sides can explain their opinions without insulting the others” (Alexandra , 19 years old); “Yes, rules of behavior need to be observed regardless of where they carry out their campaign because an elevated and respectful language is the basic element that facilitates effective communication” Cristina , 19 years old).

Analysis of answers to question number five: most respondents agreed that the Internet is a dynamic environment for sending election messages; the following views were outlined:

“The Internet is a primary factor for sending messages because many voters consult online news, blogs, social networks thus managing to form a positive or negative opinion about a certain candidate” (Valentin, 19 years old) ; “Yes, it is a dynamic environment due to the speed of sending information, but also because information circulates bidirectionally”(Alexandru, 33 years old); “In an election campaign it is very important for the information to be transmitted using new media in an effective way and in a timely manner so that the electorate is accurately informed, the Internet being a dynamic environment of sending messages on time, exactly when voters need them” (Rodica , 20 years old); “I think the Internet is the most dynamic way of sending election messages, given that it can be accessed anywhere; because of lack of time, people cannot participate in meetings organized by political actors and via the internet they can listen and read all the necessary details” (Ana -Maria, 20 years old); “Yes , as through the online environment the information transmitted reaches voters more quickly and has a much greater impact” (Maria , 20 years old); “Yes , because through social networks one can publish a large volume of information and the reaction of a large group of people can be easily monitored and evaluated” (Simona, 20 years old); “Yes, because in the online environment everything moves quickly , and if a message, an idea, a concept is good enough it will soon become popular” (Cristina , 20 years old).

Analysis of answers to question number six: all respondents agreed that the posts that candidates show on their blogs influence voter's behavior. The following opinions were revealed:

"Yes, a lot, because I believe that a good voter pays attention to all the details" (Andrea, 19 years old); "Yes , because it is very important for voters to get to know candidates better so that they form a solid opinion when granting the final vote" (Miruna, 19 years old); "I believe that the posts candidates show on their blogs influence voter's behavior because I believe that the information presented on the blog defines the candidate as a person" (Naziana, 19 years old); "Yes , these posts can have a certain impact on voters and can convince them, for this reason there are attempts to create convincing commercials" (Veronica , 19 years old); "Yes , posts made by candidates on their blogs can influence voters, though there are also people who are not easily influenced, so the quality of messages posted is very important" (Nicoleta , 19 years old); "The image that the candidate creates on his/her blog is a criterion that influences the choice of the electorate. For example, if on his/her blog the candidate does not speak only about politics, but also about his/her social life, he/she gets closer to voters, because voters want to get to know him/her as a person and not just as a politician, thus establishing a candidate - voter bond of trust" (Cristina , 19 years old).

Analysis of answers to question number seven: 62% of respondents didn't agree with those candidates who create their campaign message to voters according to their aspirations and values, who emotionally identify with them, and 38 % of respondents said yes; the following opinions were outlined:

"No, because these candidates can provide information which is not real in order to influence the electorate"(Cristina , 19 years old); "No, because voters are already used with these political clichés and with the same speeches" (Oana, 20 years old); "No, I think it is just a strategy of the candidate who wants to obtain more votes" (Mihaela , 19 years old);

"Yes , I believe that the campaign message is established by carefully studying target-voters" (Eliza , 19 years old); "Yes, because sharing the same set of values and aspirations can lead to harmonization of the connection between voters and candidates" (Anca , 19 years old); "Yes , I believe that candidates who create their electoral message according to the aspirations and of voters emotionally identify with them because

candidates want to find out the needs and desires of voters in order to come up with solutions to any problems “ (Roxana, 19 years old).

Analysis of answers to question number eight: the majority of respondents agreed that social dialogue between individuals is facilitated by the new wave of technology; the following relevant opinions were outlined:

“Yes , the new wave of technology has greatly facilitated social dialogue between individuals” (Monica , 19 years old); “Yes, because online environment allows fast communication between individuals” (Andra , 20 years old); “Yes , because candidates can now respond to voters faster and more efficiently, technological innovations helping both sides in the exchange of ideas” (Cristina , 19 years old); “By means of new technologies communication is effective and rapid, individuals are just a click away, which enormously saves their time” (Cristina , 19 years old); “Social dialogue can be facilitated by the new wave of technology as through social networks and blogs one can connect with other people from different parts of the country but also worldwide so we can learn more views on certain subjects” (Valentina, 19 years old); “Yes, I think the new wave of technology facilitates social dialogue between individuals because now you can communicate with low costs on all social networks whether you're at home or not, and much faster and easier” (Marilena, 20 years old);

“No , I think that the new technology eliminates emotion from communication, although it makes it easier; in a social dialogue, in addition to the information transmitted emotion transmitted between interlocutors plays a very important role” (Violeta, 19 years old).

Analysis of answers to question number nine: the majority of respondents agreed that candidates who promote technological innovation in an election campaign can influence the final vote. The following opinions were distinguished:

“Every promise has an effect. A part of the population, mostly younger generations will support technological innovation, while older generations and the disadvantaged population that has no access to technology will be more reluctant to vote for the candidate who supports technological innovation” (Georgiana , 20 years old).

“Depending on voters , some of them can be influenced, others not, depending largely on their aspirations and values” (Naziana 19 years old); “Yes, they can influence the final decision to vote by posts, arguments or projects that candidates can promote through technological innovation” (Liliana , 22 years old); “Yes, I believe that promoting

technology in an election campaign can influence the final decision to vote, each individual may be pleasantly surprised when the candidate keeps pace with what is new in technology” (Bianca, 20 years old); “Yes , because those candidates who promote and use new technology can spread information faster and reach voters, influencing them to grant the final vote through the content of those messages” (Marilena, 20 years old).

Analysis of answers to question number ten: question number ten identified the following advantages / disadvantages of using new media by candidates / political parties in the era web 3.0, as follows:

Advantages - rapid communication, accessibility, opportunity for a new method of transmitting the message, rapid and constant information, effective communication, visible slogans, low cost, the opportunity to receive immediate feedback, higher visibility, candidates / political parties can be easily promoted online, promptness of information, dynamic communication of election message, it is easier to interact online with younger population, complex and interactive information.

Disadvantages - the message sent is not accepted, older voters do not know how to use modern means of communication, messages sent can be false, information may not be accessed frequently, face-to -face interaction with voters is missing, in the rural areas not all people have access to the Internet.

4 Conclusions

Knowledge-based society is based on the existence of several driving forces that change the rules of the environment in which organizations operate. These driving forces are: globalization and information technology. Information technology includes in turn: knowledge / information, new media and computer networking. In a contemporary context where knowledge is the key element of any industry, new media promote online interaction between users, so knowledge / information becomes easier to access. Internet is the engine-factor of information society, globalization became a priority of the Internet which is the result of social interaction. Knowledge society is not possible without information society and therefore it should not be separated from it, knowledge meaning information.

From a theoretical perspective, this study aims to review literature in order to present the role and importance of new media in election campaigns in the context of era Web 3.0. In the last part of the paper, by presenting a qualitative research, the impact of using

new media on voter behavior was analyzed. Marketing research presented in this study may be useful for campaign managers who want to achieve an election campaign that can bring the results desired.

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CSR disclosure on the WEB: an empirical analysis on the Italian context

Katia Furlotti*, Federica Balluchi

Department of Economics
University of Parma - Italy
v. J.F. Kennedy, 6 – 43122 – Parma

* *Corresponding author*

Structured Abstract

Purpose - The purpose of this research is to analyse the role covered by internet as a communication tools of social responsibility strategies implemented by Italian companies. The hypothesis that will be tested by research are:

HP1: Italian companies disclose their commitment to CSR on their websites, fully exploiting the potential offered by the Internet.

HP2: Sectors of activities affects the quality and quantity of the information disclosed and the way in which the information is provided.

HP3: Companies that have a specific website CSR section communicate a larger quantity of information than companies that give information in a not structured way.

Design/methodology/approach

We propose a descriptive research based on a quality/quantitative approach and is focused on empirical analysis on websites of the Italian listed companies. Websites are analysed on the basis of languages, map site, dedicated CSR section, and the content both for the general aspect of social responsibility and with specific focus on environmental responsibility and relationships with the community.

The phases of research process are:

- 1) formulation of research problem (purpose of study);
- 2) literature review relating to research problem and developing of a framework to identify the hypothesis;
- 3) empirical analysis and interpretation of the results;
- 4) conclusions.

Originality/value - The research intends to work in the path outlined by the international studies on CSR disclosure (many researches represent a key starting point: Coope, 2004; Esrock, Leichty, 1998; Morhardt, 2010; Morsing, Schultz, 2006; Sousa Filho, Wanderley, 2007; Tagesson et al., 2009; Xiao et al., 2004) in order to analyse the behaviour of Italian listed companies which will be analysed, in particular, with regard to the importance of the sector to which they belong in the choice of CSR disclosure via web.

This methodology puts in evidence the important use of the Internet as a communication tool, especially in recent years.

Practical implications - The research aims to highlight areas for improvement in CSR disclosure with focus on web communications.

Keywords - Corporate social responsibility, disclosure, internet, Italian companies.

Paper type – Academic Research Paper

1. Introduction

Corporate Social Responsibility Disclosure (CSR D) is the communication process of social and environmental effects of companies' economic actions with regard to all stakeholders interest. The formal commitment to inform and involve stakeholders needs an adequate flow of communication through suitable channels, focusing on relevant content.

In recent years, the recognition of a large and various groups of stakeholders has required the use of new media and the use of technological platforms has evolved over the years. In this sense internet is the best channel and it is used since 1990.

Several studies have demonstrated the importance of the internet platform for the diffusion of CSR information (see paragraph 2). This research intends to work in the path outlined by the international studies on CSR disclosure (many international researches on this topic represent a key starting point of this paper; i.e.: Coope, 2004; Esrock and Leichty, 1998; Morhardt, 2010; Morsing and Schultz, 2006; Sousa Filho and Wanderley, 2007; Tagesson et al., 2009; Xiao et al., 2004) in order to analyse the behaviour of Italian large companies, listed on the Italian Stock Exchange, which will be analysed, in particular, with regard to the importance of the sector to which they belong in the choice of CSR disclosure via web.

In other words, the main purpose of this research is to analyse the role covered by internet (website) as a communication tools of social responsibility strategies implemented by companies in Italy.

The hypothesis that will be tested by research are mainly three:

HP1: Italian companies disclose their commitment to CSR on their websites, fully exploiting the potential offered by the Internet.

HP2: Sectors of activities affects the the quality and quantity of the information disclosed on CSR and the way in which the information is provided by a company.

HP3: Companies that have a specific website CSR section communicate a larger quantity of information than companies that give information in a not structured way.

The research is a descriptive research and is based on a quality and quantitative approach; it is focused on an empirical analysis on websites of the Italian listed companies at 28 December 2013. Websites are analysed on the basis of languages, map site, dedicated CSR section, and the content both for the general aspect of social responsibility and with specific focus on environmental responsibility and relationships with the community (paragraph 3).

The research aims to highlight areas for improvement in CSR disclosure with focus on web communications

2. Theoretical framework

Corporate Social Responsibility Disclosure (CSRSD) can be defined as “the process of communicating the social, ethical and environmental effects of organisations’ economic actions to particular interest groups within society and to society at large” (Gray et al., 1987. See also Campbell, 2004; Gray et al., 2001; Mathews, 1993). The formal commitment to inform and involve stakeholders necessitates an adequate flow of communication through suitable channels, focusing on relevant content. CSRSD plays a key role in this commitment, and transparent reliable information is also widely considered important for legitimacy.

Corporate Social Responsibility (CSR), in fact, has become a key issue in recent years and the increased consideration for stakeholders implies a change in attitude and communication with them. The commitment to formal involvement by all stakeholders necessitates an adequate flow of communication in terms of channel and information relevance. In other words, disclosing social responsibility involves two key aspects; on one hand the firm meets commitments made to its stakeholders and on the other hand ensures a wider legitimacy through clear and reliable communication (Campbell, 2004; Cho et al., 2010; Deegan, 2002; Gray et al., 2001; Hess, 2008; Kaptein, 2007; Morhardt, 2010; Roberts, 1992). Full and reliable information is in fact a basic condition for development of the firm; profits and losses as well as how these are reached are made public knowledge and this creates the consensus necessary for the firm to flourish (Balluchi and Furlotti, 2013: 3 ff).

Companies have always used financial statements and traditional media (press

announcements, advertising campaigns on television and radio, newspaper and magazine trailers, bill boards and conferences) as communication channels.

In recent years, the recognition of a large and various groups of stakeholders has required the use of new media and the use of technological platforms has evolved. In this sense internet is the best channel and it is used since 1990.

Internet has been used in order to make the companies able to meet the needs of the stakeholders in an efficient way, providing great flexibility in the presentation and quality of the information (Bolívar, 2009: 179).

The last few years, have also been marked by the important diffusion of technologies that will support sociability and relationship: social networks, aggregators multimedia content created by users and blogs.

Several studies have shown the importance of the internet platform for the dissemination of information: Porter and Kramer (2006: 78 ff), DiPiazza and Eccles (2002: 127). Other studies have focused on the limitations of the instrument; for example, Esrock and Leichty (1998: 305 ff) revealed how the websites are not being used fully exploiting their possibility: although 80% of Fortune 500 companies have webpages that deal with at least one CSR question, sites are not used fully exploiting the potential of communication, in particular with regard to CSR issue.

In 2000, another survey by the same authors showed that this percentage has risen to 85% (Esrock and Leichty, 2000: 327 ff).

On the same topic, Coope (2004: 20 ff) highlighted how useful information are often hidden in the webpages and they are hard to find for the reader.

Other studies (described below) have attempted to correlate some company characteristics (i.e.: size, sector of activity, profitability, ownership structure, etc.) to CSR and, in particular, CSR by the web. Sousa Filho and Wanderley (2007) and Morsing and Schultz (2006) analyse general aspects of social communication on the web: and other researchers study the identification of some specific key variables that inspire the scope and content of CSR information on company websites (Tagesson T. et al., 2009). Esrock and Leichty (1998) and Adams (2002) refer to companies' size; Knox et al. (2005), Zeghal and Ahmed (1990) and Xiao et al. (2004) focus on the sector of activity to which companies belong; Belkaoui and Karpik (1989), Inchausti (1997) and Ng and Koh (1994) on companies' profitability; Adrem (1999) and Secci (2005) on the ownership structure of the companies.

This research intends to work on in the path outlined by the international studies mentioned in order to develop the analysis with reference to Italian companies, listed on the Italian Stock Exchange, characterized by large size which will be analysed, in particular, with regard to the importance of the sector to which they belong in the choice of CSR disclosure via the web. The assumptions outlined in the light of the theoretical framework are explained in the introduction (see paragraph 1).

3. Empirical analysis

3.1 Purpose

The purpose of empirical research is to analyse the role covered by internet (website) as a communication tools of social responsibility strategies implemented by companies in Italy.

Specifically, we arise the following research hypothesis:

HP1: Italian companies communicate information about their commitment to CSR on their websites, fully exploiting the potential offered by the Internet.

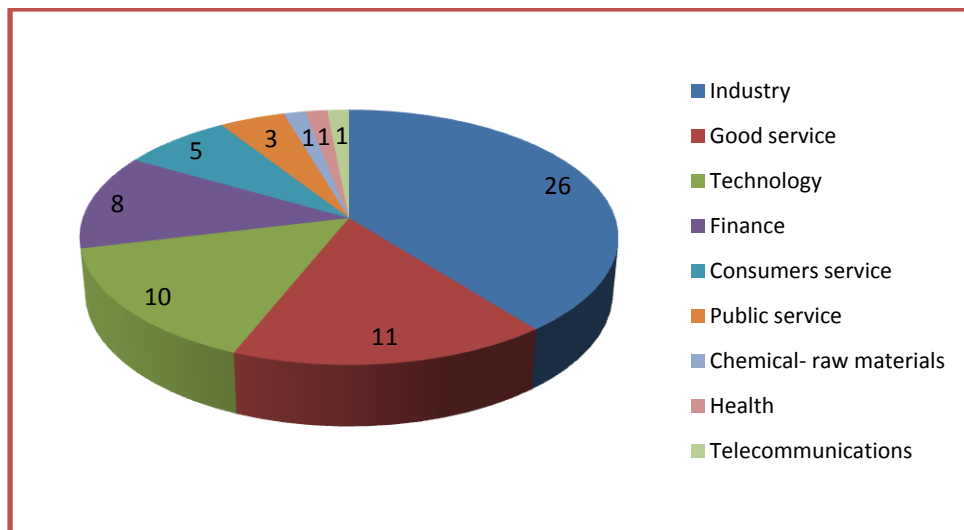
HP2: The sector of companies activities affects the CSR disclosure of a company.

HP3: Companies that have a specific section devoted to CSR communicate a larger amount of information than companies that offer information in a less structured mode.

3.2 Research methodology: definition of the sample

The universe of analysis consisted of companies listed on the Milan Stock Exchange, belonging to the STAR segment, on 28 December 2013 as recorded on the website www.borsaitaliana.it. Companies suspended from quotation or quoted on overseas markets were excluded; the final sample was of 66 firms (see Appendix for details).

The graph below shows the characteristics of sample in term of sectors of activity of companies. This information is essential in the light of the hypotheses being verified.



Graph 1 – Composition of the sample in terms of sector of activity

For HP2 Chemicals and raw materials, Health and Telecommunications are excluded because composed only by 1 firm.

3.3. Empirical evidence: data collection and results

The research examines the websites of the 66 companies using the grid shown in Table 1.

The time of survey (February 2013) is an important aspect of the research for the strong dynamics and for the updates of information.

Table 1. - Survey grid for the analysis of the companies websites.

WEBSITE STRUCTURE
Information in different languages
Site map
Navigation panel
CSR section
Direct link to the CSR section on the home page (for companies that have a specific section)
Number of “clicks” for accessing to the CSR section
Operating hyperlink
Number of sections (webpages, documents, etc.) dedicated to CSR
Format of presentation about CSR (text, audio, video, interactive resources)
Mistakes

WEBSITE CONTENTS
General aspects
Codes of ethic or guidelines
Social, environmental sustainability or intangible reports (social report)
Social performance indicators
Awards
FAQS section on CSR
Collaborations with external parties on CSR projects
Establishment of organizations that are dedicated to social responsibility in general
Projects about CSR (success or failure)
Commitments of social responsibility for the future
Environmental Responsibility
Environmental unit
Environmental Performance Indicators
Environmental policy statement
ISO 14001 Certification
Responsibility towards community
Welfare Policies
Document statement of ethics policy

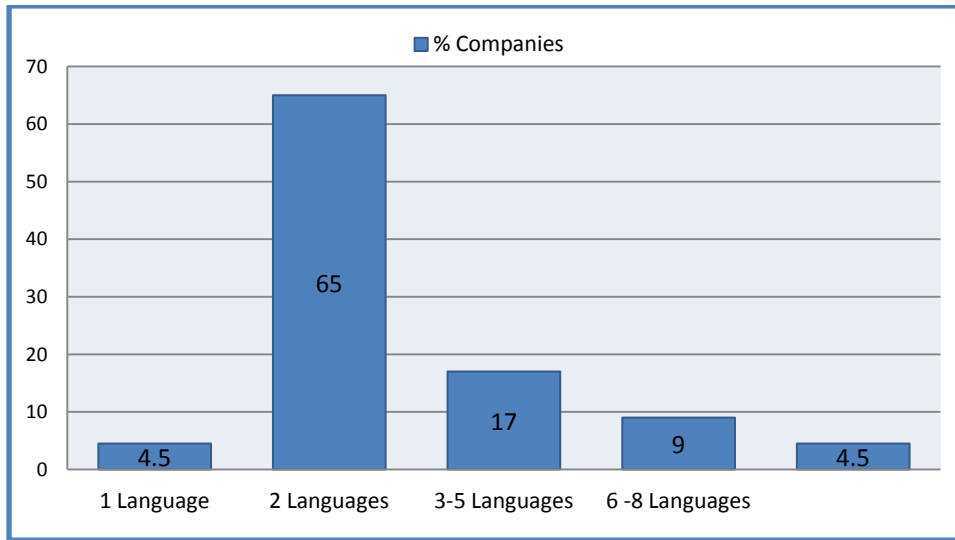
The main results are shown below, making attention to the three hypothesis defined in our research.

HP1: *Italian companies disclose their commitment to CSR on their websites, fully exploiting the potential offered by the Internet*

The variables analyzed for testing hypothesis 1 refer to:

- the language used for give information;
- the presence of a CSR specific section;
- the number of pages dedicated to CSR;
- the structure of the website;
- disclosure on general aspects (code of ethics, social report, awards, ect.) and on responsibility towards environmental and community strategies.

Analisyng the availability of information in different languages, we observe that the majority of companies (65%) offers information both in Italian and in English language; 3 out of 66 companies (4.5%) disclose information in a single language, and 30.5% allows the choice between more than two languages (see Graph 2).

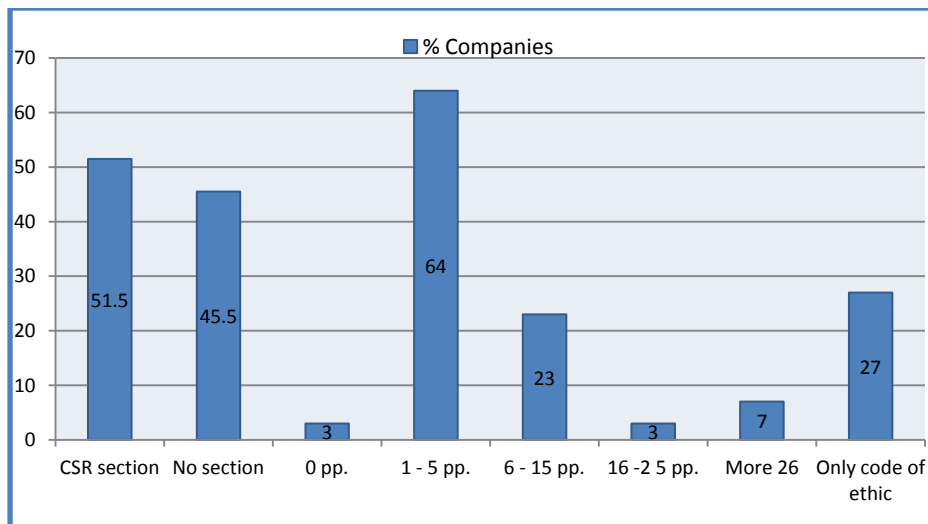


Graph 2 – Disclosure in one or more languages

More than half (51.5%) over companies surveyed (34 of 66) presents a special section dedicated to CSR on its website; among them, 53% have a immediately connection on the homepage, 23.5% use the heading “sustainability” and 15% of “social responsibility”.

45.5% of companies analysed, don’t present a CSR specific section and gives information scattered and less structured; 2 companies (3%) don’t give any infomation.

Different is the number of sections and pages devoted to CSR (see Graph 3).



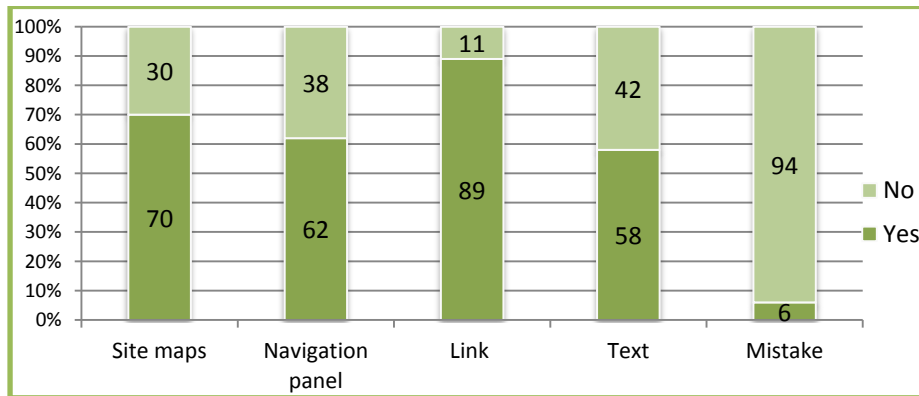
Graph 3 - Presence of a specific section and number of web pages dedicated to CSR

The structure of website was assessed by analyzing the simplicity and the speed of browsing through maps or links.

The website of the companies of the sample are characterized by an important simplicity and browsing speed:

- 70% have a site map;
- 62% have a panel to search for information;
- 89% have a working hyperlinks.

In relation to the format of the presentation, more than half (58%) of the websites analysed use only text, the other presents also pictures, diagrams, graphs; 3 companies use also interactive documents (see Graph 4).



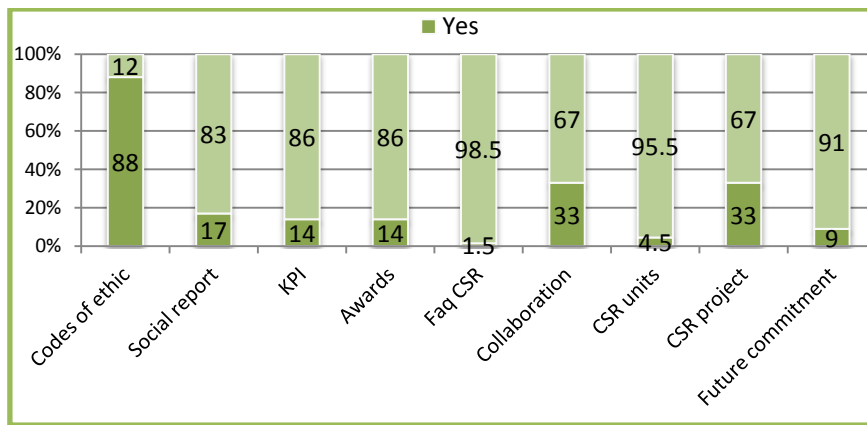
Graph 4 - Structure of the website

Referring to general aspects:

- 88% of websites contains a link to the code of ethics of the companie;
- 17% allows to download a social report.

In general, companies prefer to disclose on general aspects rather than disclose specific achievements in the field of social responsibility.

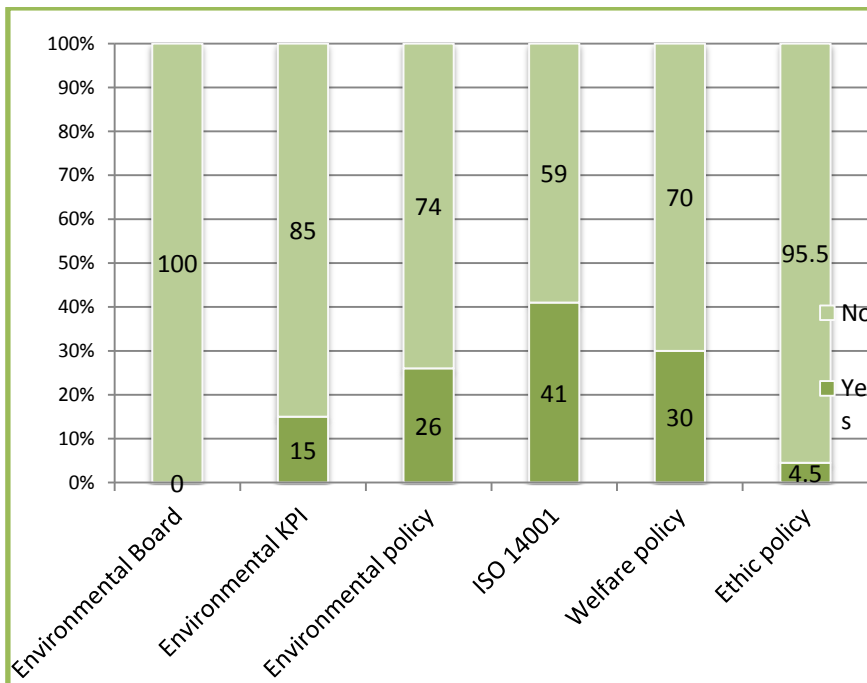
Only one company devotes a special section dedicated to frequently asked questions (see Graph 5)..



Graph 5 - General aspects

In terms of environmental responsibility and towards community, a few number of companies websites present in detail these topics. The most important information concerne (see Graph 6):

- ISO 14001 certification (41%),
- environmental policy (24%)
- and welfare policies put in place by the company (29%).

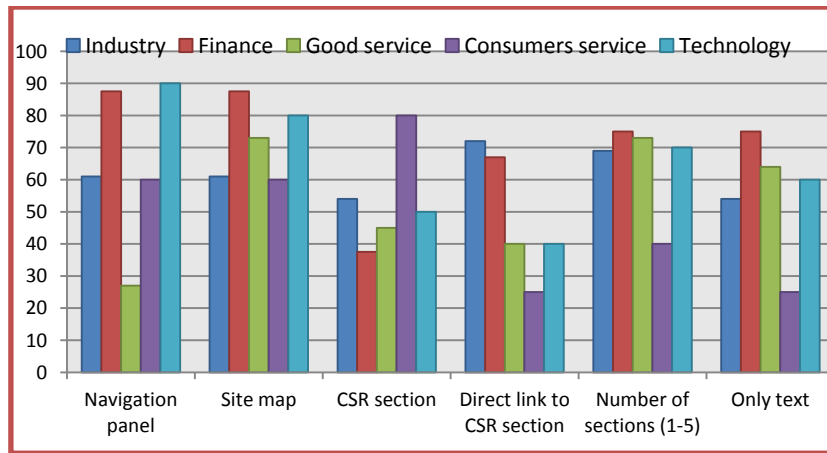


Graph 6 – Responsibility towards environmental and community

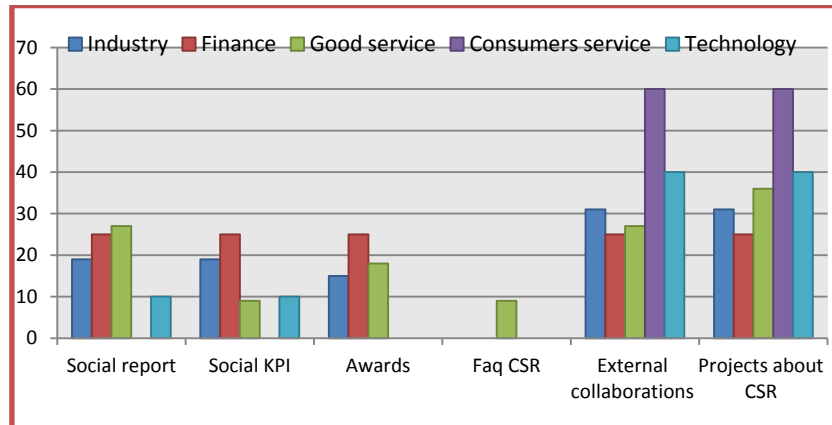
HP2: Sectors of activities affects the quality and quantity of the information disclosed on CSR and the way in which the information is provided by a company

The sectors of activity analyzed in more detail are those of industry, consumer goods, technology, finance and consumer services.

The data collected on the website structure and on general information are presented in the following graphs with refer to the single sector analyzed (Graph 7 and Graph 8).

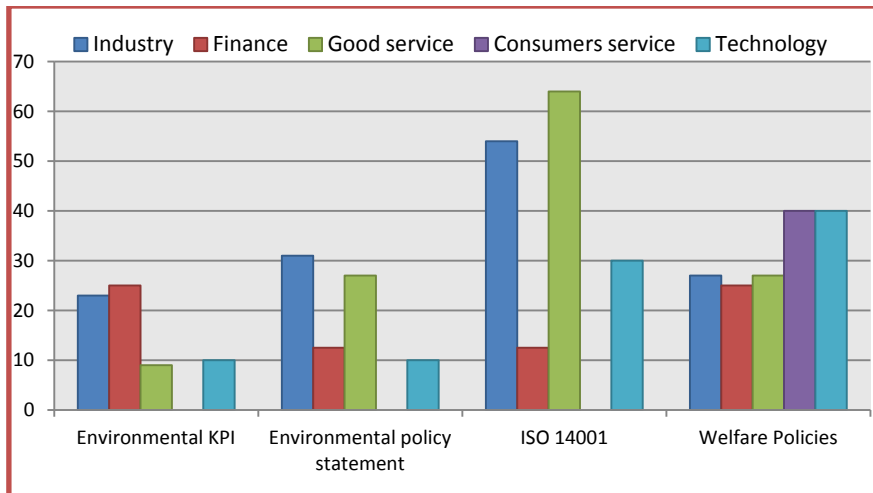


Graph 7 - Structure of the website in different sectors



Graph 8 - General aspects

Regarding to the presence of information on ISO 14001 certification, policies and environmental documentation or information on welfare policies, the data collected are presented in the Graph 9.



Graph 9 – Responsibility towards environmental and community

HP 3: *Companies that have a specific website CSR section communicate a larger quantity of information than companies that give information in a not structured way.*

The final analysis compares the websites containing a specific section (34 companies) with websites that present CSR information in a less structured way (30 companies); 2 companies do not provide any information about CSR.

Regarding the number of pages dedicated to social responsibility disclosure, 93% of websites without the specific section devotes a few pages to this topic and 7% a discrete quantity.

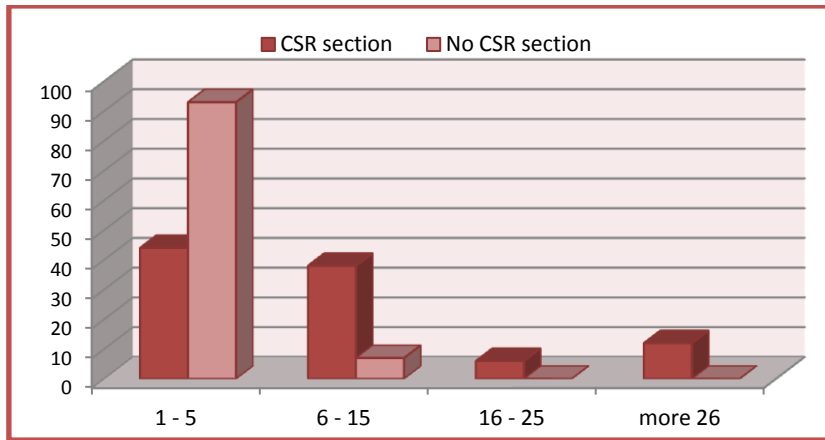
With regard to companies with a specific CSR section, instead:

44% have a few number of pages about CSR;

38% a discrete amount of pages about CSR;

6% many pages about CSR (from 16-25);

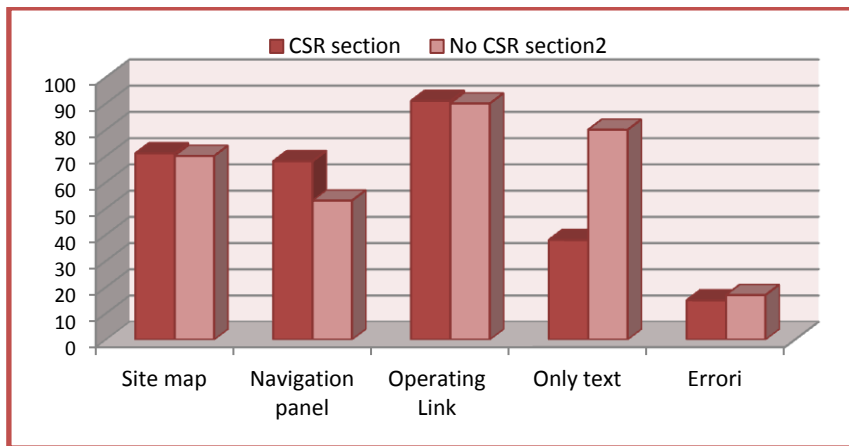
2% more than 26 pages (see Graph 10).



Graph 10 - Number of pages devoted to CSR

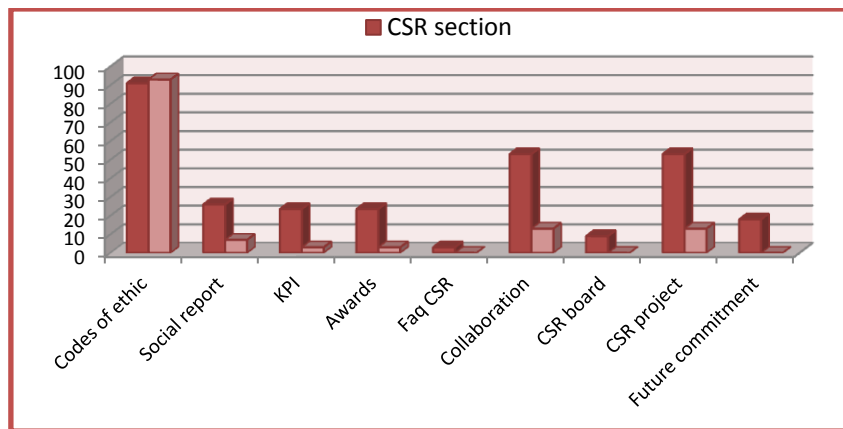
80% of websites without specific CSR section uses a presentation by only format text; 38% of the websites have a section that uses more visual impact.

Other synthetic and less significant information relating to the structure of the website are presented in the Graph 11.



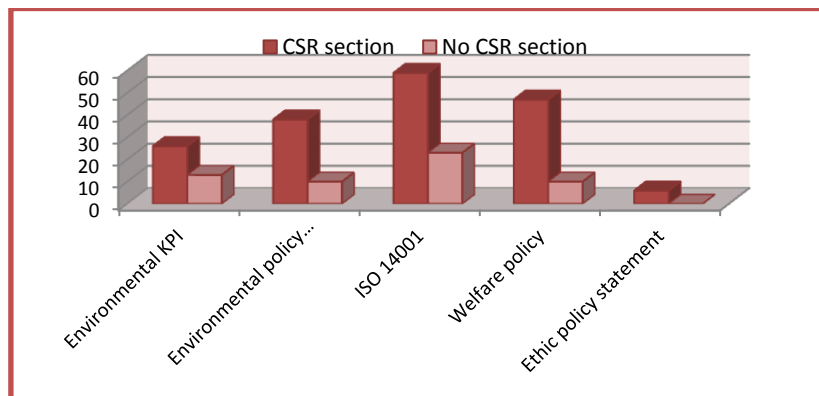
Graph 11 - Structure of the website

With regard to general aspects the results obtained can be represented as follows (Graph 12):



Graph 12 - General aspects

Finally, with regard to information concerning environmental and relations with the community, Graph 13 summarize the results.



Graph 13 – Responsibility towards environmental and community

4. Conclusion

Regarding HP1 (Italian companies disclose their commitment to CSR on their websites) is possible to underline a good availability of information regarding the CSR. The majority (65%) of the companies offers information in both Italian and English language. More than half (51.5%) has on its website a special section dedicated to CSR, although the majority of sites (64%) has a few pages dedicated to the theme of

sustainability (a number between 1 and 5). The businesses are not exploiting the full potential of the Internet as granted by approximately 2 out of 3 companies offer only minimal information on its website.

The simplicity and speed of navigation is very accurate in the websites analyzed: 70% of the companies have a site map and 62% offers a panel of navigation to facilitate the research of information; the percentage of sites that have operating links is 89%.

In terms of responsibility towards environmental and community, there are few websites that express these topics in detail. The most significant data are related to the presence of information on the ISO 14001 certification (41%), environmental policy (24%) and welfare policies (29%).

With regard to HP2 (sectors of companies activities affects the quality and quantity of the information disclosed on CSR and the way in which the information is provided), the sectors analyzed are those of industry, consumer goods , technology, finance and consumer services. The sector influences the CSR communication of companies, as in most of the aspects analyzed there is a prevalence of a particular sector than the other.

The industry and consumer goods, which are characterized by strong activity in environmental impact, offer a decent amount of CSR information but still insufficient. Enterprises belonging to these sectors should provide much more information than the others. In contrast, firms belonging to finance sector communicate information in a rather complete way, even if it is a sector with weak environmental and social impact. The areas of technology and consumer services were the ones that offer a less comprehensive CSR communication, many aspects are left out and not processed within the websites.

About HP3 (companies that have a specific website CSR section communicate a larger quantity of information than companies that give information in a not structured way), we can observe that it is fully confirmed. There is clear evidence that the websites that contain a specific section dedicated to social responsibility provide more information. This is because the companies that give much importance to CSR disclosure, usually submit information as complete as possible and easily detectable by the user.

The search can be developed considering a larger number of companies (for example considering all the listed companies and not only the ones belonging to the STAR sector) and a greater number of information (for example with regard to the relationships between company and different stakeholders such as employees, customers or consumers, and so on.)

Also the time variable represents an important limitation of the research. The data, in fact, are related to the month of February 2013 and the discussed results are usable for a specific period of time, since the information available can change very quickly with the risk of compromising the conclusions reached. This limit, however, represents a characteristic of a research whose purpose is to analyze the web site content.

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APPENDIX

List of companies

Company	Sector of activity
ACOTEL GROUP	Telecommunications
AEFFE	Consumer Goods
AMPLIFON	Health
ANSALDO STS	Industry
ASCOPIAVE	Public Services
ASTALDI	Industry
BANCA FINNAT	Finance
BANCA IFIS	Finance
BANCA POP ETRURIA E LAZIO	Finance
BIANCAMANO	Industry
BIESSE	Industry
BOLZONI	Industry
BREMBO	Consumer Goods
CAD IT	Technology
CAIRO COMMUNICATION	Consumer Services

DAMIANI	Consumer Services
CEMBRE	Industry
CEMENTIR HOLDING	Industry
CENTRALE DEL LATTE TORINO	Consumer Goods
COBRA	Consumer Goods
DADA	Technology
D'AMICO INTERNATIONAL SHIPPING	Industry
DATALOGIC	Industry
DEA CAPITAL	Finance
DIGITAL BROS	Consumer Goods
EI TOWERS	Technology
EL.EN.	Industry
ELICA	Consumer Goods
EMAK	Consumer Goods
ENGINEERING	Technology
ESPRINET	Technology
EUROTECH	Technology
EXPRIVIA	Technology
FALCK RENEWABLES	Public Services
FIDIA	Industry
FIERA MILANO	Industry
GEFRAN	Industry
MUTUIONLINE	Finance
IGD - IMMOBILIARE GRANDE DISTRIBUZIONE	Finance
IMA	Industry
INTERPUMP GROUP	Industry
IRCE	Industry
ISAGRO	Chemicals And Raw Materials
IT WAY	Technology
LA DORIA	Consumer Goods
LANDI RENZO	Consumer Goods
MARR	Consumer Services
MONDO TV	Consumer Services
NICE	Industry
PANARIAGROUP INDUSTRIE CERAMICHE	Industry
POLIGRAFICA S.FAUSTINO	Industry
POLTRONA FRAU	Consumer Goods

PRIMA INDUSTRIE	Industry
RENO DE MEDICI	Industry
REPLY	Technology
SABAF	Industry
SAES GETTERS e SAES GETTERS RSP	Industry
SERVIZI ITALIA	Industry
SOGEFI	Consumer Goods
TAMBURI INVESTMENT PARTNERS	Finance
TERNIENERGIA	Public Services
TESMEC	Industry
TXT	Technology
VITTORIA ASSICURAZIONI	Finance
YOOX	Consumer Services
ZIGNAGO VETRO	Industry

Does family matter? A study of parents' influence on the entrepreneurial intention of technical degrees students in Spain

Iciar Pablo – Lerchundi

Instituto de Ciencias de la Educación (ICE)
Universidad Politécnica de Madrid
C/ Profesor Aranguren, 3. 28040, Madrid

Gustavo Morales – Alonso*, Ana M. Vargas – P.

Departamento de Ingeniería de Organización, Administración de
Empresas y Estadística
E.T.S.I. Industriales
Universidad Politécnica de Madrid
c/ José Gutiérrez Abascal, 2. Madrid

* *Corresponding author*

Structured Abstract

Purpose – The purpose of this study is to verify the parental influence on the entrepreneurial intention of technical degrees students in Spain. In an economic crisis context such as the one Spain is currently suffering, entrepreneurship is often regarded as an opportunity for productivity increase and wealth generation, especially if it is technology-based. Therefore, the research of factors that may determine young engineers' attitude towards entrepreneurship is of great interest. Special attention is paid to parents' role as knowledge transferors, as their experience may have a positive effect on the entrepreneurial intention of their children.

Design – The proposed approach is the statistical analysis of a survey conducted on 1004 students in five different technical degrees at Universidad Politécnica de Madrid (UPM), the biggest technical university in Spain.

The survey explored the students' entrepreneurial intention and their perception of the support provided by their closer environment (family and friends) in case they decided to found a new company. Special attention is paid to the parents' current occupation as entrepreneur or civil servant, as this is believed to be relevant for the success of entrepreneurial knowledge and attitude transfer from one generation to the next.

Value – The existence of positive role models for entrepreneurship that through the transference of knowledge transmit the willingness to become self-employed have been found long before in the literature. Negative role models also exist, in the form of entrepreneurs that failed. In this research we present a new type of negative role model, which are the parents that work for the public sector. Empirical evidence is provided that, while self-employed parents grow children with higher entrepreneurial intentions, civil

servants tend to have children who do not feel the entrepreneurial professional perspective so intriguing.

Practical implications –A distinction can be made between the technological start-ups with high growth capabilities, which lead to productivity increase and wealth generation and those new companies in which the main scope is self-employment. In the foundation of the former is where technical universities can play a key role on economic development as a technology transfer vehicle to the society. However, universities can only foster entrepreneurial intentions in those students in which it is not hindered by their closer family. Therefore, it is crucial to assess to what extent parents' knowledge transfer can affect the entrepreneurial intention of technical degree students.

Keywords – knowledge transfer, entrepreneurship, family ties, technology-based companies, role models.

Paper type – Academic Research Paper

1 Introduction

Due to parents' role as knowledge transferors to their children, the existence of role models in the close family is determinant in the choice of the future professional career of young adults. This transference of knowledge and experience can take place either by *exposure*, in which the self-employed parents act as role models for their children, or by *closure*, providing financial or social capitals for the foundation of a new venture (Mungai & Velamuri, 2011).

The family, and especially father and mother, exercises great power over the desirability and feasibility for the process of the creation of a new company (Shapiro & Sokol, 1982). In this sense, determining the influence of the close family on the entrepreneurial intention and the transfer of business knowledge in students of technical degrees is the main objective of this study.

In a context of economic crisis, the founding of new technology-based companies is of the greatest importance (Hernández-Mogollón, 2014). Nevertheless, it has been stated that not all the entrepreneurial actions are of the same significance for economic growth (Shane, 2009). That is, necessity-driven entrepreneurship leads to founding of companies whose principal scope is the self-employment of the entrepreneur, and are usually regarded as low-value added companies with limited growth capabilities. On the contrary, high technology entrepreneurship (from the fields of Information Technology, aerospace engineering, bioengineered materials, nanoscience or advances in medical science, for

instance) can provide the economy with high-value added firms that foster economic growth.

However, there is a knowledge entry barrier for the foundation of such technological ventures. While entrepreneurial and managerial skills may be found amongst the population, the technical knowledge and expertise needed in technology-based companies are only found in individuals with engineering and other technical education and background.

In this research we analyze the influence of parental knowledge transfer to engineering students via positive and negative role models for their entrepreneurial intention.

2 Research framework

There are empirical evidences of parental transferences and support to their descendants across many different cultures. To cite a few examples, the transference of public working positions from parents to sons in Italy has been found by Scoppa (2009), the providing of material resources and services from parents to their young adult children in Taiwan and Philippines (Agree, Biddlecom, Chang, & Perez, 2002) or the inter-generational transmission of home ownership in the Netherlands (Mulder & Smits, 2012) have also been analyzed.

But the transferences from parents to children are not limited to tangible goods or working positions, being the choice of a professional career also influenced by them (Otto, 2000). In the case of self-employed parents, their influence on their children entrepreneurial intention has also been stated.

Research findings (Bosma, Hessels, Schutjens, Praag, & Verheul, 2012; Carr & Sequeira, 2007; Laspita, Breugst, Heblich, & Patzelt, 2012; Oren, Caduri, & Tziner, 2013) show a positive correlation between parental occupation as entrepreneurs and the likelihood that their children will become entrepreneurs themselves. They claim that parents are in a unique position to influence the future behavior of their children, becoming role models for them. Other studies have focused on the role model of the entrepreneur father and the influence it has on their children to become entrepreneurs. Lindquist et al. (2013) found that both biological and adoptive entrepreneur parents increase over 60% the chance of having children who are themselves entrepreneurs. It is

worth noting that the influence of the adoptive parents is twice than that of the biological parents.

Regarding the gender of the entrepreneur, many entrepreneur women look to their parents for advice, support and encouragement for entrepreneurship, while men want independence from their parents, especially from their father (Kirkwood, 2007). According to (Chlosta, Patzelt, Klein, & Dormann, 2010) a self-employed father increases the likelihood of children becoming entrepreneurs in the future, but moderated by aspects of his personality as the openness of the individual. Contrarily, mothers have been stated to be a more decisive influence in the choice of the professional career by Otto, (2000).

Nevertheless, the existence of a negative role model for entrepreneurial intention of descendants has been found by Mungai and Velamuri (2011). Whenever the father fails in his entrepreneurial activity, his children will be less prone to become self-employed, being this more pronounced in young adults.

As has been stated, the fact of having self-employed parents makes the likelihood of the children becoming entrepreneurs greater. Then, what could the effect of the parents employed by the public sector in the entrepreneurial intention of their sons be? It has already been mentioned than in collectivist cultures like the South of Italy parents who are civil servants help their descendants to become public workers themselves (Scoppa, 2009). This, together with the existence of negative role models for entrepreneurship provided by Mungai and Velamuri (2011), leads us to the research question of this study: Are self-employed parents a positive role model for entrepreneurial intention of engineering students while parents employed as civil servants are a negative role model? This issue has not been sought after so far, to the author's knowledge. The research question stated is depicted graphically in figure 1, with the two main hypotheses tested in this paper.

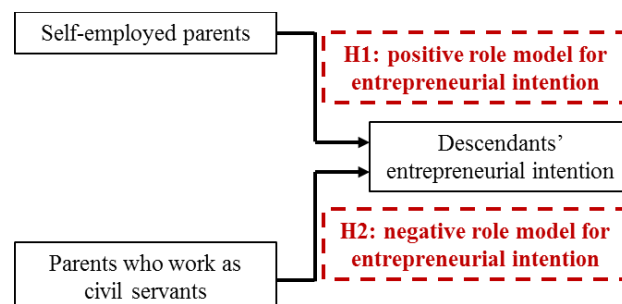


Figure 1. Model and hypotheses tested

There are several models for the development of the entrepreneurial action based on the intention of the individual. Here we rely on the Theory of Planned Behavior (TPB) model from Ajzen, (1991), which is described in the following.

Ajzen proposed in his theory that the intention is determined by three socio-cognitive factors: *attitude* toward performing the behavior, *subjective norms* concerning action, and *belief in one's ability* to perform successfully the behavior, in this case, the foundation of a new company. In a meta-analytic review of 185 empirical studies that applied the TPB, Armitage and Conner (2001) showed that it is effective in predicting both intentions and behaviors.

The TPB model is summarized in figure 2. Behavioral attitude is related to the level of attractiveness that the action has for the individual, which creates a favorable or unfavorable position to the behavior. Subjective norm represents the perception by the individual of the social pressure to pursue an action. Finally, perceived control is a factor that may facilitate or impede performance of the behavior, according to the perceived capability of the individual.

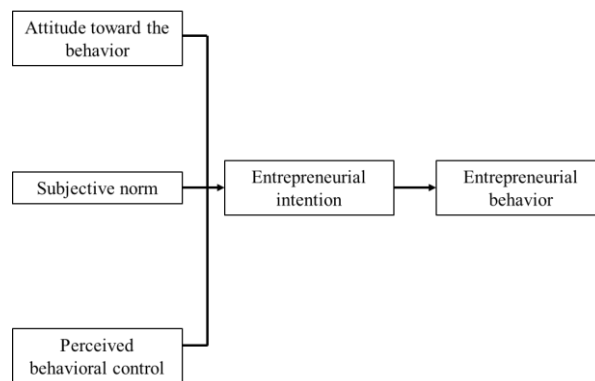


Figure 2. Theory of Planned Behavior model by Ajzen (1991).

The TPB model is used to provide the theoretical background of the hypotheses tested in this research. While H1 and H2 are based in the aforementioned research question, the sub-hypotheses H1a, H1b, H1c, H2a, H2b and H2c refer to the TPB model. The hypotheses under study are, hence,

H1. Self-employed parents act as a positive role model and knowledge transferors to their children, increasing their entrepreneurial intention.

H1a. Those students whose parents are self-employed, have a better attitude toward the founding of a new company.

H1b. Those students whose parents are self-employed perceive more support from their environment toward the founding of a new company.

H1c. Those students whose parents are self-employed show a higher perception of their capability for the founding of a new company.

H2. Parents employed in the public sector act as a negative role model and knowledge transferors to their children, decreasing their entrepreneurial intention.

H2a. Those students whose parents are civil servants have a worse attitude toward the founding of a new company.

H2b. Those students whose parents are civil servants perceive less support from their environment toward the founding of a new company.

H2c. Those students whose parents are civil show a lower perception of their capability for the founding of a new company.

3 Methodology

3.1 Procedure and variables

In order to explore how the family acts as a knowledge transfer asset for the creation of technology-based firms, a survey, addressing the different factors of entrepreneurial intention as well as information on the families, was created. This survey included items based on Ajzen's TPB (1991) and the three main factors that affect entrepreneurial intention, namely attitude towards the behavior, subjective norm and internal locus of control. These items were based on a previous study by Liñán and Chen (2009). As the main goal of the study was to explore differences according to the family influence, the survey also contained items concerning the parents' professional background, especially regarding if they were self-employed or civil servants. Other items explored if there were other people in the students' environment who carried out these kinds of jobs.

The study was conducted with engineering and architecture students of the Universidad Politécnica de Madrid (UPM), the biggest and oldest technical university in Spain. Data were collected at the beginning of the 2012/2013 winter semester during a four weeks period in five different degrees which count among the most traditional and

demanded ones at the UPM (Universidad Politécnica de Madrid, 2013), namely, Aeronautical Engineering, Architecture, Civil Engineering, Mechanical Engineering and Telecommunications Engineering.

3.2 Sample

Of the initial 1004 obtained answers, those of non-Spanish students were eliminated in order to maintain cultural homogeneity. As the items concerning the parents' profession were formulated in yes/no format and explored if the parent (not differentiating mother and father) was or was not e.g. a civil servant, those students who answered affirmatively for the civil servant and self-employed questions, were also left out. This way, the final sample considered for analysis comprised a total of 851 students. 67.3% of them are men and 32.3% women (0.4% did not give information about their gender), which is congruent with the fact that the number of men in technical degrees, and specifically at UPM, is usually higher than the number of women (Instituto Nacional de Estadística, 2012; Otero & Salamí, 2009).

As stated before, five degrees with great tradition in engineering studies and which count among the most demanded ones at the UPM (2013) were chosen for the present research. 31.7% of the sample were Aeronautical Engineering students, 18.3% were studying Architecture, 20.1% were enrolled in Civil Engineering, 24.2% in Mechanical Engineering and 5.6% were Telecommunications Engineering students. As differences may be expected according to the students' proximity to their graduation, and therefore entry into the labour market, data from students in their first and last semester of the degree were collected. This distribution was balanced with 50.9% of the respondents enrolled in their first and 49.1% in their last semester at university.

Concerning age, the sample had a mean of 20.52 years and a standard deviation of 2.90, being the youngest respondent 17 years old and the oldest 34.

4 Results

4.1 Descriptive results

If we consider the parents professional background, we find that 20.8% of the students claim that at least one of their parents has his/her own business. Parents who work as civil servants take up to 40.2% of the sample. Questions concerning other people in the closer

environment of the students were considered and it was found that 29.3% did not have anyone close who was self-employed. Similarly, 25.9% expressed the absence of civil servants in their close environment.

In this study, the impact of the family background and their knowledge transfer is considered, regarding the entrepreneurial intention of technical degrees students and the three main factors affecting it. These variables were measured through different items on a scale from 1 to 7. For these, we found in this sample that entrepreneurial intention was rated 3.57, this is, a medium score. If we look at the general means of the predicting factors we find that attitude was rated 4.87 meaning that entrepreneurship is viewed, in general, as an attractive professional option. The support respondents think they would receive from their parents and siblings is also high, with a mean of 5.64 in subjective norm. Finally, we found the lowest mean for the internal control factor ($\bar{x}=3.32$), which indicates that students see themselves as not very capable of creating and managing their own firm.

4.2 Data analysis

In order to analyze if the professional background of parents and social environment is affecting the entrepreneurial intention of technical degrees students, we conducted mean comparisons with Student's t-test. We compared the students who indicated that at least one of their parents was an entrepreneur, with those who stated that none of their parents was self-employed. The same comparison was carried out for possible sons/daughters of civil servants.

Table 1. t-test for entrepreneurial intention.

Family's professional background	N	Mean (1-7)	df	t
Parents with own business	177	3.91	844	-3.54***
Parents without business	669	3.48		
Parents civil servants	342	3.35	845	3.49***
Parents no civil servants	505	3.71		

***p<.001; **p<.01; *p<.05

Table 1 shows the results for the entrepreneurial intention variable. As can be seen, students who have parents with their own business have a significantly higher entrepreneurial intention than students whose parents are not self-employed ($t=-3.54$;

p<.001). Similarly, students with civil servants parents have a lower entrepreneurial intention than those whose parents are not employed in public services (t=3.49; p<.001).It can be therefore stated that the professional background of parents influences the entrepreneurial intention of their descendants, having children of entrepreneurs a higher intention to create their own firm and those of civil servants a lower intention.

For the rest of variables studied, the same pattern was found. As can be seen in tables 2, 3 and 4, students whose parents are entrepreneurs show a more favorable attitude towards entrepreneurship (t=-2.38; p<.01), feel more support (t=-4.29; p<.001) and see themselves more capable of doing it (t=-3.59; p<.001) than students whose parents are not self-employed. On the other hand, children of civil servants show lower means than students whose parents are not public employees in all of the three variables: attitude towards the behavior (t=3.12; p<.01), perceived support (t=3.19; p<.01) and internal control (t=3.67; p<.001).

Table 2. t-test for attitude towards the behavior .

Family's professional background	N	Mean (1-7)	df	t
Parents with own business	177	5.06	842	-2.38**
Parents without business	667	4.81		
Parents civil servants	341	4.71	843	3.12**
Parents no civil servants	504	4.97		

***p<.001; **p<.01; *p<.05

Table 3. t-test for subjective norm.

Family's professional background	N	Mean (1-7)	df	t
Parents with own business	177	6.06	841	-4.29***
Parents without business	666	5.54		
Parents civil servants	340	5.45	842	3.19**
Parents no civil servants	504	5.77		

***p<.001; **p<.01; *p<.05

Table 4. t-test for internal control.

Family's professional background	N	Mean (1-7)	df	t
Parents with own business	177	3.59	843	-3.59***
Parents without business	668	3.26		

Parents civil servants	342	3.15		
Parents no civil servants	504	3.44	844	3.67***

***p<.001; **p<.01; *p<.05

4.3 Discussion

As it can be seen in table 1, those students whose parents are self-employed rank higher in entrepreneurial intention, allowing for the acceptance of the first hypothesis of this study. This finding is not surprising, as it is in line with the results provided by (Bosma et al., 2012; Carr & Sequeira, 2007; Laspita et al., 2012; Oren Caduri, & Tziner, 2013), among others.

Contrarily, it has been found that parents who work for the public sector tend to hinder the entrepreneurial intention of their sons/daughters, as they have been found to have a lower mean in that item. That is, civil servants act as a negative role model regarding the foundation of new businesses. Therefore, the second main hypothesis can also be accepted. This is a far-reaching result, as to the authors' knowledge, it has never been assessed before.

Regarding the hypotheses linked with the Theory of Planned Behavior model, there is empirical evidence that supports H1a, H1b and H1c, stating that self-employed parents act as positive role models that increase their sons' attitude towards the creation of a new company, their perception of environmental support and their perception of their own capability, respectively.

With regard to the presence of negative role models, it has been found that sons/daughters from parents working in the public sector score lower in the three dimensions (attitude, subjective norm and perceived control) of the TPB model. Thus, hypotheses H2a, H2b and H2c are also confirmed.

5 Conclusions

The founding of innovative, technology-based companies with high growth potential would be of great importance in the context of the economic crisis that Spain is suffering. This highlights the important role of technical universities that feed the society with the professionals able to create such businesses.

In this research the results of a survey of engineering and architecture students from UPM, the largest technical university in Spain are presented. We analyzed how the parental occupation as self-employed or civil servant influences the entrepreneurial

intention of students from technical degrees. We posit that parents act as knowledge transferors to their sons/daughters, thus being determinant on their later career choice.

Our findings support that parents who own a business act as a positive role model towards the entrepreneurial intention of their children, while parents who work at the public sector are a negative role model.

These results obtained for entrepreneurial intention are also confirmed for the three dimensions that form the TPB Ajzen model. That is, a positive role model makes the students have a better attitude towards entrepreneurship, feel higher support from their environment with regard to the founding of a new venture, and feel more capable to succeed in case of creating a company. Contrarily, having parents who work as civil servants hinders the three dimensions of the model.

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Ambidextrous organization and Innovative performance: testing the mediation effect of the internal networking

Lara Agostini, Roberto Filippini, Anna Nosella *

Department of Management and Engineering
University of Padova
Stradella San Nicola 3, 36100 Vicenza

Structured Abstract

Purpose - This paper has two aims: first to investigate whether an ambidextrous organization can be represented in a more integrated and complete way as a second order construct, reflected by contextual (managers social support and performance management context) and structural approaches (see figure below); second to examine whether internal networking mediates the relationship between the ambidextrous organization and its attitude to pursue high level of innovation ambidexterity.

Design/methodology/approach - To test our arguments, we carried out a survey in medium high tech industries, collecting data from a sample of Austrian and Italian firms. Data collection took place in 2011. In total, 185 useful questionnaires were received, resulting in an effective response rate of 13.5%. Structural equation modeling (SEM) with AMOS was used to examine the hypothesized model.

Originality/value - The results show that our second order theoretical model fits the data well and internal networking partially mediates the relationship between the ambidextrous organization and the innovative performance. This study contributes to the debate on organizational ambidexterity in at least two important ways: first, it shows that both structural and contextual approaches can be taken together and modelled as a second order construct, thus representing an holistic view of the ambidextrous organization. Second, this empirical study is one of the first to investigate the role that the ambidextrous organization has in fostering internal networking, which in turns affects innovative performance.

Practical implications - This study shows that the ambidextrous organization is not simply the result of either a structural solution or a contextual solution, but it should be made up of different organizational antecedents of ambidexterity that might complement one another. Together with the formal organizational structure, the role played by managers is fundamental since they foster employees to reach their objectives, to be empowered and to be free to decide how to divide their time and resources; furthermore managers should devote considerable effort to developing subordinates, giving creative challenges to their people instead of narrowly defining tasks..

Keywords – Ambidexterity, Internal networking, SEM

Paper type – Academic Research Paper

Introduction

Competitive pressure, rapidly changing and disruptive environments, frequent technological turnovers and shortening of product life cycles are all factors that characterize many industries in a globalized economy and require firms to continuously reconfigure structures and processes in order to sustain the current business and, at the same time, to generate innovations to meet or create future demands (Jansen *et al.*, 2008). In other words, firms should manage the tension between exploration activities that correspond to “the experimentation of new alternatives” and exploitation activities that refer to with “the refinement and extension on existing competencies, technologies, and paradigms” (March, 1991: 85). Here the concept of ambidexterity, defined as the capability of an organization to manage conflicting activities and tensions by achieving high levels of both simultaneously, comes into play as a possible solution to this concern (Nosella *et al.*, 2012). Since the pioneering work of Tushman and O’Reilly (1996), in both the academic and managerial practice there has been an increasing attention to this phenomenon, resulting in an increase of publications which mainly address the issue of antecedents and consequences of ambidexterity (Raish and Birkinshaw, 2008). As far as antecedents are concerned, literature has mainly investigated the effect that intra-organizational solutions can have on achieving ambidexterity; particularly, structural, contextual and leadership-based features have been analysed. Structural ambidexterity refers to the creation of separate organizational units specifically devoted to exploitation and exploration activities (Tushman and O’Reilly, 1996), while contextual ambidexterity emerges when leaders are able to shape an organizational context with proper degrees of performance management and social support (Ghoshal and Bartlett, 1994; Gibson and Birkinshaw, 2004). However, until now, few papers have empirically investigated the effect that adopting a structural design with elements of a contextual design has on innovative performance, even if there is an explicit call for research on this issue (Chang, Hughes, 2012). Indeed literature has outlined that an ambidextrous organization often contains both structural design and contextual elements (performance management and social support), thus emphasizing the importance of a simultaneous adoption of a comprehensive set of ambidextrous organizational approaches (Kauppila, 2010). Along this perspective, also O’Reilly and Tushman (2008) argue that the resolution of tensions requires organizations to be integrated around a culture which is shaped by top managers and tied up with an over-arching structure and complementary context. Starting from

these considerations, this paper focuses on the tension between radical and incremental innovation and aims at investigating whether an ambidextrous organization for innovation can be represented in a more integrated and complete way as a second order construct reflected by contextual and structural approaches.

Furthermore, recently some studies have provided evidence of the role these two ambidextrous configurations have in fostering internal networking for knowledge exchange, defined as the set of practices and methods through which individuals are linked together to create and share knowledge and experience (Ledwith *et al.*, 2012). For its nature, internal networking fuels innovation activities, in this way contributing to innovation ambidexterity, defined as the achievement of high levels of both incremental and radical innovation (Lin *et al.* 2011). Due to the often inconsistent use of the word ambidexterity (Lin *et al.*, 2011), for the sake of clarity we specify that ambidextrous organization refers to specific structure, context and behaviour that lead to innovation ambidexterity that thus is viewed as a “performance oriented outcome” (Lin *et al.*, 2011). Until now, the role of internal networking for knowledge exchange as a mediator between ambidextrous organization and innovation ambidexterity has not been investigated yet; consequently, this study also aims to examine whether internal networking for knowledge exchange mediates the relationship between the ambidextrous organization and its ability to pursue high level of innovation ambidexterity.

To test our arguments, we carried out a survey in the medium high tech industries, collecting data from 185 Austrian and Italian firms, using structural equation modeling (SEM). Results show that our second-order theoretical model fits the data well and internal networking for knowledge exchange partially mediates the relationship between the ambidextrous organization and the innovation ambidexterity.

The remainder of this paper is organized as follows. Next section presents the literature review and develops the hypothesized relationships. Then, the research methodology and analysis of results are presented before discussing them and illustrating implications of the study.

Literature review and research hypothesis

The ambidextrous organization

Since the founding work of Tushman and O’Reilly (1996), literature on management and organisation has addressed the phenomenon of ambidexterity that is defined as an

organisational capability that makes it possible to simultaneously manage opposing poles and tensions, such as: alignment vs. adaptability, comfort of the past vs. uncertainty of the future, exploitation vs. exploration of knowledge, radical vs incremental innovations. Being able to solve these contrasting tensions and thus realising ambidexterity has been demonstrated to contribute to superior performances (He and Wong, 2004; Gibson and Birkinshaw, 2004; Cao *et al.*, 2009).

The rapid emergence of the literature on the theme has caused an inconsistent definition of the construct (Lin *et al.*, 2011; Nosella *et al.*, 2012) which authors refer to as behavioral ambidexterity and structural ambidexterity (thus focusing on the organizational features that lead to the solution of tensions) or realized ambidexterity (thus concentrating on “the performance oriented outcome”, Lin *et al.*, 2011). In this paper we consider both perspectives, using the word ambidextrous organization in order to refer to structure and context, and innovation ambidexterity in order to encompass the achievement of high level of both incremental and radical innovation (Lin *et al.*, 2011; Chang and Hughes, 2012).

If on the one hand literature has investigated the performance implications of being ambidextrous, on the other hand there is an another growing body of research which has focused on investigating structural and contextual ambidexterity, as well as other factors and conditions that could lead to the development of this capability. Structural design refers to the creation of spatially separated units for solving contrasting tensions (Duncan, 1976; Tushman and O’Reilly, 1996; Benner and Tushman, 2003; He and Wong, 2004; Jansen *et al.*, 2006; Fang *et al.*, 2010), while the contextual solution sustains that organisations can solve constrasting tensions “by building a set of processes or systems that enable and encourage individuals to make their own judgments about how to divide their time between conflicting demands for alignment and adaptability” (Gibson and Birkinshaw, 2004: 211). In this last perspective, studies demonstrate that a context characterized by a combination of performance management and social support is associated with a higher level of ambidexterity (Birkinshaw and Gibson, 2004); performance management refers to a context where managers push employees to account for their actions and results, whereas social support is concerned with giving employees the security they need to perform their activities. In both solutions the abilities and the characteristics of leaders (Jansen, 2008) and top management teams (Lubatkin *et al.*, 2006) are critical as enabling factors of ambidexterity.

Most of the studies on this field analyse the impact that a single configuration – whether structural or contextual – has on firm performance, while there are few works that consider the possibility that structural and contextual ambidexterity are complementary alternatives that can coexist and alternate within the same organisation; in their review of the state of the art of the topic, Raisch and Birkinshaw (2008) suggest that the simultaneous effect of these approaches should be considered in order to understand how ambidexterity is likely to emerge. Along this vein, also O'Reilly and Tushman (2007) emphasize that resolution of tensions requires organizations to be integrated around a culture which is shaped by top managers and tied up with an over-arching structure and complementary context. To conclude, ambidexterity is a nested concept present at different levels into an organization which normally adopts both structural and contextual solutions (Birkinshaw and Gupta, 2013) interacting in a synergic way. Up to now, an integration of all the approaches is still lacking, “leaving an important gap in our knowledge of the theory and practice of ambidexterity” (Chang and Hughes, 2012). Building on these considerations, this paper aims at investigating whether an ambidextrous organization can be represented in a more integrated and complete way as a second order construct reflected by contextual and structural approaches. On these grounds, the first hypothesis is presented.

HYPOTHESIS 1: *Ambidextrous organization is a multidimensional, second-order construct, reflected by three first order ambidextrous organizational approaches (structural design, managers' social support, performance management context).*

Ambidextrous organizations, internal networking for knowledge exchange, innovation ambidexterity

The literature (Zhang and Zhao, 2006; Nilakanta *et al.*, 2006) has outlined that knowledge is a key element in business success; in fact, knowledge is one of the most strategically important asset in order to guarantee competitive advantage. Firms which introduce knowledge management practices will use their resources more efficiently and will be more innovative and perform better, as different authors sustain (Smith *et al.*, 2005; Darroch and McNaughton, 2002; Dougherty *et al.*, 2002; Hargadon and Sutton, 1997, Darroch, 2005). Particularly, many studies emphasize the fact that creativity and innovation are enhanced through the integration of different pieces of knowledge and

experience since existing ideas from one group of employees could be a novelty to another, thus leading to the development of potentially new products or processes. For this reason, firms more and more push individuals to interact and share knowledge with each other so that they can not only improve their capacity to solve problems (Nonaka *et al.*, 2006), but also create new knowledge (Van Den Hooff and De Ridder's 2004). A set of organizational mechanisms and practices have been suggested by the literature as a powerful method to favor the gathering and dissemination of knowledge in an organization, making it accessible to everyone. Using these practices would help individuals with different skills and experience to connect more easily in order to solve problems, learn new perspectives and generate powerful new ideas; internal networking for knowledge exchange has been proved to contribute to bringing together employees with different knowledge and background and to help teams connect with other people company-wide through network ambassadors (Ledwith *et al.*, 2012), thus being a powerful source of innovation.

Overall, as Bierly (2009) outlines, knowledge transfer and sharing are crucial to improve an organization's existing products, processes or services (exploitative innovation) and could lead to the development of new products and technologies in the case of exploratory innovation.

Investigating the role that internal networking and integration practices have in fostering innovation ambidexterity is a challenging issue which only recently has been addressed by the literature (Kamasak *et al.*, 2010). Gilbert (2006) and Westerman *et al.* (2006) are among the first authors who have posed the questions of how formal and informal integration mechanisms can increase the flow and recombination of knowledge in an ambidextrous organization. Furthermore, Kamasak *et al.* (2010) examine the impact that knowledge sharing, intended as a construct made up of the dimensions of knowledge donating and knowledge collecting, has on explorative, exploitative and innovation ambidexterity. The results of their studies carried out in a sample of middle- and top-level managers of Turkish companies show that knowledge collecting has a significant effect on exploitative, exploratory and innovation ambidexterity. As far as knowledge donating is concerned, results prove that it positively influences the ambidextrous and exploitative innovation in case it takes place within the same function, while it does not show impact in any kind of innovation when outside the function, thus being partially in contrast with previous mentioned findings. Finally, Nosella (2012) highlights that managing internal

knowledge creation is an important search strategy for both incremental and radical innovation and positively impact on ambidexterity.

Even if, as shown above, there are some papers dealing with the impact of internal networking for knowledge sharing on innovation ambidexterity, there seems to be little insights about its relationship with structural and contextual approaches. Among the fews, Jansen *et al.* (2009) show that connectedness, measured as the extent to which employees are networked to various levels of the hierarchy in their organization, influences employees' ability to share and recombine different sources of knowledge, thus mediating the relationship between structural ambidexterity and innovation ambidexterity. In this way a flow of knowledge between explorative and exploitative units is enabled and this bridge can favor the "search for new applications of exploitative efforts or help those organizational members who want to advertise their exploitative efforts in new areas" (Jansen *et al.*, 2009). Indeed, thanks to connectedness, organizational members share their experience, knowledge, and backgrounds. Subsequently, Andriopolous and Lewis (2009) find that structural solutions and integration mechanisms, which "stress interdependence between seeming opposites and enable coordination", should be used in order to solve paradoxes; integrative efforts enable the flow of knowledge between spatially separated units which otherwise would not be able to properly exchange and recombine it, in this way leading to innovation ambidexterity.

While the last mentioned studies deal with structural ambidexterity and integration practices, very recently the issue of contextual ambidexterity and internal networking comes up. Contextual ambidexterity has been analysed as antecedent of knowledge sharing at the level of interorganizational relationship, providing evidence of its positive impact (Ram and Im, 2008): in particular, the effect of contextual ambidexterity on performance is partially mediated by explorative and exploitative knowledge sharing in the case of the relationship with customers, whereas it is fully mediated for the vendor. Differently from the latter study, the paper of Clercq *et al.* (2013) carries out the analysis at the firm level, showing that the relationship between contextual ambidexterity and firm performance is positively influenced by firm's internal knowledge exchange; overall, to guarantee that "the simultaneous pursuit of alignment and adaptability leads to enhanced firm-level performance, the firm's different functional areas must freely share resources". Furthermore, also the paper of Lin *et al.* (2011) argues that a culture that promotes knowledge sharing has a positive impact on the emergence of innovation ambidexterity.

Building on these evidences, we can sustain that ambidextrous organizations, taken as a high-order construct, play an important role in fostering internal networking which in turns pushes the achievement of innovation ambidexterity. On these ground, the following hypothesis are presented.

HYPOTHESIS 2: *The more the firm uses internal networking for knowledge exchange, the greater the innovation ambidexterity will be.*

HYPOTHESIS 3: *Internal networking for knowledge exchange mediates the relationship between the ambidextrous organization and the innovation ambidexterity.*

Figure 1 depicts our research model.

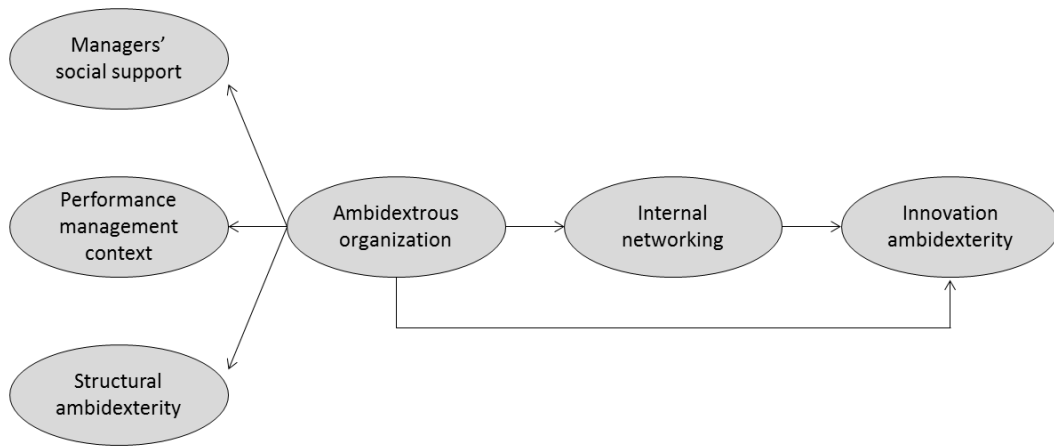


Figure 1: The research model

Research Method

Sampling and data collection

Data for this study were collected thanks to a survey in Italy and Austria. The target population frame consisted of high-tech companies with more than 50 employees and covering the specific two-digit NACE codes C20, C21, C25, C26, C27, C28, C29, C30, C32 (see the following table for a detailed description of the codes).

Table 1: Sectors included in the analysis

SECTOR	NACE CODE
Manufacture of chemicals and chemical products	C20
Manufacture of basic pharmaceutical products and pharmaceutical preparations	C21

Manufacture of fabricated metal products, except machinery and equipment	C25
Manufacture of computer, electronic and optical products	C26
Manufacture of electrical equipment	C27
Manufacture of machinery and equipment n.e.c. (not elsewhere classified)	C28
Manufacture of motor vehicles, trailers and semi-trailers	C29
Manufacture of other transport equipment	C30
Other manufacturing	C32

A total sample of 1370 firms was randomly obtained from Austrian and Italian commercial listings of firms having the characteristics described above. An on line self-administered questionnaire was used as the means for data collection; R&D managers served as respondents because they possessed the deepest knowledge about the R&D organizational and managerial design, the practices used to exchange knowledge for innovative purposes and the innovative performance. Companies were contacted by phone to introduce the research initiative, and an email, including the survey cover letter and an account for survey on line access, was sent to those who agreed to participate. In total, 185 useful questionnaires (85 Italian and 100 Austrian) were received, resulting in an effective response rate of 13.5%. The response rate is within the accepted range of typical response rate for this typology of study.

Data collection took place in 2010-2011.

Measure and operationalization

As far as independent variables are concerned, we used already well validated scales.

Social support context and performance management context were measured using the scale taken from Birkinshaw and Gibson (2004). The four-item measure for “Social support context” (SSC) captures the extent to which management systems in the organizations encourage people to challenge outmoded practices, and devote considerable effort in developing subordinates, pushing decisions down to the lowest appropriate level. The three-item scale for “Performance management context” (PMC) captures the extent to which managers use business goals and performance indicators to run their business.

The independent variable “Structural ambidexterity” (SA) was measured using 2 items taken from Jansen *et al.*, (2009), asking the respondents to indicate the extent to which they agree or disagree with some statements about the extent to which

organizations segment the activities involved in the innovation process into separated units.

As far as the mediation variable is concerned, internal networking for knowledge exchange (INK) was measured using the scale taken from Ledwith *et al.* (2012) and Nosella (2013). The three-item scale makes reference to the use of methods that help organizational members with different backgrounds and skills to connect in order to exchange knowledge and experience and to learn new perspectives.

The dependent variable, innovation ambidexterity (IA), was calculated as the multiplicative score between explorative and exploitative innovation, as suggested by the literature (Gibson and Birkinshaw 2004; Gupta *et al.*, 2006). Explorative innovation (EXR) and exploitative innovation (EXT) were measured using 4 items each, adapted from Atuahene-Gima (2005). The respondents indicated the extent to which they agree or disagree with eight statements about the extent to which organizations, over the last three years, acquired respectively new or improved knowledge.

All items for the constructs used in the present study were assessed on a 5-point Likert scale ranging from 1 (completely disagree) to 5 (completely agree).

Appendix 1 presents a detailed description of all items.

Statistical procedure

Our methodology consisted of an explorative and confirmatory factor analysis and a structural equation modelling (SEM) to test and measure our conceptual framework using the software R (package lavaan).

Results for the measurement model

Scale validation

To ensure that all criteria had the desirable characteristics of dimensionality, convergent and discriminant validity and reliability, we conducted several analyses.

Convergent and discriminant validity

Principal component analysis with promax was conducted to identify and confirm the different factors under each construct in our conceptual model. First, we run exploratory factor analysis (EFA) removing items with a factor loading lower than 0.4 or items which load with value greater than 0.4 in two factors. The results of the EFAs are shown in appendix.

Confirmatory factor analysis (CFA) was then run on all the items and it clearly replicated the intended factor structure, with each item loading on its intended factor. Thus, all items are significantly related to their underlying constructs, thus proving support for convergent validity; all standardized parameter loadings were significant (p-value < 0.001) and ranged from 0.4 to 0.8, with most of the items greater than 0.6 (see appendix 1). Furthermore composite reliability was assessed by checking whether the composite reliabilities exceeded 0.6: as shown in table 3, the requirement is satisfied by MSC, PMC, INK, EXR, EXT, thus indicating that items relate well within each latent variable. We further assessed discriminant validity by examining Cronbach's alpha, which shows alphas higher than the acceptable threshold of 0.60 (Nunnally, 1978).

Finally, unidimensionality was assessed by the overall model fit that can be tested using the comparative fit index (CFI), incremental fit index (IFI), Normed Fit Index (NFI), root mean square error of approximation (RMSEA), and normed chi square (i.e. χ^2 per degree of freedom) (Bryne, 1989; Hair *et al*, 2006). All the indexes (see appendix) indicate that the data acceptably fit the model. In addition, results provided strong evidence that the measures are of good quality .

Table 2 presents the correlations of the studied variables.

Table 2: correlations

	M SC	PM C	SA	IN K	EX R	EX T
Managers Support Context	-	.37 6	.41 1	.28 8	.26 9	.22 8
Performance Mgmt Context		-	.29 0	.15 5	.13 3	.14 5
Structural Ambidexterity			-	.30 2	.31 2	.29 4
Internal networking for Kw Exchange				-	.33 5	.28 1
Knowledge exploration					-	.34 9
Knowledge exploitation						-

Table 3: CFA and scale validation

Item	MSC	PMC	SA	INK	EXR	EXT	p-value
CNTX_2	0.815						No p-value [†]
CNTX_3	0.640						***
CNTX_4	0.571						***
CNTX_5	0.630						***
CNTX_6		0.573					No p-value
CNTX_7		0.568					***
CNTX_8		0.818					***
CNTX_9			0.637				No p-value
CNTX_11			0.400				***
NET_2				0.654			No p-value
NET_3				0.907			***
NET_4				0.693			***
KW_EXR_1					0.653		No p-value
KW_EXR_2					0.776		***
KW_EXR_3					0.761		***
KW_EXR_4					0.759		***
KW_EXT_2						0.658	No p-value
KW_EXT_3						0.616	***
KW_EXT_4						0.729	***
KW_EXT_5						0.747	***
Cronbach's alpha	0.764	0.702	°	0.790	0.822	0.778	
Composite reliability	0.762	0.695	0.429	0.800	0.827	0.783	

CMIN=192.113; DF=155; CMIN/DF=1.239; CFI=.971; IFI=.972; RMSEA=.036

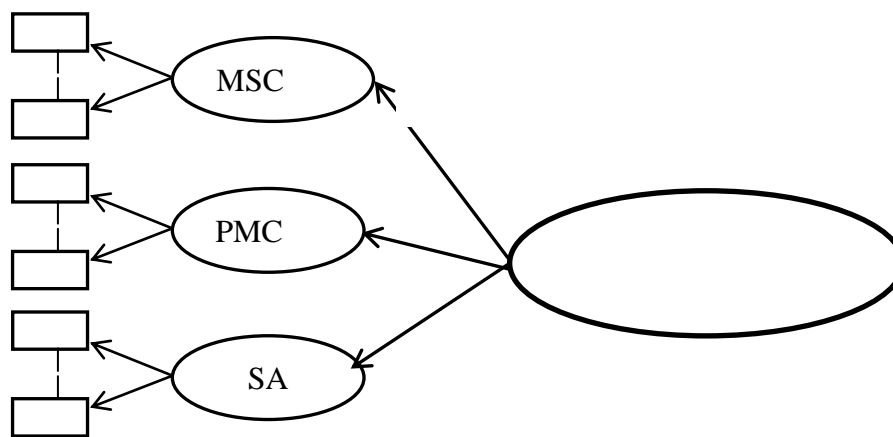
[†]No p-value means that the parameter has been fixed at 1

[°]Pearson correlation: 0.245**

5. Model testing: analysis of the structural model

Ambidextrous organization was conceptualized as a second order model made up of three dimensions. The structural model was used to determine whether a high-order factor model is appropriate; results are shown in Figure 2. All standardized path coefficients were statistically significant at p-value <0.001, ranging from 0.765 to 0.923, supporting H1. The target coefficient (T) index is employed to assess the fit of the second-order

factor model relative to the first-order factor model, as suggested by Marsh and Hocevar (1985). The target coefficient is the ratio of the chi-square value of the first-order model to that of the second-order factor model, with an upper limit of 1.0. A target coefficient value of 1.0 was obtained, which indicates that the second-order factor model could completely explain the relationships among the first-order factors (Marsh and Hocevar, 1985). Furthermore, the fit statistics for the second-order model were CMIN=28.250; CMIN/DF=1.177;CFI=.990; NFI=.985; RMSEA=.031, thus indicating an acceptable fit.



(all the error terms are not shown for the sake of brevity)

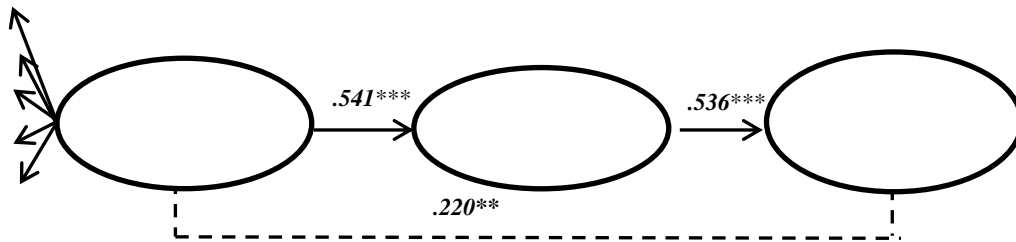
†No p-value means that the parameter has been fixed at 1

Figure 2: Second-order representation of ambidextrous organization (AO) (Hypothesis H1)

When we tested for mediation, the following conditions had to be satisfied: 1) the independent variable must influence the dependent variable; 2) the independent variable must influence the mediator; 3) the mediator must influence the dependent variable; 4) the effect of the independent variable on the dependent variable must decrease in the presence of the mediator. Full mediation is reached when all the previous conditions are met and the influence of the independent variable becomes not significant in the presence of the mediator. If all the conditions are satisfied, but the influence of the independent variable is still significant in the presence of the mediator, there is only partial mediation (Baron and Kenney, 1986).

In order to verify our hypotheses 2 and 3, we used the decomposition of effects results, in which the total effect of an independent variable on a dependent variable is disaggregated into its indirect and direct effects (Tabachnick and Fidell, 1996). Figure 3 encompasses both direct and indirect paths whose standardized parameter estimates are shown.

Overall the model has acceptable fit indexes: CMIN=84.581; DF=60; CMIN/DF=1.410; CFI=.967; TLI=.958; IFI=.968; NFI=.898; RMSEA=.047



* Significance at p<0.05 level
 ** Significance at p< 0.01 level
 *** Significance at p<0.001 level

When taking into consideration the indirect effects, a significant indirect effect indicates that a relevant quantity of the independent variable's total effect on the dependent variable happens via the hypothesized mediator. Consistent with hypotheses, internal networking partially mediates the relationship between ambidextrous organization and innovation ambidexterity.

Robustness check

When using structural equation modelling, authors often compare the proposed model to competing models to determine which model fits the data best. In our proposed model (Model 1), internal networking partially mediates the relationship between ambidextrous organization and innovation ambidexterity. A full mediation model (Model 3), where the direct path from AO to IA was cut, and the direct model (Model 2) were tested (see Table 4).

Table 4: Comparison of different models

	Model 1 (hypothesized model)	Model 2 (direct model)	Model 1 (full mediation)
AO to IA	1.168 **	1.391***	-

AO to INK	.515***	-	.555***
INK to IA	2.992***	3.146***	3.743***
CMIN/DF	1.410	2.047	1.496
CFI	.967	.915	.960
TLI	.958	.892	.949
IFI	.968	.917	.961
NFI	.898	.850	.890
RMSEA	.047	.075	.052

As Table 4 exhibits the hypothesized mediational model (Model 1) has smaller chi-squares and RMSEA, and better fit indexes when compared to the other models. Particularly, Models 2 and 3 fit the data worse than the mediation model, as suggested also by the RMSEA. Taken together, information provided by the comparison of the direct effects and mediation models shows that the partial mediation model (Model 1) fits the data best. So we can conclude that data support the mediation hypothesis.

Discussion and conclusion

The results show that all our three hypothesis were supported: the various fit indexes consistently indicate that our second-order theoretical model fits the data well and internal networking for knowledge exchange partially mediates the relationship between the ambidextrous organization and the innovation ambidexterity.

This study contributes to the debate on organizational ambidexterity in at least two important ways: first, it shows that both structural and contextual approaches can be taken together and modelled as a second-order construct, thus representing an integrated view of the ambidextrous organization. This study shows that the ambidextrous organization is not simply the result of either a structural solution or a contextual solution, but it is made up of different organizational antecedents of ambidexterity that might complement one another. Here, together with the formal organizational structure, the role played by managers is fundamental since they foster employees to reach their objectives, to be empowered and to be free to decide how to divide their time and resources; furthermore managers should devote considerable effort to developing subordinates and giving creative challenges to their people instead of narrowly defining task. In this perspective, the resolution of tensions requires organizations to be integrated around a context which

is shaped by top managers and tied up with an overarching structure where units, devoted to innovative exploration and exploitation activities, are separated.

Second, this empirical study is one of the firsts to investigate the role that the ambidextrous organization has in fostering internal networking which in turns affects innovation ambidexterity. As far as behavioural elements are concerned, managers are hence called to shape values and norms to create a supportive context that promotes the creation of an internal networking, which plays a significant role in achieving innovation ambidexterity. Providing employees with clear and assessed objectives as well as empowering them with broad and challenging tasks push organizational members to connect each other to exchange knowledge, therefore finding solutions easily; along this perspective, putting in place a supportive and performance management context fosters internal networking, favouring knowledge management processes and increasing innovative outcomes. At the same time, the presence of separate units devoted to exploration and exploitation activities intensifies the need of integration mechanisms to connect employees belonging to the two units in order to have some cross benefits from the knowledge developed in the two mentioned areas.

These results answer to some of the calls presented in the literature on the theme. In particular, our findings represent a step towards the integration of all the ambidexterity approaches, as recently some authors (O'Reilly and Tushman, 2008; Chang and Hughes, 2012) recommended. In fact, we have statistically shown that structural solution, performance management context and social support load together in a high-order construct, which is a representation of an ambidextrous organization; consequently, the ambidextrous organization seems the result of three underlying dimensions which deal with structure and context. Of course, our attempt to simultaneously considering all the approaches together is an initial step that has some limits. In fact, we focus only on the paradox between radical and incremental innovations, thus looking at the ambidextrous organization as a way to solve this specific tension; many other tensions are present inside an organization and call for being managed, using different ambidextrous approaches, which makes the complexity of the interactions between different organizational units increase. Taking this nested view of the ambidexterity requires a qualitative approach, which could shed more light on the synergies and chosen approaches.

Furthermore, our findings show that the ambidextrous organization positively impacts on the ambidexterity innovation, also through the creation of an internal networking that

pushes individual to exchange knowledge and ideas, increasing the potential to generate innovations. On this basis, firm's managers are called upon to solve the tension between radical and incremental innovation through both designing the organizational structure and creating the right context that push individuals to solve problems and to be accountable for their objectives.

All these organizational features contribute to the creation of ambidexterity, since they encourage organizational members to interact, which leads to exchanging knowledge and creating powerful new ideas.

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Appendix: explorative factor analysis

3	Item	MSS	PMC	SA	INK	EXP	EXT
CNTX_2	Managers in my organization devote considerable effort to developing subordinates	0.5692					
CNTX_3	Managers in my organization push decisions down to the lowest appropriate level	0.7270					
CNTX_4	Managers have access to the information they need to make good decisions	0.8394					
CNTX_5	Managers in my organization issue creative challenges to their people instead of narrowly defining tasks	0.8064					
CNTX_6	Managers in my organization use business goals and performance measures to run their business		0.5276				

CNTX_7	Managers in my organization hold people accountable for their performances	0.9623
CNTX_8	Managers in my organization encourage and reward hard work through incentive compensation	0.5652
CNTX_9	Our organization has separate units to enhance innovation and flexibility	0.4129
CNTX_11	We have units that are either focused on the short term or the long term	0.9709
NET_2	Our organisation has organizational practices that allow the bringing together of people for different knowledge sets, backgrounds or functions	-0.8019
NET_3	In our organization, innovation teams are encouraged to expand their resource network by tapping into the knowledge of any employee in our firm	-0.8032
NET_4	In our organization, we have "network ambassadors" who can help innovation teams connect with other people company-wide when knowledge or insight is needed	-0.8564
KW_EXR_1	Over the last three years, to what extent has your firm acquired manufacturing technologies and skills entirely new to the firm?	0.8320
KW_EXR_2	Over the last three years, to what extent has your firm learn product development and processes skills entirely new for the industry?	0.7279
KW_EXR_3	Over the last three years, to what extent has your firm acquired entirely new managerial and organizational skills that are important for innovation?	0.4222

KW_EXR _4	Over the last three years, to what extent has your firm strengthened innovation skills in area where it had no prior experience?	0.674
KW_EXT _2	Over the last three years, to what extent has your firm invested in enhancing skills in exploiting mature technologies that improve productivity of current innovation operations?	- 0.6378
KW_EXT _3	Over the last three years, to what extent has your firm enhanced competencies in searching for solutions to customer problems that are near to existing solutions rather than completely new solutions?	- 0.7927
KW_EXT _4	Over the last three years, to what extent has your firm upgraded skills in product/service development processes in which the firm already possesses significant experience?	- 0.8635
KW_EXT _5	Over the last three years, to what extent has your firm strengthened your knowledge and skills for projects that improve efficiency of existing innovation activities?	- 0.6829
Cumulative % of variance		62,5%

Exploration vs. Exploitation Strategies for Local Development: An Empirical Study in Italy

Nunzia Carbonara *

Department of Mechanic, Mathematic and Management
Polytechnic of Bari
Viale Japigia, 182 – 70126 Bari

Antonio Messeni Petruzzelli

Department of Mechanic, Mathematic and Management
Polytechnic of Bari
Viale Japigia, 182 – 70126 Bari

** Corresponding author*

Structured Abstract

Purpose – This paper aims at evaluating the effects of the exploitation and exploration strategies on the economic and innovative performance of a local system of firms. Accordingly, this study embraces the exploration-exploitation dilemma (e.g., March, 1991; Benner and Tushman, 2003; Burgelman, 2002; Holmqvist, 2004; Katila and Ahuja, 2002) and differently from the extant literature we investigate the two above mentioned innovation strategies at the level of a system of firms rather than at a single organization's one. Specifically, we aim at empirically analyzing which strategy is more beneficial for those systems of organizations? Can systems benefit more by the introduction of new technology into existing products and processes or they can take more advantage by the continuous improvement of their technological knowledge base?

Design/methodology/approach – To reach our aim, an empirical research has been conducted on the 103 Italian Provinces, by measuring for each province both economic and innovative performance and indexes that capture the exploitation and exploration strategies. Specifically, focusing on the manufacturing sector, we use two different indexes, as: the inverse Gini coefficient of the distribution of firms by sector (two-digit level) in each province, which measures the heterogeneity across unrelated manufacturing sectors, and the inverse Gini coefficient of the distribution of firms within each two-digit sector in each province, which measures the heterogeneity across related manufacturing sectors. Furthermore, a set of control variables is included to account for other potential effects on provinces' performance.

Originality/value – Our results reveal that exploration strategies, as reflected by the agglomeration of industrially different organizations, have positive effects on the economic and innovative performance in a territory, as well as that this effect results greater when the exploration regards more similar industrial sectors. Our interest on the effects of the two strategies on a system of firms rather than on a single organization

significantly offers contributions both to the literature related to innovation strategies and to the studies on local economic growth. Specifically, while most of previous studies on innovation strategies adopt as level of investigation the single organization or dyadic collaborations, we focus on the exploitation-exploration balancing at the level of firms' geographical systems. Furthermore, analyzing which of the two strategies is more conducive for the territorial development and growth, allows us to give a contribution in the field of economic growth and regional development, answering the question on the relevance of heterogeneity in firms' competencies and capabilities for the competitive advantage of the local systems of firms (Boschma, 2005; Schamp et al., 2004).

Practical implications – Of course this study presents a number of practical implications, especially referring to the definition of innovation strategies and policies aimed at sustaining the economic and innovative outcomes of given territories. In particular, our findings suggest the importance of enhancing local development by favouring the establishment of organizations operating in different by complementary industrial sectors.

Keywords – Exploration, Exploitation, Local Development, Econometric analysis.

Paper type – Academic Research Paper

1 Introduction

Since the publication of March's (1991) pioneering article, the terms "exploration" and "exploitation" have increasingly come to dominate studies in the fields of innovation strategy, technology management, and economic growth (e.g., Aghion and Howitt, 1992; Allen and McGlade, 1986; Benner and Tushman, 2003; Burgelman, 2002; Holmqvist, 2004; Katila and Ahuja, 2002; McGrath, 2001).

According to He and Wong (2004) exploitation strategies trigger learning processes aimed at improving the product-market domains. Therefore, exploitation refers to learning gained via local search, experiential refinement, and selection and reuse of existing routines domains (Baum et al., 2000). As a result, exploitative innovations involve improvements in existing components and build on the existing technological trajectory (Benner and Tushman, 2002).

Differently, exploration refers to learning gained through processes of concerted variation and planned experimentation (Baum et al., 2000). According to Benner and Tushman (2002) exploratory innovation involves a shift to a different technological trajectory. Along the same lines, He and Wong (2004) defined exploratory innovation as technological innovation aimed at entering new product-market domains.

Following March (1991), exploitation and exploration strategies are strongly complementary and both essential for successful organizational adaptation, technological innovation, organizational learning, and even organizational survival. However, although both exploration and exploitation are essential for assuring organizations' competitive advantages in the short and long-term, the simultaneous pursuit of both appears very difficult. First, they compete for scarce organizational resources, since more resources devoted to exploitation imply fewer resources left over for exploration, and vice versa. Second, both types of actions are iteratively self-reinforcing, as exploration often leads to more exploration, and exploitation to more exploitation. Finally, the mindsets and organizational routines needed for exploration are radically different from those needed for exploitation, making them fundamentally incompatible (Gupta et al., 2006).

Recognizing the incompatibility of the two strategies, several authors stressed the need for a balance between exploitation and exploration strategies, leaving however an open question: which strategy is more beneficial for organizations? Can firms benefit more by the introduction of new technology into existing products and processes or they can take more advantage by the continuous improvement of their technological knowledge base? Furthermore, these dilemmas have been generally analyzed at the level of single organization (e.g., Benner and Tushman, 2002) or dyadic collaborations (e.g., Lavie and Rosenkopf, 2006), devoting few attention to the exploitation-exploration balancing at the level of firms' geographical systems. Thereby, this paper tries to cover this gap, by evaluating the effects of the exploitation and exploration strategies on the economic and innovative performance of a local system of firms.

We believe our interest on the effects of the two strategies on a system of firms rather than on a single organization significantly contribute to the existing literature. In fact, analyzing which of the two strategies is more conducive for the territorial development and growth, allows us to answer to another open question characterizing the studies in the field of economic growth and regional development, namely the relevance of heterogeneity in firms' competencies and capabilities for the competitive advantage of the local systems of firms (Boschma, 2005; Schamp et al., 2004). Exploration strategies have been found to have a higher effect on the level of knowledge heterogeneity, because those strategies span on a wider range of technological knowledge. On the contrary, exploitation strategies involve an intensive search along an existing knowledge dimension, producing a lower diversity in the knowledge system (Quintana-Garcia and Benavides-

Velasco, 2008). A fully understanding of the benefits and costs going along with the adoption of these distinct strategies at a territorial level still lacks, hence calling for further investigations.

To reach our aim, an empirical research has been conducted on the 103 Italian Provinces, by measuring for each Province both economic and innovative performance and indexes that capture the exploitation and exploration strategies. An econometric analysis on the 103 Italian Provinces over the period 1999-2010, controlling for an extensive set of control variables, is applied. Results reveal that exploration strategies positively influence the economic and innovative performance of a firms' geographical system, although this effect seems to be strengthened when firms share common technological expertise.

In the following session we present the research methodology, describing data, variables, and estimation method. Section 3 reports the empirical results, while Section 4 finally concludes.

2 Research Methodology

2.1 Data Sample

The data set is represented by the 103 Italian Provinces. To build our dataset we used different statistical sources: the Italian Office of National Statistics (ISTAT) databases; the European Patent Office (EPO) database; the Ministry of University and Research (MIUR) database, and the UNIONCAMERE database. Data on GDP, employment, population, and R&D investment come from ISTAT databases, data on university are extracted by the MIUR database, data on firms in two-digit and three-digit NACE codes come from the UNIONCAMERE database, and finally data on patents are provided by the EPO database. Data have been collected for each Province and refer to the period 1999-2010.

2.2 Variables

2.2.1 Dependent variables

As the phenomenon under investigation is the development and growth of local areas, we used as dependent variable the number of patents developed in each province, as an indicator of the innovative performance (see Jaffe and Trajtenberg (2005) and Acs et al.

(2002)); and the GDP, employment rate (Employment-to-population ratio) and unemployment rate as indicators of the economic performance.

They have been measured by:

Patent_p = Number of patent registered in province

$$GDP_p = \left(\frac{GDP_{region}}{N..employees_{region}} \right) \times N.employees_{province}$$

$$Employment_rate = \frac{Employees}{population} \times 100$$

$$Unemployment_rate = \frac{Unemployed_workers}{total_labour_force} \times 100$$

These variables have been measured in a time period of seven years and in particular for the years 2004, 2007 and 2010. Finally, in order to exclude endogeneity problems, the dependent variables are lagged of five years respect to the independent variable.

2.2.2 Independent variables

To capture the characteristics of the strategies carried out within the provinces, in terms of exploitation and exploration, the degree of a province's industrial heterogeneity has been measured by using the inverse Gini coefficient (Greunz, 2004; Paci and Usai, 1999; van der Panne and van Beers, 2006). The index aims at capturing the level of concentration of firms in a specific industrial sector and it has been measured over a period of seven years and in particular in the 1999, 2002 and 2005.

Specifically, focusing on the manufacturing sector, we use two different measures: 1) the inverse Gini coefficient of the distribution of firms by sector (two-digit level) in each province (invGini_{unrelated-sector}); 2) the inverse Gini coefficient of the distribution of firms within each two-digit sector in each province (invGini_{related-sector}). The invGini_{unrelated-sector} measures the heterogeneity across unrelated manufacturing sectors, as those characterized by a greater technological diversity. Instead, invGini_{related-sector} measures the heterogeneity across related manufacturing sectors, namely those characterized by a greater

technological similarity. Following Frenken et al. (2007), we assume that the related manufacturing sectors are those that share the same 2-digit NACE code.

The Gini index is defined as follows:

$$\text{invGini} = 1 - \left(\frac{\sum_{i=1}^{n-1} (Q_i - P_i)}{\sum_{i=1}^{n-1} P_i} \right)$$

Where:

- i indexes the manufacturing sector ($i = 1 \dots n-1$), classified into the two-digit NACE code for the $\text{invGini}_{\text{unrelated-sector}}$ and into the three-digit codes that share the same 2-digit class for the $\text{invGini}_{\text{related-sector}}$;

- $Q_i = \frac{\sum_{j=1}^i F_j}{CF}$

- $\sum_{j=1}^i F_j$ is the cumulative sum of firms in each manufacturing sector, classified into 2-digit NACE code/ 3-digit code, when the sector is ordered in increasing order;

- CF is the total number of firms.

- $P_i = \frac{i}{n}$

The inverse Gini coefficient ranges from a minimum value of zero to a maximum of one. Values of the index close to zero indicate that the industrial system in the province is specialized into a very few sectors, while values of the inverse Gini coefficient close to one indicate that the province industry specialization is spread across the different manufacturing sectors. Therefore, we assume that values of $\text{invGini}_{\text{unrelated-sector}}$ close to one reflect exploration strategies towards industries that are characterized by a greater technological diversity, while values of $\text{invGini}_{\text{related-sector}}$ close to one reveal exploration strategies towards industries technologically related. Values of the inverse Gini coefficient close to zero indicate exploitation strategies within the province.

2.2.3 Control variables

The analysis includes several control variables. First, in order to take into account the general economic conditions of the provinces, we use a dummy for provinces localized in the Northern Italy, generally considered as a more advanced and developed area (Mariotti et al., 2008). Three other controls have been included that may affect the province innovative performance. Specifically, the first variable refers to the presence of universities within the province area, which are considered as sources of new knowledge (Benneworth and Hospers, 2007; Cooke and Piccaluga, 2004). The second variable measures the R&D expenditure in the area. The index is defined as follows:

$$R \& D_p = \left(\frac{R \& D_r}{F_r} \right) \times F_p$$

Where:

- . $R \& D_p$ is the amount of R&D investments in region p where the province p is located.
- . F_r is the total number of firms in region r .
- . F_p is the total number of firms in province p .

R&D expenditure has been frequently used as a proxy for the local capability to generate new knowledge and innovation (Cohen and Klepper, 1991; 1992; Frenken, 2007). We control also for sectors, by introducing a dummy variable for high-tech sector (Head et al., 1995).

Finally, we control for the scale of local economic activity, measured by the total number of firms located in the province, that is a determinant of some type of cross-fertilization and economic advantages, usually called urbanization economies (Henderson, 2003).

2.3 Model and measurements

In order to estimate the relationship between the economic and innovative performance and exploitation and exploration strategies carried out within the province, proxied by the variables presented in Section 2.2, we apply a non-linear estimator, i.e.

negative binomial. The reason for choosing such estimator is because of the special feature of our dependent variables.

The descriptive statistics together with correlation matrix are shown in Table 1 and Table 2, respectively.

Table 1. Descriptive statistics.

Variables	Mean	St.Dev.	Min	Max	Obs
Patent	37.41	75.89	0	714.78	309
GDP _p	14476.34	18373.92	1582.03	133629	309
Empl_rate	58.22	9.28	36.86	72.36	309
Unempl_rate	7.62	4.39	1.86	21.61	309
invG _{unrelated-sector}	0.45	0.06	0.16	0.61	309
invG _{related-sector}	0.35	0.05	0.15	0.46	309
R&D _p	135.04	217.77	3.12	1788.14	309
N _{university}	0.85	1.76	0	15	309
N _{firms}	48041.47	45138.59	7479	338010	309

Table 2. Correlation matrix.

Variables	Patent	GDP _p	Empl_rate	Unempl_rate	invG _{unrelated-sector}	invG _{related-sector}	R&D _p	N _{university}	N _{firms}	North	Central	South	H_tech	M_tech	L_tech
Patent	1														
GDP _p	0.7555	1													
Empl_rate	0.3310	0.1649	1												
Unempl_rate	-0.3005	-0.1180	-0.9045	1											
invG _{unrelated-sector}	0.2499	0.3127	0.1255	-0.1637	1										
invG _{related-sector}	0.4285	0.4297	0.2565	-0.2897	0.8450	1									
R&D _p	0.6654	0.9507	0.1749	-0.1252	0.2557	0.3557	1								
N _{university}	0.4257	0.8206	0.0354	-0.0041	0.2605	0.2940	0.8118	1							
N _{firms}	0.7243	0.9311	0.0182	0.0164	0.3244	0.4283	0.8393	0.7114	1						
North	0.3498	0.1577	0.6982	-0.6383	0.1424	0.2398	0.1417	-0.0813	0.0731	1					
Central	-0.0836	0.0274	0.1777	-0.1688	0.0227	0.0510	0.1064	0.1519	-0.0478	-0.4546	1				
South	-0.2941	-0.1876	-0.8781	0.8081	-0.1677	-0.2932	-0.2377	-0.0436	-0.0358	-0.6585	-0.3710	1			
H_tech	-0.0357	-0.0445	0.0833	-0.1009	-0.1252	-0.1377	-0.0503	-0.0482	-0.0710	0.1102	-0.0501	-0.0726	1		
M_tech	0.3832	0.2119	0.4645	-0.4263	0.2414	0.4095	0.2209	-0.0214	0.1541	0.5335	-0.0582	-0.5070	-0.0685	1	
L_tech	-0.3729	-0.2011	-0.4783	0.4441	-0.2136	-0.3778	-0.2088	0.0313	-0.1382	-0.5524	0.0682	0.5183	-0.1400	-0.9782	1

3 Empirical Results

The results of negative binomial estimation of effects of exploitation/exploration strategies on the economic and innovative performance for Italian provinces over the period 1999-2010 are reported in the Table 3 and Table 4. In particular, Table 3 reports the effects of the exploration strategies across industries that are characterized by a greater technological diversity on the economic and innovative performance of the Italian provinces. Table 4 reports the effects of the exploration strategies across industries technologically related on the economic and innovative performance of the Italian provinces. Results show a positive a significant relation between the strategies of

exploration and two of the local performance indicators: the GDP that is a measure of the local economic performance, and the patent application, that is a measure of the innovativeness of the province.

Table 3. Negative binomial estimation of the effect of exploration strategies across technologically unrelated industries on the economic and innovative performance (1999-2010).

	Patent	P> z	GDP _p	P> z	Empl_rate	P> z	Unempl_rate	P> z
invG _{unrelated-sector}	1.828915 (.8828808)	0.038	.5940278 (.3682679)	0.097	-.1141013 (.1469545)	0.437	-.4849046 (.4451763)	0.276
R&D _p	-2.65e-09 (5.88e-10)	0.000	-4.55e-10 (2.23e-10)	0.041	-1.31e-10 (8.77e-11)	0.135	5.50e-10 (2.42e-10)	0.023
N _{firms}	.0000243 (2.44e-06)	0.000	.0000168 (9.29e-07)	0.000	9.60e-08 (3.39e-07)	0.777	3.45e-07 (8.88e-07)	0.698
N _{university}	.1101777 (.0493161)	0.025	-.0006739 (.0201746)	0.973	.014434 (.0079612)	0.070	-.0515069 (.0232693)	0.027
Central	-.6646297 (.1366196)	0.000	-.083949 (.0527804)	0.112	-.070632 (.0208808)	0.001	.3402452 (.0706866)	0.000
South	-2.047982 (.1411257)	0.000	-.4268026 (.0531106)	0.000	-.3442234 (.022152)	0.000	1.073546 (.0672972)	0.000
M _{tech}	.9191724 (.4803183)	0.056	.2388702 (.1910832)	0.211	.005481 (.0735845)	0.941	.3438435 (.3312133)	0.299
L _{tech}	.5661076 (.4798646)	0.238	.1463752 (.1903738)	0.442	.0051691 (.0733688)	0.944	.3305159 (.3310775)	0.318

Results show a positive and significant relation between the exploration strategies across technologically related industries and three of the local performance indicators: GDP and the unemployment rate, which are measures of the local economic performance; and patent application.

An interesting result is that the correlation coefficients assume greater values in the second model than in the first model. Therefore, we can conclude that exploration strategies have more positive effects on the economic and innovative performance in a territory when the exploration regards more similar technological sectors.

Table 4. Negative binomial estimation of the effect of exploration strategies across technologically related industries on the economic and innovative performance (1999-2010).

	Patent	P> z	GDP _p	P> z	Empl_rate	P> z	Unempl_rate	P> z
invG _{related-sector}	5.158667 (1.137204)	0.000	1.552514 (.4744778)	0.001	-.040838 (.1943315)	0.834	-1.334403 (.5807184)	0.022
R&D _p	-2.45e-09 (5.72e-10)	0.000	-3.89e-10 (2.21e-10)	0.078	-1.22e-10 (8.80e-11)	0.166	4.80e-10 (2.44e-10)	0.049

$N_{university}$.0000224 (2.41e-06)	0.000	.0000162 (9.36e-07)	0.000	5.81e-08 (3.49e-07)	0.868	8.75e-07 (9.23e-07)	0.343
N_{firms}	.0991855 (.0480231)	0.039	-.0027386 (.0198906)	0.890	0.135759 (.0079264)	0.087	-.0478095 (.0232411)	0.040
Central	-.662919 (.1349083)	0.000	-.0851706 (.0522465)	0.103	-.0703395 (.0208804)	0.001	.3449685 (.0708258)	0.000
South	-2.0109 (.1388131)	0.000	-.4070007 (.0528636)	0.000	-.3429069 (.022328)	0.000	1.057372 (.0677893)	0.000
M_{tech}	.6400563 (.4747348)	0.178	.1591465 (.1904885)	0.403	-.0002445 (.0742952)	0.997	.4114412 (.3325167)	0.216
L_{tech}	.4141259 (.4709553)	0.379	.1039127 (.1883564)	0.581	.0006611 (.0734919)	0.993	.364672 (.3312523)	0.271

4 Conclusions

This paper has contributed to the debate on effects of the exploitation and exploration strategies on the economic and innovative performance of a local system of firms.

Our study on the effects of the two strategies on a system of firms rather than on a single organization significantly offers contributions both to the literature related to innovation strategies and to the studies on local economic growth. Specifically, while most of previous studies on innovation strategies adopt as level of investigation the single organization or dyadic collaborations, we focus on the exploitation-exploration balancing at the level of firms' geographical systems. Furthermore, analyzing which of the two strategies is more conducive for the territorial development and growth, allows us to give a contribution in the field of economic growth and regional development, answering the the question on the relevance of heterogeneity in firms' competencies and capabilities for the competitive advantage of the local systems of firms.

Our results prove that exploration strategies have positive effects on the economic and innovative performance in a territory and such effect is greater when the exploration regards more similar technological sectors.

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Sustaining Growth in the 21st century: Knowledge Sharing & Opportunism in Joint New Product Development

Richard CM Yam

Department of Systems Engineering & Engineering Management
City University of Hong Kong, Hong Kong
Tat Chee Avenue, Kowloon Tong, Hong Kong

Structured Abstract

Purpose - Knowledge sharing in joint new product development (NPD) with business partners has been recognized by researchers on its crucial role for sustaining organizational growth in the 21st century. In joint NPD, huge amount of information and knowledge are being interchanged among firms. Organizations worry that knowledge sharing (KS) would invite opportunism; i.e. knowledge being copied, stolen or leaked to outsiders or even competitors. This empirical survey study investigates the relationship of contract, commitment and opportunism during knowledge sharing among business partners in NPD.

Design/methodology/approach – 312 valid responses were collected and data was analysed by using structural equation modelling. Our findings indicate that commitment among contractual business partners provide strong support to enhance knowledge sharing in NPD. Knowledge sharing itself will not directly affect product performance. But the enhanced knowledge sharing process among the committed contractual business partners facilitate the NPD team. The extensive sharing of innovative knowledge could help the committed NPD teams with contractual binding to achieve consensus and cohesive understanding of knowledge quickly. This would help the NPD teams to respond quickly to the rapidly changing market with better product performance.

Originality/value – Researchers have recognised the importance of corporate collaboration in NPD to sustain growth for firms in today's highly competitive global markets. However, the worry of opportunism for knowledge sharing with business partners in NPD has threatened many business collaborations. This study has shown that knowledge sharing among the committed contractual business partners will suppress rather than increase the chance for opportunism in NPD.

Practical implications – Managers engaged in joint NPD activities should commit seriously with their contractual business partners by sharing more innovative knowledge. This would reduce rather than increase the chance for opportunism and lead to better product performance. This finding is important for firms to work collaboratively in NPD for sustaining growth in the 21st century.

Keywords: contract, commitment, knowledge sharing, opportunism, sustainable growth

Paper type – Academic Research Paper

1. Introduction

In the 21st century, firms need to strive in developing new products for growth. Successful firms can seize new market opportunities by working collaboratively with their business partners to continually introduce new products. In addition, sharing updated knowledge with their business partners and adopting outsourcing strategies allow them to sustain competitiveness. A wide variety of knowledge are generated, disseminated and exchanged among firms during the new product development (NPD) process. However, industrial experience and research findings indicated that opportunism often exists in NPD. Firms worry that knowledge sharing in NPD invites opportunism. Many of them look for protection by building up complex contracts and good collaboration. They hope that this can help to improve knowledge management and product performance. Scholars acknowledged that transactional mechanism, e.g. contract, can suppress opportunism between business partners through legal actions (Liu et al., 2008; Luo et al., 2009) and relational mechanism, e.g. commitment, can nourish cooperation among business partners.

2. Literature review and Research Model Development

2.1 Contract and commitment

When a contract is signed by two or more firms and put into execution, it brings in sense of commitment between the signed business parties (Holm et al., 1999). A close and valuable business relationship can be gradually developed. When a signed contract is implemented, it is just one in a series of events that gradually committed the firms to a valuable and close business partnership. A signed contract can give power and obligation to firms for committing to other parties. This can help to achieve certain goals that are beneficial to the development.

Hypothesis 1 (H1) is proposed as: Contract is positively associated with commitment.

2.2 Contract suppresses opportunism

Contracts propose special behaviour patterns and specify duties of both parties, along with penalties for agreement violation. The explicit statements and binding conditions can help to curb opportunism (Poppo & Zenger, 2002). Through legal forces, contract can prevent opportunistic behaviors. Contracts can extend the context to control and monitor the collaboration. This can help to minimize opportunism.

Hypothesis 2 (H2) is proposed as: Contract is negatively associated with opportunism in NPD

2.3 Commitment reduces opportunism

By having commitment within the relationship, firms may be able to reduce the risk in knowledge sharing during NPD. Commitment could lead to the development of mutual interests and trust that the partners would treasure in their relationship. This can help to mitigate opportunism and nourish cooperation (Kim, 2000). Commitment is a necessary basic ingredient for long-term relationship between business partners. Firms are willing to make short-term sacrifices to get long-term benefit. Having a good commitment can reduce opportunism as parties would not expose to get a short term benefit only.

Hypothesis 3 (H3) is proposed as: Commitment is negatively associated with opportunism.

2.4 Commitment enhances knowledge sharing

A high level of commitment builds trust among business parties (Wuyts & Geyskens, 2005). In return, commitment would encourage knowledge generation and dissemination. It provides strong signals of willingness to communicate, share and exchange critical information and knowledge for supporting business growth to business partners. Improving the level of commitment in a relationship can encourage partners to share knowledge and information. Firms in highly trust relationship would not afraid to share knowledge and believe in the knowledge that they have received.

Hypothesis 4 (H4) is proposed as: Commitment is positively associated with knowledge sharing.

2.5 Opportunism inhibits knowledge sharing

Lee and Whang (2000) voiced out that firms concern about the confidentiality of their shared information being leaked to competitors. Researchers have pointed out that information or knowledge in the form of procedures, work practices, training and design are critical sources of opportunism. As the amount of disadvantages can be estimated, firms would prefer to keep the knowledge to their own.

Hypothesis 5 (H5) is proposed as: Opportunism is negatively associated with knowledge sharing.

2.6 Knowledge sharing improves knowledge interpretation and responsiveness

Critical information and knowledge tend to be exchanged earlier in the design and production phases to enhance efficiency and allow more innovations to be incorporated into product design and production processes (Baiman & Rajan, 2002). Involved individuals and teams must communicate among each other with an open dialogue about the knowledge required for all parties to reach a common understanding as the foundation for integrated. The integration of knowledge is critical to planning and implementing an interpretation and a collective response.

Hypothesis 6 (H6) is proposed as: Knowledge sharing is positively associated with knowledge interpretation and responsiveness.

2.7 Opportunism suppresses knowledge interpretation & responsiveness

Opportunism would cause business partners to have hesitation to trust the knowledge and information that they have received. For interpretation, they need time for filtering the knowledge that they receive and choosing the appropriate knowledge to compromise. This would lead to a slow responsive time. The hesitation and verification would delay the knowledge interpretation and responsiveness.

Hypothesis 7 (H7) is proposed as: Opportunism is negatively associated with knowledge interpretation & responsiveness.

2.8 Knowledge interpretation and responsiveness improves product performance

Firms with ability to interpret the related specialized knowledge of their employees know it is crucial to implement a collective response (Sutcliffe & McNamara, 2001). Achieving a common interpretation can help to get a faster response. The product performance would be better as it can fit the market needs. Achieving a cohesive understanding of knowledge within a short period of time is important. If the involved parties spent too much time to interpret knowledge, they may miss the opportune moment.

Hypothesis 8 (H8) is proposed as: Knowledge interpretation and responsiveness is positively associated with product performance.

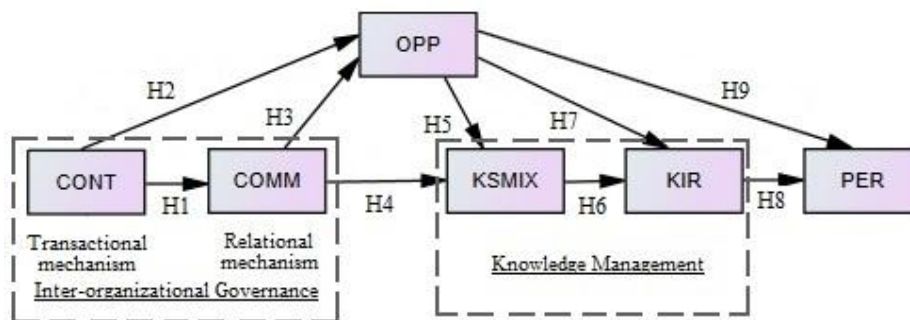
2.9 Opportunism suppresses product performance

Opportunistic problems cause skeptical behavior among NPD personnel to share more information and knowledge with others (Lee and Whang, 2000). The spiral effect would slow down the level of knowledge sharing among different parties. Firm's mind and thought would be limited. The end result may affect the creation of new products and product quality.

Hypothesis 9 (H9) is proposed as: Opportunism is negatively associated with product performance.

3. Research Model

By consolidating the above literature and discussions, the research model is proposed in Figure 1:



CONT: Contract

COMM: Commitment

OPP: Opportunism

KSMIX: Knowledge sharing (knowledge generation and knowledge dissemination)

KIR: Knowledge interpretation and responsiveness

PER: Product performance

Figure 1 : The Research Model

4 Research Method

An on-line survey was conducted to test the research hypotheses. Invitation e-mails were sent to target respondents with a hyper-link to the survey questions. This on-line survey reduces time and manual tasks for respondents in completing and returning the questionnaire. Invitations were sent out to 1350 samples. After a four-month survey period and data scrutiny, 312 completed and valid responses were collected, representing

a 23.1% response rate. Follow-up interviews were conducted to verify the survey findings.

5 Findings and discussion

Figure 2 shows the model with data testing result. Regression weights and significance between constructs are shown in Table 1. Model Fit Summary is shown in Table 2. The fit indices suggest that the data fit the model quite well. The result of our hypotheses testing is shown in Table 3.

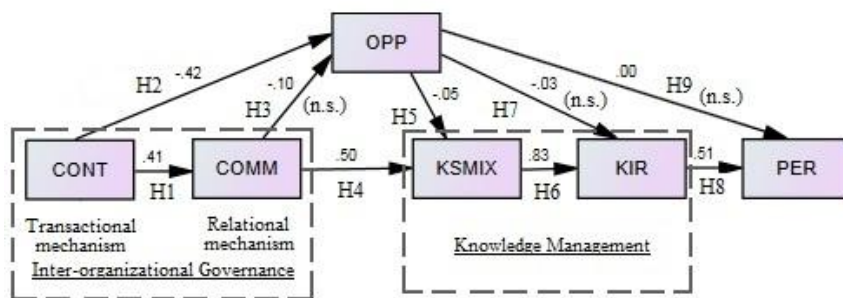


Figure 2: Model with testing result

Table 1: Regression Weights

		Estimate	S.E.	P
Commitment	<--- Contract	.412	.052	***
Opportunism	<--- Contract	-.417	.104	***
Opportunism	<--- Commitment	-.098	.103	.345
Knowledge sharing	<--- Commitment	.498	.040	***
Knowledge sharing	<--- Opportunism	-.055	.023	.019
Knowledge interpretation and responsiveness	<--- Knowledge sharing	.835	.048	***
Knowledge interpretation and responsiveness	<--- Opportunism	-.031	.024	.197
Performance	<--- Knowledge interpretation and responsiveness	.513	.053	***
Performance	<--- Opportunism	-.004	.032	.894

Table 2: Model fit summary

Fit Index	Model	Fit Guideline
RMR	0.057 ✓	≤ 0.08
GFI	0.957 ✓	≥ 0.90
AGFI	0.850 ✓	≥ 0.80
NFI	0.923 ✓	≥ 0.90
CFI	0.932 ✓	≥ 0.90
RMSEA	0.142 X	< 0.07

[Note: at least 4 out of 6 fit index fit, the data can be concluded they are ‘fit’ for the model]

Table 3: Summary of hypotheses tests

Hypotheses		Results
H1	Contract is positively associated with commitment in NPD	Supported
H2	Contract is negatively associated with opportunism	Supported
H3	Commitment is negatively associated with opportunism	Not Supported (ns)
H4	Commitment is positively associated with knowledge sharing	Supported
H5	Opportunism is negatively associated with knowledge sharing	Supported
H6	Knowledge sharing is positively associated with knowledge interpretation and responsiveness	Supported
H7	Opportunism is negatively associated with knowledge interpretation & responsiveness	Not Supported (ns)
H8	Knowledge interpretation and responsiveness is positively associated with product performance	Supported
H9	Opportunism is negatively associated with product performance	Not Supported (ns)

Briefly speaking, the effect of opportunism within inter-organizational governance and knowledge management is less than the prediction. This reflects that the weight of opportunism within the relationship is less. So firms are encouraged sharing knowledge as benefits are far more than risks.

However, opportunism is always exist and unavoidable. Therefore, it is important for firms to learn how to minimize opportunism. Interviews with specialists in the field were conducted for discussing the test results. Respondents pointed out that the role of inter-organizational governance is very important in NPD. Governance mechanisms can control and align incentives. Inter-organizational governance includes “Transactional Mechanism”, e.g. contract, which generally provides a formal legal and institution framework and “Relational Mechanism”, e.g. commitment, which focuses on the role of the informal social interaction and socially embedded relationships. Formal and informal mechanisms are effective in governing the partnership complementarily. Contract actually

is a protection for the involved parties for their intellectual property and confidential knowledge. Gradually, commitment and trust can be built among business partners. Apple Inc. is an apparent example for demonstrating the importance of collaboration and knowledge sharing among business partners. The Apple's collaborating success has significant impact to the market and change people's way of living. The commitment allows extensive knowledge sharing among partners which enhance more NPD with no worry of opportunism. In the past, Apple Inc. is a technology company which focus on computer only. Programming and hardware were the main themes that they put a lot of effort to develop. In order to meet customers' needs; Apple Inc. makes the mobile phone and computer into one device through business collaboration in NPD.

6 Conclusion

The research results indicate that the existence of inter-firm governance measures is important to regulate collaborative business activities. Once firms have signed up a clear contract, they would commit to their business partners to jointly develop new products through knowledge sharing, interpretation and use of knowledge. Sometimes, business environment has become too complicated for inter-firm collaboration to be governed by transactional mechanism solely. Relational mechanism is therefore crucial to supplement transactional mechanism for supporting inter-firms activities. The complementary effects of contract and commitment are important to build up trust among business partners to avoid opportunism in NPD.

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Monitoring and analyzing the mutual relationship between KC pillars and the domains of quality of life in European cities

Ayman Mohammed Mostafa*, Khaled Youssef
Mohamed

Department of Architecture
Faculty of Fine Arts, El-Menia University,
University Address: El-Menia, Egypt

**Corresponding author*

Structured Abstract

Purpose- By studying and analyzing mutual relationship between two main topics – Knowledge Cities and the quality of life- this paper aims at determining the relationship between Knowledge Based Urban Development (KBUD) pillars, leading to successful emergence of KCs (economic, Socio-cultural, Enviro-urban, and institutional development), and the domains of quality of life; economic, social, urban, and environmental. It also aims at setting a scale for observing and analyzing the mutual relationship to facilitate reading, finding, and analyzing the gap between citizens' satisfaction with the quality of life and the results achieved in terms of the KBUD pillars. This helps decision makers to orient decisions in the right directions, achieving balance between both, and – thus- positively reflecting on cities sustainability.

Design/methodology/approach- To achieve the aim, the research adopts the following:

- Determining the different concepts and pillars of KBUD, and their assessment models.
- Determining quality of life factors, indices, and measurement model according to EU report (Quality of life in cities).
- Selection criteria for cities investigated.
- Determining an approach for analyzing and connecting quantitative results (method of KCs assessment) and the qualitative ones (method of assessing quality of life in European cities).
- Proposing a tool for the observation and analysis of mutual relationship between KBUD pillars and the quality of life potentials.
- Formulating the previous conclusion in a diagram/compass to facilitate extracting the mutual relationship.

Originality/value- The challenge before social development lies in the interaction of different development parameters for the purpose of making a society characterized by quality of life; the ultimate development goal. If such premises do not achieve quality of life results, then they are unable to achieve their goals. KBUD is a global fact proven by the end of the last century. Thus, knowledge-related value is the driving power of civilization.

So, the value of this research is attributed to the scarcity of studies related to the mutual relationship between the quality of life and Knowledge economy-based cities.

Practical implications- Reaching an approach for monitoring and analyzing the mutual relationship between the potentials and pillars of KCs and the different aspects of the quality of life supporting the theoretical and practical aspects as follows:

In theory: deducing the mutual relationship between the quality of life and KCs. The authors think that the quality of life is a concept that has analytical efficiency and capacity for handling problems and aids in setting an integrated approach for achieving knowledge-based developmental aims.

In practice: Proposing an observation tool for clarifying the mutual relationship between the quality of life and KCs to decision makers to help them boost the efficiency of decision making for achieving the quality of life to city residents; thus positively reflecting on the sustainability of cities.

Keyword- Knowledge Cities, quality of life, Knowledge Based Urban Development, pillars

Paper type- Academic Research paper

1. Introduction

Knowledge cities are important as 50% of the world's population now live in cities. After WWII, more than 50% of GDP of many industrial nations turned from physical development to knowledge-based development. Thus, knowledge-related value is the driving power of civilization.¹³ In 1996, the Organization for Economic Co-operation and Development (OECD) coined the term Knowledge City (KCs). Consequently, several developed countries sought to develop and adapt some aspects in their cities to be upgraded to knowledge-based economic cities. The aim was achieving sustainability, safe economic growth, environmental preservation, and a high quality of life level. The quality of life is a novel global issue that is attracting increasing attention in developed countries. The quality of life approach is one that looks holistically at issues, and is the prospective answer because it aims at setting a number of factors that reflect the social, psychological, economic, urban, and hygienic status of local residents. It also helps evaluate the occurrence / possible occurrence of change in such regions. Quality of life methodologies are gaining increasing global interest. In recent years, world organizations focused more in the quality of life issues and methods of their assessment such as: The UN's Human Development Index; social organizations such as The Ontario Social Development Councils " Quality of Life in Ontario" project; sustainable development organizations such as Hamilton-Wentworth, Seattle; organizations interested in health (e.g., Pasadena, Ontario Healthy

Communities Coalition), and organizations interested in municipal governments (e.g., Jacksonville Community Council, the Federation of Canadian Municipalities).

Hence, the research studies the mutual relationship between the potentials of KCs and the different aspects of the quality of life in cities to observe the extent of quality of life achieved by knowledge cities

2. Knowledge Based Urban Development concepts and pillars

In the late 1900s some urban development concepts were developed. Several experts stated that the future of cities and urban regions lies in the attraction, generation, and enhancing of knowledge, innovation, and creation (Yigitcanlar, 2011). In the middle of this, some new concepts emerged:

- Knowledge Economy: defined as economy depending on knowledge production and usage as an input in production. The term was first coined by the OECD IN 1996 (Hogan, 2011; Yigitcanlar, 2007).
- Knowledge society: this term defines a society which is developed in parallel with knowledge development. The knowledge society is a human development era, i.e., the knowledge society replaced the industrial society in several developed countries (Ironfiled, Read and Higgins, 2013).

This was followed by the emergence of the concept of KBUD. Knight was the first to coin such concept. He indicated the KBUD is a process where citizens take part in developing their cities through enhancing cultures and knowledge production in the city (Yigitcanlar, 2007). Yigitcanlar described KBUD as the knowledge development model in the knowledge economy era. It aims at achieving the following (Yigitcanlar, Lonnqvist, Kapyla and Salonijs, 2012):

- Sustainable urban development (Yigitcanlar and Sarimin, 2010; Yigitcanlar, Lee, 2009).
- Designing a knowledge city that encourages, produces, and expands knowledge work. This methodology can be considered a process of city transformation and innovation (Yigitcanlar, Lee, 2009).
- Boosting the quality of life through providing services needed for achieving social development (Yigitcanlar, Velibeyoglu and Martinez-Fernandez, 2008).
- Achieving a strong, safe knowledge economy that achieves the quality of life and makes the city vivid in terms of cultural activities (Yigitcanlar, 2007).

2.1 The main pillars of Knowledge Based Urban Development

Knowledge Based Urban Development may be regarded as a four-pillar model (Yigitcanlar, 2010):

- Economic development.
- Socio-cultural development.
- Environmental urban development.
- Institutional development.

2.1.1 Economic Development

The first KBUD pillar is economic development (Yigitcanlar, 2010). It aims at creating a knowledge-based economy that depends on knowledge creation, assessment, and marketing. Success in domestic economic development is closely related to the ability of a city on adaptation to knowledge economy. Literature indicates that upon determining the economic development level of a city in the knowledge economy era, the main variables/indices related to the economic structure are selected as follows (Yigitcanlar, 2011):

- Gross Domestic Product.
- Growth in domestic product.
- Spending income available.
- Foreign investment.

As for indices related to knowledge economy performance, they indicate:

- Spending on R&D, patents, knowledge workers, and knowledge-intensive services.

2.1.2 Socio-cultural development

It aims at achieving progress towards creating a knowledge economy that generates, distributes, publishes, and uses knowledge and information; which is the economic and cultural activities driving power. So, it is necessary to increase individuals' skills as a means for social development (Yigitcanlar, 2011). The benefits of social development go beyond economic growth and achieving life quality in public services (such as health and education) to maintaining cultural, social, and environmental values which distinguish cities and attract/expel the creative class of knowledge workers (Yigitcanlar and Velibeyoglu, 2008).

According to literature, the main indices used in assessing socio-cultural fall under socio-cultural capital indices (Yigitcanlar, 2010):

- Educational attainment in the city.
- Main university stature in the city.
- Social and cultural diversity in the city.

2.1.3 Environmental urban development

It aims at achieving environmental preservation along with meeting society needs. So, it seeks achieving sustainable urban development and quality of life in knowledge societies (Yigitcanlar, 2011). Sustainable development indices include (Yigitcanlar, 2010):

- Environmental status of the city.
- Sustainable urban development.
- Mitigating the effect of climatic changes.
- Sustainable transportation.

2.1.4 Institutional development

Institutional development, from the KBUD perspective, seeks to gather all active parties for organizing and facilitating knowledge-intensive activities needed for the strategic planning for creating a knowledge city (Yigitcanlar, 2011). The main institutional development indices revolve around two groups; governance and planning (Yigitcanlar, 2010):

- Electronic governance.
- The ability to develop.
- Strategic planning.

The second group, community leadership, includes:

- Local & regional.
- Establishing brand of the city.
- Community participation.

2.2 Knowledge based urban development assessment models

Several economic organizations – such as the OECD, The World Bank, and the European Commission – provide guidance to developed and developing countries for

building knowledge-based economies through KBUD. Here, five models for assessing and analyzing KBUD were observed (Sarimin, Yigitcanlar and Parker, 2010):

- The most admired knowledge cities model (Makci).
- The KBUD analysis model.
- The KBUD characteristics model.
- The ALERT model.

Here, the Makci model is used in assessing knowledge-based urban development. The Most Admired Knowledge Cities Award is an international award aiming at determining the best knowledge cities in the year. The award was established in 2006 by The World Capital Institute. The MAKCI model is essentially a model for evaluating knowledge-based urban development in terms of economic positions, represented by the financial capital; the urban social positions, represented by the identity capital; and the organizational positions, represented by the tools capital. There are eight indices in this regard (The World Capital Institute and Teleos, 2009; Sarimin, Yigitcanlar and Parker, 2010):

2.2.1 Identity Capital

All formal and informal elements in the city that have contributed and/or are contributing to determine the city's identity, its clarity and differentiation (i.e. historic profile, city characterization, infrastructure, and utilities).

2.2.2 Intelligence Capital

Refers to the city's systems capacity to sense, make sense of and respond to external agents and events which are significant to the city's welfare (i.e. city's strategic planning agencies, city public/private future centers, prospective studies etc).

2.2.3 Financial Capital

Refers to the city's articulation of monetary denomination of production value dimensions which elicit economic sustainability within the capital system (i.e. macro indicators: investment, GDP, tax system, un/employment etc).

2.2.4 Relational Capital

Refers to the city's articulation capital that provides cohesion and makes social integration possible (i.e. ethnic diversity, individual health habits, intellectual and cultural habits, etc).

2.2.5 Human Capital (collective base)

Refers to the collective cultural fitness and team based value generating capacities of all citizens that contribute to the city's system of capitals (public health, social welfare intellectual heritage, civic culture, innovation and entrepreneurial capacities).

2.2.6 Human Capital (Individual)

Refers to value generating capacity of individual citizens that contribute to the city's system of capitals (health: biological inheritance and physical development; education :holistic personal development).

2.2.7 Instrumental Capital (tangible)

Refers to the material-based means of production through which other capitals leverage their value generating capacity. Instrumental capital includes natural existing before the settlement and infrastructure.

2.2.8 Instrumental Capital (intangible)

Refers to the knowledge-based means of production through which other capitals leverage their value generating capacity (i.e. organization and production systems in electronic and non electronic repositories).

3. General concepts and frameworks of the quality of life

The quality of life is a novel global issue that is attracting increasing attention in developed countries. The quality of life approach is one that looks holistically at issues, and is the prospective answer because it aims at setting a number of factors that reflect the social, psychological, economic, urban, and hygienic status of local residents. It also helps evaluate the occurrence / possible occurrence of change in such regions. The same methodology will be adopted in handling quality of life issues: definition, quality of life indices, and the assessment method.

3.1 Definition of quality of life

While there is no consensus as to what quality of life is, several definitions listed below provide an overall sense of what is meant by the term (Anderson, 2004):

- “the degree to which a person enjoys the important possibilities of his or her life” (Centre for Health (Promotion, University of Toronto)
- “the products of the interplay among social, health, economic and environmental conditions which affect human and social development” (Ontario Social Development Council)
- “a feeling of wellbeing, fulfillment or satisfaction resulting from factors in the external environments” (Jacksonville Community Council)
- “a popular expression that, in general, connotes an overall sense of wellbeing when applied to an individual and a pleasant and supportive environment when applied to a community. Quality of life is a global outcome that is highly valued by all populations” (Healthy People 2010, Draft Objectives).
- Quality of life is a term used by government synonymously with sustainable development, because it is felt to be more easily understood by the general public. (DETR, July 2000, Local Quality of Life Counts, p 5)

The concept of the quality of life includes the quantitative and the qualitative criteria on the individual and society levels. The qualitative criteria on the individual level are: (Satisfaction about life, feeling happy, ...), whereas on the level of the society :(The ability to participate and to have effect, the amount of correlation between the person and the individual and the society,...).On the society level, (measuring the environmental, economical and social status,...), thus the quality of life can be considered two-dimensional matrix. It is clear in the table (1).

Table (1): The elements of the quality of life (Jones, 2002).

	On the individual level	On the society level
Personal/ qualitative (Feeling)	How the person feels towards himself and his status	How the person feels towards his society, and his ability to participate and affect the decisions of the society concerning the quality of life.
Objective/quantitative (Cases)	The professional cases like education.	The economical, social, environmental, cases, and the governmental efficiency.

A comprehensive definition for the term "the quality of life, can be deduced from all the above, and the research can adopt it: The quality of life is the outcome of the interaction between the social, economical, constructional, and environmental cases which affect Man (Mostafa, 2008).

3.2 *Quality of life Indices*

The process of developing urban communities is the essence of solving their problems. Knowing whether such development positively influences the quality of life was not clear due to lack of its indices. Now, decision makers and society partners are looking for evidence for determining outputs to reach good measurable results. The quality of life approach is one that looks holistically at issues, and is the prospective answer because it aims at setting a number of factors that reflect the social, psychological, economic, urban, and hygienic status of local residents. It also helps evaluate the occurrence / possible occurrence of change in such regions. Quality of life methodologies are gaining increasing global interest. Quality of life indices help understand how to act on the individual and the collective levels and what we feel. It helps answer three questions: where were we? Where are we now? Where do we want to go? (Jones, 2002).

3.3 *Quality of life measurement methodology*

The quality of life measurement methodology depends on the 2013 EU report "Quality of life in cities" results.

The request of the Directorate-General for Regional and Urban Policy to get a snapshot of people's opinions on a range of urban issues. Earlier surveys were conducted in 2004, 2006 and 2009. This survey included all capital cities of the countries concerned (except for Switzerland), together with between one and six more cities in the larger countries. In each city, around 500 citizens were interviewed. A total of 79 European cities were used in this analysis. In addition to these, the surroundings areas of Athina, Lisboa, Manchester and Paris were analyzed. The report therefore refers to "83 cities", though a more accurate terminology would be "79 cities and 4 surrounding areas". A complete list of these is included below as well as the list of questions asked. These cities have been classified according to the population size of their "urban centre" into 6 categories:

- S 50 000 – 100 000 inhabitants

- M 100 000 – 250 000 inhabitants
- L 250 000 – 500 000 inhabitants
- XL 500 000 – 1 000 000 inhabitants
- XXL 1 000 000 – 5 000 000 inhabitants
- Global More than 5 000 000 inhabitants

These classifications are used in the analysis when relevant. The results from the four surrounding areas introduced in the survey are included in the report under the following names: “Paris surroundings”, “Lisbon surroundings”, “Athens surroundings” and “Manchester surroundings”. This survey was carried out by the TNS Political & Social network in the then 27 Member States of the European Union, as well as Croatia, Iceland, Norway, Switzerland and Turkey, between the 15th of November and the 7th of December 2012. Some 41,137 respondents from different social and demographic groups were interviewed via telephone (landline and mobile phone) in their mother tongue on behalf of the European Commission, Directorate-General for Regional and Urban Policy. The methodology used is that of Euro barometer surveys as carried out by the Directorate-General for Communication (“Research and Speechwriting” Unit)². A technical note on the manner in which interviews were conducted by the Institutes within the TNS Political & Social network is appended as an annex to this report. Also included are the interview methods and confidence intervals.

4. Method of selecting cities and the proposed observation and analysis method

The research studies the mutual relationship between the potentials and pillars of KCs (the quantitative aspect) and the different aspects of the quality of life in cities (the qualitative aspect) being studied- as well as setting the different criteria for selecting cities.

4.1 Selection criteria of cities

The research selects three cities according to the following criteria:

- Located in the EU territories.
- MAKCI Award winner.
- Studied in the EU report " Quality of life in cities".

Hence, three cities were selected: Manchester, 2010 MAKCI first place; Barcelona, 2010 MAKCI third place; and Zurich, 2010 MAKCI forty place.

4.2 Method of connecting KBUD pillars and quality of life potentials

The research proposes a method for connecting KBUD pillars (as in the MAKCI report), and their relationship to the EU quality of life report, as in table (2).

Table (2): Connecting the quantitative and qualitative aspects of knowledge cities

KBUD pillars and quality of life potentials	MAKCI Report Quantitative aspect	Quality of life measurement questions Qualitative aspect
Economic development	<ul style="list-style-type: none"> ▪ Financial capital 	<ul style="list-style-type: none"> ▪ It is easy to find a job in [CITY NAME]. ▪ It is easy to find good housing at a reasonable price in [CITY NAME].
Socio-cultural development	<ul style="list-style-type: none"> ▪ Relational capital ▪ Human capital (collective) ▪ Human capital (individual) 	<ul style="list-style-type: none"> ▪ Health care services, doctors and hospitals. ▪ The presence of foreigners is good for [CITY NAME]. ▪ Foreigners who live in [CITY NAME] are well integrated. ▪ I feel safe in [CITY NAME]. ▪ I feel safe in my neighborhood. ▪ Generally speaking, most people in [CITY NAME] can be trusted. ▪ Generally speaking, most people in my neighborhood can be trusted
Environmental-urban development	<ul style="list-style-type: none"> ▪ Instrumental capital (tangible) ▪ Identity capital 	<ul style="list-style-type: none"> ▪ Public transport, for example the bus, tram or metro. ▪ Sports facilities such as sport fields and indoor sport halls. ▪ Cultural facilities such as concert halls, theatres, museums and libraries. ▪ The state of the streets and buildings in your neighborhood. ▪ Public spaces such as markets, squares, pedestrian areas. ▪ Green spaces such as parks and gardens. ▪ Availability of retail shops. ▪ Schools and other educational facilities. ▪ The quality of the air. ▪ The noise level. ▪ Cleanliness ▪ [CITY NAME] is committed to fight against climate change (e.g.: energy efficiency, green transport)
Institutional development	<ul style="list-style-type: none"> ▪ Intelligence capital ▪ Instrumental capital (intangible) 	<ul style="list-style-type: none"> ▪ The administrative services of [CITY NAME] help people efficiently. ▪ Generally speaking, the public administration of [CITY NAME] can be trusted.

4.3 Tool for the observation and analysis of mutual relationship between KBUD pillars and the quality of life potentials

Using the proposed tool, the MAKCI report and the EU quality of life report percentages are observed as in fig. (2). It is worth mentioning the strong and relative agreements were added to facilitate observation and comparison as in fig (3). The difference between

achieved results was observed, and reasons of occurrence of such difference were analyzed as in table (3).

Fig (2): Method of laying the results of the EU quality of life report survey questions (European Commission, 2013)

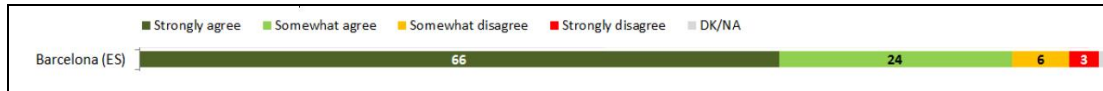


Fig (2): EU quality of life report (modified by the authors)

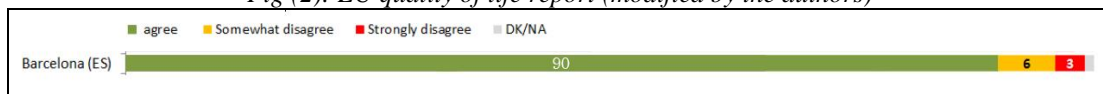


Table (3): The proposed tool for observation and analysis

City	Pillars	Makci	Quality of life (strongly agree + somewhat agree)	Makci / quality	cause

From the above, and after selecting cities, results were observed and analyzed as in table (4).

Table (4): observation and analysis of mutual relationship between KBUD pillars and the quality of life potentials of case study cities

City	Pillars	Makci	Quality of life	Makci / quality	cause
Barcelona	Socio cultural development	89.5%	71%	-19%	<ul style="list-style-type: none"> Foreigners who live in Barcelona are well integrated (50%). Health care (66%).
Zurich		70.5%	85%	+14.5%	
Manchester		84.3%	85%	+0.7%	
Barcelona	Physical Environment and Urban Development	90%	65%	-25%	<ul style="list-style-type: none"> Quality of air (31%) , cleanliness (58%) and climate change (53%). Public transport (69%), sport facilities (65%), school and education facilities (62%).
Zurich		75.8%	92%	+16.2%	
Manchester		89.5%	74%	-15.5%	<ul style="list-style-type: none"> cleanliness (57%) sport facilities (67%) and

					The state of the streets and buildings in your neighborhood (68%). ▪ school and education facilities (73%).
Barcelona	Economic Development	78%	33%	-45%	▪ It is easy to find a job in Barcelona (37%). ▪ It is easy to find good housing at a reasonable price in. Barcelona (28%).
Zurich		80%	30.5%	-49.5%	▪ It is easy to find a job in Zurich (55%). ▪ It is easy to find good housing at a reasonable price in Zurich (6%).
Manchester		85%	37%	-48%	▪ It is easy to find a job in Manchester (31%). ▪ It is easy to find good housing at a reasonable price in Manchester (43%).
Barcelona	Management and Governance	85%	48%	-37%	▪ The administrative services of Barcelona help people efficiently (45%). ▪ Generally speaking, the public administration of Barcelona can be trusted (51%).
Zurich		75.8%	79%	+3.5%	
Manchester		88.5%	68%	-20.5%	▪ The administrative service of Barcelona help people efficiently (69%). Generally speaking, the public administration of Barcelona can be trusted (67%).

N.B: Authors argued that a 5-10% difference is a balanced one.

5. Conclusion

Through the study, the research managed to observe the mutual relationship between the potentials of KBUD and the quality of life. Results were analyzed based on these potentials, as follows:

5.1 Socio-cultural development

- Analyzing the mutual relationship in Barcelona case, there was a negative imbalance between the socio-cultural development and the quality of life; a difference of 19%. This is due to citizens' dissatisfaction with health care. Also, foreigners were not satisfied; 50% satisfaction.

- In the Manchester case, a balance was detected between socio-cultural development and the quality of life; a 0.7% difference.
- As for Zurich, a positive balance was found; 14.5%.

5.2 *Environmental urban development*

- A negative imbalance was observed in Barcelona; 25%. This can be attributed to citizens' dissatisfaction with the quality of air (31%), city cleanliness (58%), systems of protection against climatic changes (53%), public transportation (69%), sport establishments (65%), and educational facilities (62%).
- As for Manchester a negative imbalance was observed; 15.5%. This is attributed to citizens' dissatisfaction with city cleanliness (57%), sports facilities (67%), and educational facilities (73%).
- As for Zurich, a positive imbalance was observed.

5.3 *Economic development*

- A negative imbalance was observed in the three case studies. This is attributed in the case of Barcelona to dissatisfaction with employment (37% satisfaction) and 28% satisfaction with finding a residence suitable for income.
- As for Manchester there is dissatisfaction with employment (31% satisfaction), and 43% for satisfaction with a suitable residence.
- As for Zurich, there was a 6% satisfaction with finding a suitable residence, and 55% satisfaction with employment.

5.4 *Institutional development*

- A negative imbalance was observed in the case of Barcelona; 37% difference. Citizens' satisfaction with administrative services is 45%, and 51% satisfaction with the public administration of Barcelona.
- As for Zurich a state of balance was observed.
- As for Manchester a negative state of imbalance was observed; a difference of 20.5%. This is attributed to citizens' dissatisfaction with administrative services; 69% satisfaction. Citizens' satisfaction with public administration was 67%.

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Individual Knowledge Structuring for Smart Services Requirements Engineering

Tatiana Gavrilova *, Irina Leshcheva

Graduate School of Management
Saint-Petersburg University
Volkhovskiy per, 3, 199004, Saint-Petersburg, Russia

* *Corresponding author*

Structured Abstract

Purpose – Smart Services are now an emerging phenomena that is based on intelligent technologies which are widely used for better customer. Smart Service is supposed to be an IT-service based on rich intellectual capital, realtime tools, sophisticated analytics, and automation (definition based on Cisco approach from (Smart Services, 2011). Individual Knowledge Structuring (IKS) is a significant part of any design activity, as it forms together and within critical thinking an analytical preface to a synthesising process. We argue that the current palette of individual knowledge structuring techniques and their cognitive impact affect the effectiveness of requirement engineering procedures.

Design/methodology/approach – The aim of this study is to show how the repertoire of IKS is affected by individual cognitive style (Witkin, Moore, Goodenough and Cox, 1977; Palmquist and Kim, 2000). We have done an experiment with 79 students to discover the impact of the cognitive style features on the knowledge structuring. From the plethora of cognitive style characteristics three parameters have been chosen: field dependence/ field independence (FD/FID), impulsivity/ reflectivity, and narrowness/ width of the category. The point is that we received totally different knowledge models from respondents with different cognitive styles peculiarities. In this paper we aim to introduce our findings on this issue.

Originality/value – The paper proposes new approach to using cognitive psychology for the knowledge analytical activity for requirement engineering. The proposed findings are based on wide survey and experiments of the authors. The paper contributes to a wider use of knowledge engineering methodologies for smart service design and development. Individual Knowledge Structuring helps to develop a holistic conceptual service model. In this paper we aim to overcome the limitations of traditional approach and to enrich the repertoire of the methods that can be used by service designers and analysts to broad the understanding of the customer needs and service capabilities issues.

Practical implications – The essential attributes of Smart Services are that they deliver better insights and predictability through software enabled tools predictive analytics, and intelligent automation. Smart Services design and development needs thorough requirements engineering process (Ralph, 2013) that involves all the palette of knowledge

engineering techniques and methods. The paper contributes to business service science and practice by introducing recommendations for service analysts at the crucial phase of the design and development process. Such approach merges the cognitive ergonomics issues with knowledge engineering.

Keywords – knowledge structuring, visual models, cognitive approach, requirements engineering, knowledge engineering.

Paper type – Academic Research Paper

1 Introduction

Smart Services are now an emerging phenomena that is based on intelligent technologies which are widely used for better customer. Smart Service is supposed to be an IT-service based on rich intellectual capital, realtime tools, sophisticated analytics, and automation (definition based on Cisco approach from (Smart Services, 2011)). The essential attributes of Smart Services are that they deliver better insights and predictability through software enabled tools predictive analytics, and intelligent automation. Smart Services design and development needs thorough requirements engineering process (Ralph, 2013) that involves all the palette of knowledge engineering techniques and methods. The primary measure of success of any software system or service is the degree to which it meets the purpose for which it was intended. So requirements engineering (RE) is the process of discovering that purpose, by identifying stakeholders, their needs and knowledge, and documenting and mapping these in a form that is amenable to analysis, communication, and subsequent implementation (Nuseibeh and Easterbrook, 2000).

Individual Knowledge Structuring (IKS) is a significant part of such RE design activity, as it forms together and within critical thinking an analytical preface to a synthesising process. We argue that the current palette of individual knowledge structuring techniques and their cognitive impact affect the effectiveness of requirement engineering procedures.

The paper contributes to business service science and practice by introducing recommendations for service analysts at the crucial phase of the design and development process. Such approach merges the cognitive ergonomics issues with knowledge engineering.

This paper presents the main results of the KOMET (Knowledge and cOntent structuring via METHods of collaborative ontology design) project which was devoted to developing methods of using group visual ontology design in research and education with regards to the respondents' individual cognitive styles. The group ontology design was tested in the medical domain (smaller group) (Gavrilova, Ravodin, Bolotnikova and Kotko, 2012) and computer science (informatics) domain (larger group of participants).

2 About KOMET Project

The KOMET project was aimed at developing a paradigm of data and knowledge structuring with regard to individual cognitive styles, using recent advances in knowledge engineering and conceptual structuring, aimed at creating structurally holistic knowledge bases for various areas of science and technology.

This aim was decomposed into such objectives as:

- research of correlations between the expert's individual cognitive style and the peculiarities of the expert's subject domain ontology development,
- research of correlations between the expert's individual cognitive style and the group ontology design (including design performed in groups consisting of experts with either similar or different cognitive styles), and
- research of formal ontology evaluation methods from the cognitive ergonomics point of view and informal evaluation by peers.

The idea of using visual structuring of information to improve the quality of understanding and mentalization among research colleagues is not new (Shneiderman, 1996). For more than twenty years, concept mapping (Grosslight, Unger, Jay and Smith, 1991; Sowa, 1984; Jonassen, 1998; Conlon, 1997) has been used to compile maps and mental models that support the process of knowledge sharing.

Ancient scholars used diagrams and figures to describe taxonomies and other complex sets of terms. As such, the visual representation of general domain concepts facilitates and supports understanding of both substantive and syntactic knowledge. Many scholars, especially those who also teach sciences courses, operate as knowledge analysts or knowledge engineers by making visible the skeleton of the studied discipline and showing the domain's conceptual structure (Kinchin, 2005). This structure is frequently represented by a so-called "ontology".

An ontology is a set of definitions we make in understanding and viewing the world. The visual approach to presenting an ontology is not only compact but also comprehensive. It makes ontology a powerful mind tool (Johanssen, 1998; Gavrilova and Voinov, 1996). One particular role of ontology is to act as “cognitive prosthesis” (Sutcliffe, 2003) or an example to stimulate the designer’s imagination.

By definition, ontology is a declarative representation of a certain precise domain specification, including the glossary of the domain terms and the logical expressions describing the meanings and the relationships of these terms, thus allowing structured sharing of knowledge related to the domain (Gruber, 1993). There are numerous definitions of this milestone term (Neches, Fikes, Finin, Gruber, Patil, Senator and Swartout, 1991; Gruber, 1993; Guarino and Giaretta, 1998; Gómez-Pérez, Fernández-López and Corcho, 2004).

However, the ontology-based approach to knowledge representation in requirement engineering and smart services design is a relatively new development.

Many researchers and practitioners have argued about the distinctions between ontology and a conceptual model. We propose that ontology corresponds to the analyst’s view of the conceptual model, but is not de facto the formal model itself. There are more than a hundred techniques and notations that help to define and visualize conceptual models. Ontologies are now considered as the most universal and shareable forms of such modelling.

Of course, the ontologies are inevitably subjective to a certain extent, as knowledge by definition includes a component of personal subjective perception; however, using the ontologies developed by others is a convenient and compact means of acquiring new knowledge. At the same time, collective ontology development experience allows the participants in the process to gain the fullest possible understanding of the subject area.

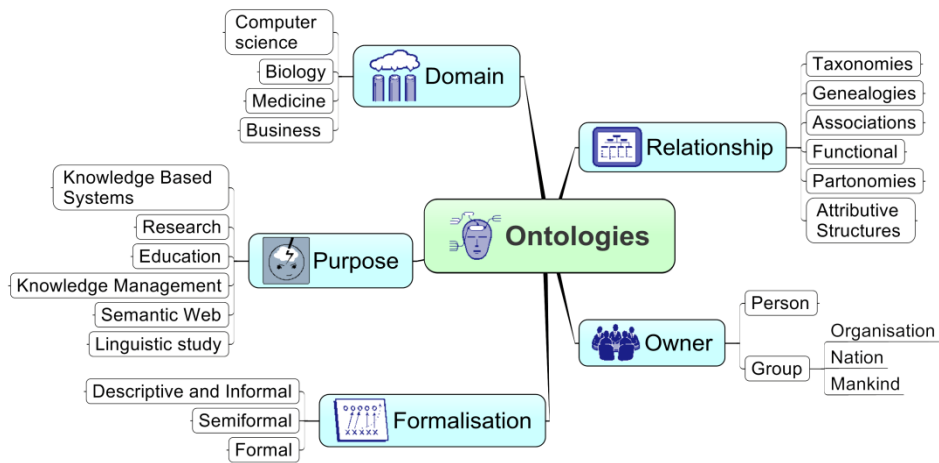


Figure 1. Summarizing the ontology classifications in a mind-map

Meta-ontology provides a more general description dealing with higher-level abstractions. Figure 1 illustrates different ontology classifications in the form of the mind map. This representation may be called the knowledge map. Such maps are graphical tools for organizing and representing knowledge. Later in this paper and in our study we will use two particularly appropriate forms of knowledge maps: mind maps (Buzan, 2005) and concept maps (Novak, 1998; Novak and Canas, 2006).

Knowledge maps are now widely used for visualizing ontologies at the design stage, while ontology editors (like Protégé) facilitate the development stage.

3 Individual Cognitive Style and Knowledge Structuring

There is a thriving industry devoted to publishing cognitive-style tests and guidebooks for teachers, and many organizations offer professional development workshops for teachers and educators built around the concept of learning styles (Peterson, Rayner and Armstrong, 2009). The cognitive-styles view has acquired great influence within the education field.

However, we will use the concept of cognitive style only for the predefined aim. As the aim of the KOMET project was to develop a paradigm of structuring data and knowledge with regard to individual cognitive styles, we had to choose the appropriate parameters or features of cognitive style.

The cognitive styles explain and describe how an individual acquires knowledge and how an individual processes information. The cognitive styles are related to problem solving, and generally to the way that information is acquired, structured and used.

Among the main features of cognitive style (Hayes and Allinson, 1998) we can name:

- field dependence versus field independence;
- impulsivity versus reflection;
- narrowness versus width of the categories;
- rigidity versus flexibility;
- levelling versus sharpening;
- scope of cognitive equivalence;
- visual/audio/kinesthetic preferences, etc.

Three characteristics have been chosen from the plethora of cognitive style characteristics described in the literature (Kholodnaya, 2004): field dependence/field independence (FD/FID), impulsivity/reflection, and narrowness/width of the category.

According to the definition by Witkin (Witkin, Moore, Goodenough and Cox, 1977) FD/FID is “a structuring ability of perception”. The field-independent style is defined by a tendency to separate details from the surrounding context. It can be compared to the field-dependent style, which is defined as a relative inability to distinguish detail from other information around it. The FD/FID characteristic can be interpreted as a proxy of the structuring capability of an individual mind. The characteristic of this style does influence the structuring process as a whole (e.g. ontology development “from scratch” in the research setting described in this paper), and even more it affects the restructuring process (the merging of individual ontologies). FD/FID exerts considerable influence on the collective problem-solving process. In dyads where members have cognitive styles differentiated by the FD/FID characteristic, the final solution is usually closer to the variant suggested by the FID participant. The FID dyads experience difficulty in developing common decisions on arguable points, while the FD dyads are more successful in coming to agreement in collective problem solving.

Psychologists in our research group were used to working with on-line text based on the popular modification of Witkin’s method of “embedded figures” which is aimed at the search for a simple figure hidden within the complicated one (Witkin, 1971).

The impulsivity/reflection characteristic considers the amount of information collected prior to making a decision: impulsive individuals are able to make decisions on

a considerably bounded information basis, while the reflective individuals are more inclined to make decisions considering completely full information on the respective situation. For assessing the respondents' impulsivity/reflection features, the "similar pictures comparison" (Kagan, 1966) method has been used.

As for the narrowness/width of the category, the main difference between the extreme poles of this characteristic is that narrowly categorizing individuals are inclined to restrict the area of application of a certain category, while the broad categorizers are, conversely, inclined to include a plethora of more-or-less related examples into a single category. The psychologists that help us with the experimental part advised us to use a modification by Pettigrew (1958) and Fillenbaum (1959): their method of so-called "average judgment". The procedure is based on respondents' opinion on the minimum, average and maximum evaluations of a concept or category.

4 Research Approach and Methodology

The study of expert's individual cognitive style was divided into four consecutive steps:

1. Identifying the significant individual cognitive style characteristics on the basis of the on-line testing results, using the software developed by Elena Kotova and Andrew Pisarev.
2. Creating the "informatics" research domain ontologies using the Protégé (Protégé) tool and estimating the ontology metrics using the COAT software environment (Gavrilova, Bolotnikova and Gorovoy, 2012).
3. Merging individual ontologies in face-to-face group ontology design.
4. Performing statistical analysis in order to find out significant relationships between the young researchers' (experts') individual cognitive style characteristics and the ontology metrics.

The second part of the research was performed using the same test sample and included ontology development in/with the use of the Protégé tool. All the tested students were given the task of developing an ontology for the informatics domain. They did it by using visual mapping approach.

The quality of the developed ontologies was assessed by two methods:

- An expert method, where the ontology analyst and domain experts (both professors in computer science) assessed the quality by such criteria as completeness, imbalance, relevance, etc.
- A formalized method, where any ontology was assessed by a set of quantitative metrics using COAT software.

The formalized method was preferable as it was free from experts' and analysts' subjective interpretations and had the potential to be automated.

For step 3 the KOMET-DILIGENT collective ontology development was designed (Gavrilova, Leshcheva, Bolotnikova, Blagov and Yanson, 2013). This methodology enriches the findings of the Neon Project (Neon Project).

All the individual and collective ontologies (both in dyads and in small groups of 3-5 members) were analyzed. In the KOMET project, specificity of the collective ontology development has been researched. The test sample consisted of the students of the Saint Petersburg State Polytechnic University, Institute of Information Technology and Control Systems (IITCS), attending the intelligent systems development course. The experiments were also aimed at figuring out how the collective categorization style is being developed.

5 Cognitive Ergonomic Metrics

The individually designed ontologies were assessed by an augmented set of metrics (such as minimal depth, absolute width, etc.) suggested in Bolotnikova, Gavrilova and Gorovoy (2011). In evaluating the quality of the designed ontologies, the following two aspects are most important: (1) correctness and depth of reflection of the subject domain, and (2) ergonomic aspect of the ontology representation from the point of view of quality and human speed of perception.

As an example further we describe two metrics. The notation used to describe the metrics is the following:

“g”, a graph representing an ontology; the concepts (classes and exemplars) of the ontology are the graph nodes, the relationships between the concepts are the graph edges;

“G”, a set of all the nodes g;

“E”, a set of all the edges g.

A minimal depth:

$$m = N_{j \in P}, \quad \forall i (N_{j \in P} \leq N_{i \in P})$$

where $N_{j \in P}$ and $N_{i \in P}$ are the path lengths j and i from the set of paths P of the graph g .

An absolute width:

$$m = \sum_j^L N_{j \in L}$$

where $N_{j \in L}$ is a number of nodes of degree j from the set of nodes L of the graph g .

Many aspects affect the quality of an ontology from the cognitive point of view. The COAT software environment provides calculation of more than 20 metrics. Metrics of this kind were first proposed by the research group of Aldo Gangemi (Gangemi, Catennaci, Ciaramita and Lehman, 2006). The ontology evaluation based on these metrics is formal but it helps to assess the ontology quality. The complete list of metrics was presented in detail in two works (Bolotnikova, Gavrilova and Gorovoy, 2011; Gavrilova, Bolotnikova and Gorovoy, 2012).

These metrics can help to understand what should be corrected in the description of the subject domain in order to improve it from the point of view of cognitive ergonomics or better perception. Thus it is supposed that each next version of the ontology will be better and it can be perceived faster by users.

The metrics can also be used in evaluating ontologies of the same subject domain produced by different people/teams. The calculated metrics help to estimate which of them is better from the point of view of cognitive ergonomics and to choose the best of them if the evaluations of other important criteria differ insignificantly.

6 Analysis of the Individual Construction Affected By Cognitive Style

The research sample for the described study was consisted of 79 students, enrolled in the intelligent systems development course. All the tested students were given the task of developing an ontology for the informatics research domain. Due to the professional specificity of the sample, a bias toward narrow, reflective and field-independent test persons was found in the sample. However, a statistically significant Spearman's negative correlation between the FID score and the time of the first answer in the Kagan was calculated, showing that the sample was dominated by the fast FID and slow FD respondents.

The two methods mentioned above were used for assessment of the result.

On the basis of the literature review and the practical ontology development experience, the following hypotheses are suggested:

Hypothesis 1. *Individuals belonging to the FID extreme point of the FD/FID cognitive style characteristic tend to have highly developed cognitive structuring capabilities; thus, the quality of ontologies developed by the FID individuals would be higher.*

Hypothesis 2. *Impulsive individuals tend to develop superficial ontologies lacking sufficient categorization in the upper level, while the reflective individuals tend to develop deeper ontologies.*

Hypothesis 3. *Ontologies developed by the individuals described as “imprecise” in the Kagan impulsivity/reflectivity test results tend to be more complex.*

Hypothesis 4. *The “narrowness/ width of the category” cognitive style characteristic exerts significant influence on the ontology width: the “wide categorizers” tend to develop broader ontologies.*

The correlation between the cognitive style and ontology metrics values was assessed by Spearman’s coefficient (rank correlation). The significant correlation between the metrics and such features as field dependence/ field independence was not found.

Hypothesis 1 was not confirmed, as no significant correlation between the FD/FID metric and the quality of the ontologies was found; this result gave rise to optimistic feelings about the whole project, as it shows that it is possible to teach any individual to develop ontologies of a high quality.

Hypothesis 2 was partially confirmed: the “90% line depth” metric demonstrated significant positive correlations with the time of the first answer in the Kagan test, thus showing that reflective test persons tend to develop deeper ontologies; however, no significant negative correlation between the time of the first answer and the ontology width was found.

Hypothesis 3 was confirmed, as the number of mistakes in the Kagan test demonstrated a significant positive correlation with the values of the “Average number of parents of a graph node” metric that characterizes the ontology complexity.

Furthermore, the number of mistakes in the Kagan test demonstrated significant positive correlations with the metrics of the “Minimal depth of the ontology” and the “Families branching coefficient” and significant negative correlation with the weighted leaves branching coefficient.

Hypothesis 4 was fully supported: the broad categorizers developed bigger ontologies in terms of the number of concepts, achieved mainly by the greater number of “children” of each parent concept.

Respectively, the results of the “Average judgments” test demonstrated significant correlations with such metrics as the “Average ontology width”, “Number of leaves”, “Absolute cardinality of families”, etc. These results also demonstrated significant correlation with the root-mean-square deviation of the average ontology width. This result shows that the number of concepts belonging to the neighbouring levels and to different branches is significantly different, indicating imbalance in the ontologies developed by the wide categorizers.

Despite the objectivity of the quantitative metrics-based method of ontology assessment, this method has the significant drawback of being too formalized and lacking semantic analysis elements. Having augmented the quantitative metrics-based analysis by a semantic analysis performed manually, we found that the ontologies developed by the field-independent test persons tend to have simpler and clearer structure. However, this simplicity and clarity tends to be achieved by truncating the concepts that do not fit into the developed ontology, thus sacrificing the ontology’s completeness and integrity for formal logical consistency.

As for the collective ontology development, including wide categorizers into a group together with a FID individual can be useful, with the wide categorizers generating a plethora of sub-classes and the FID participant restructuring these. This hypothesis has been tested on the stage of research dedicated to collective ontology development.

So, the following relationships between the respondent’ individual cognitive styles and the peculiarities of respondents’ subject domain ontology development have been identified as a result of the research:

- Considering the “impulsivity/reflection” scale, the reflective individuals tend to develop deeper ontologies.
- The ontologies developed by the imprecise individuals (as defined in the Kagan test) tend to be more complex.
- The “narrowness/ width of the category” cognitive style affects the ontology branching coefficient, i.e. the ontology width.

7 Collective Ontology Design

An objective of this study was to establish how the collective categorization style was developed. Specificity of the collective ontology development has also been researched, both in dyads as well as in the groups of 3-5 persons.

The KOMET-DILIGENT collective ontology face-to-face design methodology proposed within the KOMET project uses the following algorithm (Gavrilova, Leshcheva, Bolotnikova, Blagov and Yanson, 2013):

1. Preliminary individual ontology development by the participants and consequent mutual ontology matching.
2. Ontologies analysis, merging and alignment.
3. Ontology revision and redesign.

Students first developed individual ontologies and then were asked to develop a collective common ontology on the same topic, “computer science”. The time allowed was one hour.

The experiments aimed at figuring out how a collective categorization style was developed. Two strategies were identified:

S1, a strategy of collective ontology development “from scratch”, and

S2, a strategy of common ontology development on the basis of two or more individual drafts.

These strategies were affected by the peculiarities of analyzing and merging individual ontologies in the collective ontology development methodology suggested and previously explained by the authors.

The second strategy, S2, is of greater practical interest. In this case the respondents effectively applied all three basic ontology engineering operations (matching, merging and alignment).

The experiments have shown that merging usually follows either of the two scenarios:

1. Absorption scenario (60-70% of all the tested groups);
2. Compromise (synthesis) scenario (30-40% of the tested groups).

The absorption scenario has been researched by us in more detail, as this scenario was used more often than the others. The implications of this scenario have led to the design of two models:

A disjunctive model, in which the higher power ontology absorbs the lower power one, with further merging of the same-degree nodes in the resulting ontology.

A conjunctive model in which the reduction of nodes leads to the resulting ontology including only the disjunction or intersection of the same-degree nodes.

Comparison of these scenarios with the cognitive styles of the test participants revealed the following relationships:

- Field-independent (FID) test persons tend to prefer the conjunctive scenario.
- Field-dependent (FD) test persons tend to prefer the disjunctive scenario.

Figures 2, 3 and 4 illustrate the experiment and demonstrate the variation from the synthesizing scenarios. This variation is the best alternative, with collective effort showing the synergetic effect of “jumping” to a higher level of abstraction. The higher level always demonstrates deeper knowledge and better understanding of the domain specifics. These ontologies can be criticized as they were developed by young researchers. However, our experiment was targeted at the study of collaborative ontology design, not the production of a serious domain ontology.

8 Conclusions

This paper addresses the conceptual limitations of traditional research communication and proposes using a visual metaphor for illustration and presentation of the research state-of-the art and main findings.

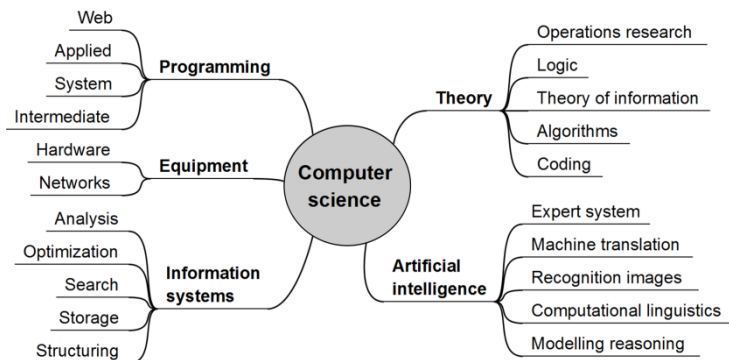


Figure 2. Example of individual A ontology of computer science

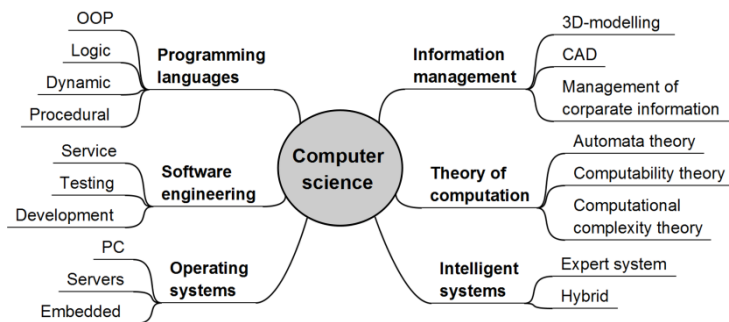


Figure 3. Example of individual B ontology of computer science

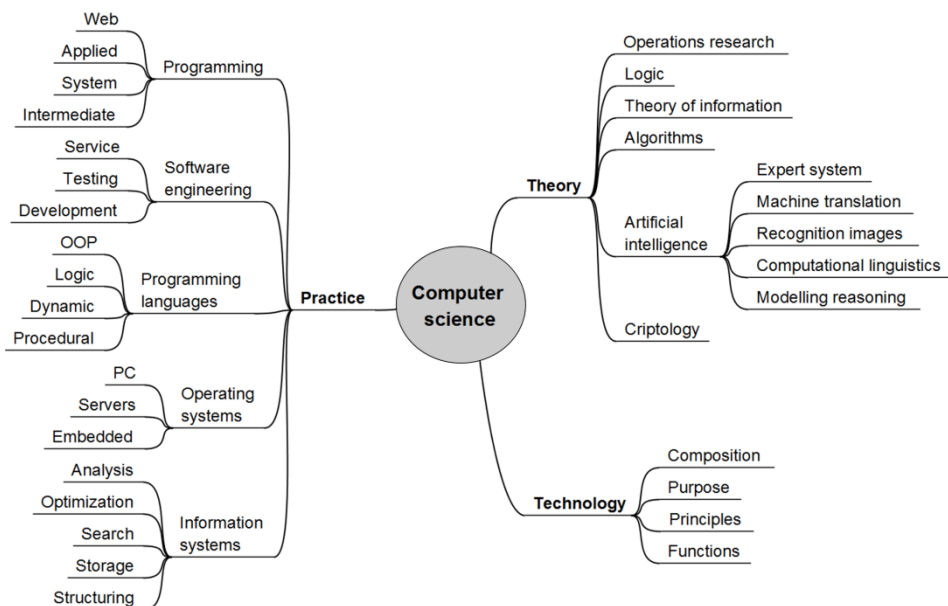


Figure 4. Collaborative AB ontology of computer science

Finally, the impact of individual cognitive styles on team ontology development can be taken into consideration in such areas where team intellectual work with ontology development as a possible method can be used, e.g. requirement engineering, smart services R&D or management consulting.

Using visual inspection of the ontology it is possible to detect gaps and misunderstandings in the state-of-the-art knowledge level and cognitive model of the domain knowledge. However, there is as yet little consensus on the useful design and orchestration of such structures. Furthermore, in many cases it is not known what the structure of socially legitimate knowledge patterns looks like, or how a particular instance

of a knowledge model deviates from that “ideal” state (e.g. guru’s view) (Cross, Parker, Prusak and Borgatti, 2001). However, researchers are individuals, and they may disagree among themselves.

The study described here is only a first step in the interdisciplinary research field dedicated to the inquiry into the affect of the expert’s individual cognitive style parameters on the group structuring design activity. Our results are therefore of a preliminary nature.

Group ontology design, both in dyads and groups of more than two participants, is performed either “from scratch” or on the basis of the drafts prepared by the members of the group individually.

Merging of the individual drafts into a single group ontology follows either an absorption or compromise scenario, or a synthesis scenario. The absorption scenario of the merging of ontologies can be implied from either a conjunctive or a disjunctive model.

From the different cognitive styles, the field-dependent participants tended to prefer the disjunctive model of merging ontologies, with the higher power ontology absorbing the lower power one and further merging of the same-level nodes in the resulting ontology.

The field-independent participants tended to prefer the conjunctive model, with the node reduction leading to the resulting ontology, with the conjunction or interception only of the same-level nodes.

Despite the preliminary character of the research results, all the findings can be used in organizing collective ontology development, data structuring and other group analytical work. Our work presents a novel approach on collaborative ontology development from the psychological point of view. Knowing of the cognitive personal peculiarities helps to leverage the subjectivity of the individually-designed ontologies.

Using recent advances in knowledge engineering and a human factors approach, we aim at creating new consistent ontologies for smart service requirements engineering. Especially it is important for the knowledge portal maintenance services.

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A knowledge-based representation of sustainable banking: insights from fuzzy cognitive mapping

Daniela Carlucci

Laboratorio di Ingegneria Gestionale
University of Basilicata
Via Lazazzera, 75100 Matera, Italy

Fernando A. F. Ferreira *, Marjan S. Jalali, Nelson
J. S. António

ISCTE Business School
University Institute of Lisbon & University of Memphis
Avenida das Forças Armadas, 1649-026 Lisbon, Portugal

Giovanni Schiuma

Innovation Insights Hub, University of the Arts London
King's Cross, London, UK

** Corresponding author*

Structured Abstract

Purpose – Integrating sustainability into the banking activity, *i.e.* taking a broader view of how actions affect future generations, stakeholders and the environment, is an increasingly necessary but extremely challenging issue currently facing financial institutions. It is thus becoming ever more important to understand the key determinants of sustainable banking and how they inter-relate with each other. As such, our aim in this research is to build a cognitive map, in particular a fuzzy cognitive map (FCM), to model, dynamically analyze and test the reciprocal influence of key factors underlying sustainable banking.

Design/methodology/approach – We propose an approach which explores the applicability of FCMs in the context of sustainable banking. FCMs have been shown to be of particular use in the handling of complex decision problems characterized by lack of information or unavailable data. They constitute a methodological framework that should allow for a reduction of omitted determinants with regard to sustainable banking, as well as a greater understanding of the relationships between them.

Originality/value – This methodology puts in evidence the value of applying FCMs to the structuring of the process of sustainable banking. We know of no previous work which has done this; and believe this first effort in the application of cognitive mapping

techniques to the identification of the key determinants of sustainable banking will be an important contribution to both theory and practice.

Practical implications – The outcomes of the application of FCMs to sustainable banking can be expected to contribute to the literature, not only in what refers to sustainability strategies in the banking sector, strategic knowledge asset management and operational research, but also at a methodological level. As neuro-fuzzy systems, FCMs are able to incorporate experts' knowledge, holding powerful and far-reaching potential to analyze and model complex decision problems, such as those considered in this paper. We anticipate implications and practical applications for both bank managers and policymakers aiming to increase the efficiency of their decision making in the context of sustainable banking.

Keywords – Sustainable Banking, Problem Structuring Methods, Fuzzy Cognitive Maps, Knowledge Management, Expert Systems.

Paper type – Academic Research Paper.

1. Introduction

The 21st century has brought greater business diversification to the banking industry, such that most of the major banks in the industrialized world are now complex financial organizations offering a wide range of services to international markets, and strategically controlling billions of dollars in cash and assets. Making use of technological advances, banks have been working to identify new market opportunities, implement new strategies, and increase their levels of customer retention (*cf.* Reis *et al.*, 2013). And as the globalization and diversification of the financial industry increase, these challenges become bigger: the changes in the environment become faster, the competition more fierce, and the need to adapt greater (Cole, 2011; Ferreira *et al.*, 2012). It is anticipated that over the coming years the banking sector will become even more complex, and that in the future it will no longer work in the same manner all over the world. The requirement for survival, therefore, is of a posture of learning, whereby banks are able to adapt to the demands of the external environment with greater agility. At the same time, from an academic point of view, it becomes increasingly pressing to understand the effects of these ongoing changes in the global economy, as well as the role of banks in particular, as their importance in the business community increases (Stephens and Skinner, 2013; Ferreira *et al.*, 2014).

There has been growing discussion about the integration of sustainability into the banking activity, in both academia and business practice. Recent analyses have shown

that sustainable, values-based banks, which predominantly base their decisions on the needs of people and the environment, are outperforming traditional mainstream banks in terms of financial indicators such as return on assets or growth in loans and deposits (for a fuller discussion, see Ramos *et al.*, 2011; Rebai *et al.*, 2012; Fatemi and Fooladi, 2013; Stephens and Skinner, 2013). Results such as these have put sustainability at the forefront of banks' managerial concerns, and at the same time made researching sustainable banking an imperative.

The integration of sustainability concerns in banking has essentially been taking two forms: (1) socially and environmentally responsible initiatives (*e.g.* support for cultural events, charitable donations, recycling programs and support for improvements in energy efficiency); and (2) the integration of environmental and social considerations into product design, mission and business strategies (*e.g.* the integration of environmental criteria into lending and investment strategies) (Jeucken and Bouma, 1999; Bouma *et al.*, 2001). This second dimension highlights the importance of incorporating sustainability into banks' competitive strategies and decision-making processes on a larger scale, since financing environmentally and socially responsible projects can be expected to ultimately lead to changes in the business landscape as whole, as sustainable and sound enterprises are helped to prosper (Stephens and Skinner, 2013). Indeed, a major shift has already happened, as banks have come to realize that poor environmental performance on the part of their clients can represent a threat to their profitability. There is an increasing concern among banks over clients' environmental performance, which has been acting as an additional driver of sustainable banking, leading banks to develop mechanisms to assess their customers' ethical and environmental risk exposure, in order to protect themselves from potential losses.

Despite the above arguments, integrating wider concerns over stakeholder and the environment into the banking activity is not as simple as it might appear. In fact, given the considerable number of decision makers involved, and the large variety of sustainability determinants to be considered, this integration can actually be a very challenging undertaking. It becomes imperative, therefore, to understand these determinants, and how they inter-relate with each other, to promote (or inhibit) the consideration of sustainability in banks' strategic decisions. A fuller understanding of this hitherto largely underdeveloped topic is not only of academic interest, but of great utility to the decision makers involved. Ultimately, it can be expected to help support not only

the development of more sustainable banking, but more sustainable business ventures in general.

Our first research question thus pertains to the key determinants of sustainable banking and the manner in which they inter-relate with each other. Identifying and understanding the conditions that underpin sustainable banking and clarifying the links between them is crucial to the enhancement of value creation and achieving the desired sustainability goals. Existing research on these conditions or indicators “*is yet speculative, due to a shortage of standard definitions and relevant data*” (Kauko, 2010: 191), which highlights the need to not only identify them, but also to develop a framework for their representation and categorization, such that they can better be used to create value. Our second research question thus seeks to determine whether a knowledge-based representation of sustainable banking can be created, and having been developed, whether such a framework can enhance value creation.

In seeking to analyze these questions, an approach using *Fuzzy Cognitive Maps* (FCMs) is employed. This approach simultaneously allows the pursuit of a third research goal, which is to test the applicability of FCMs in the context of sustainable banking. FCMs have previously proven useful in handling complex decision problems characterized by lack of information or unavailable data (*cf.* Carlucci *et al.*, 2013; Gavrilova *et al.*, 2013). Indeed, “*FCM is a well-established artificial intelligence technique, incorporating ideas from artificial neural networks and fuzzy logic, which can be effectively applied in the domain of management science*” (Carlucci *et al.*, 2013: 208). This methodological framework should allow not only for a reduction in the number of omitted determinants, but also for a greater understanding of the relationships between them. We know of no previous work applying FCM to structuring the process of sustainable banking decisions; and believe this first effort in the application of cognitive mapping techniques to the identification of the key determinants of sustainable banking will be an important contribution to both theory and practice.

The remainder of the paper is structured as follows. The next section presents a brief review of the literature on sustainable banking. Section 3 presents the research problem and the methodological background. Section 4 explains the steps followed during the construction of our FCM, and section 5 concludes the paper.

2. Previous studies on sustainable banking

It is commonly claimed that the current economic crisis has triggered a sharp increase in competition, an assertion which is backed by research (e.g. Ferreira *et al.*, 2011). Wu (2012: 303) refers to the “*chain effects of the financial ‘tsunami’*” that was the Global Financial Crisis, and the fact that “*financial institutions in particular have encountered more competitive challenges worldwide*” as a result of it. In this climate, it becomes increasingly necessary for financial and banking institutions to have a clear and clearly understood mission, as well as agreed upon objectives, on the basis of which they can determine the strategies and tactics that will be used to achieve them (Ferreira *et al.*, 2012). This implies substantial progress in banks’ abilities to mobilize, explore and evaluate tangible and intangible resources, in line with the opportunities offered by its (ever changing) context. As highlighted by Carmeli (2004: 111-112), “*the real source of competitive advantage is underlined by the organization’s ability to consistently meet environmental changes [...]*”.

It is precisely with regard to this challenge that integrating longer term considerations into the banking activity plays a fundamental role. The current demand from the external environment appears to be that of sustainability, and banks need to develop the organizational agility to integrate this into their strategic decision making processes. Simply performing traditional activities such as attracting and investing savings is no longer enough. New responsibilities – environmental and social – are demanded of banks, and arguably the best way forward is to look at these as business opportunities, rather than risk factors.

Delineating and implementing a “sustainability strategy” is only possible when there is an ability and willingness to consider and involve stakeholders in decision making processes. *Figure 1* identifies banks’ main internal and external stakeholders.

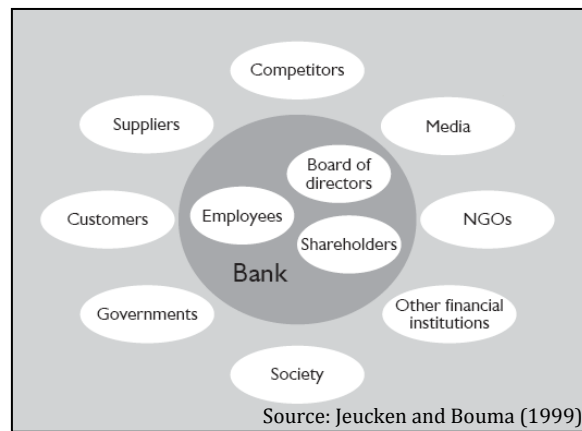


Figure 1. Sustainability strategy and (internal and external) stakeholders

Immediately, a challenge can be identified: the number of stakeholders is considerable, and they all constitute potential decision makers. However, they do not necessarily have the same interests and priorities, making decision making in general, and with regard to sustainability issues in particular, unlikely to be easy. A further challenge emerges when it becomes apparent from the literature that the determinants of sustainable banking have not yet been clearly identified, let alone defined and understood (Kauko, 2010). Understanding these determinants and their relative importance, however, is fundamental to our comprehension of banks' ability to consider sustainability in a strategic manner. This integration of sustainability in banking further implies a solid long-term commitment on the part of bank managers toward the creation of both value and of a more responsible society.

Given the social and economic relevance of this issue, it is not surprising that it has been attracting increasing interest in the literature (*cf.* Jeucken and Bouma, 1999; Bouma *et al.*, 2001; Rebai *et al.*, 2012; Fatemi and Fooladi, 2013; Stephens and Skinner, 2013). However, and their undeniable merit notwithstanding, the insights provided by these contributions have been unable to fully identify and define the determinants of sustainable banking, or the relationships between them. Indeed, most of the existing research presents the end results of sustainable banking practices, but does not explain why they emerge or how they can be improved. A further limitation of the existing research relates to the methodological frameworks used. Most of this research relies on parametric analyses, which, as highlighted by Garland and Gendall (2004) and Ferreira *et al.* (2011), have

limited ability to provide practical contributions to sustainable relationship management. In particular, the process by which the determinants of sustainable banking are identified and articulated in such studies arguably appears somewhat arbitrary (Pan *et al.*, 2012).

Given these limitations, the recourse to modern approaches, such as FCMs and neural networks, constitutes a promising avenue in the field of sustainable banking. Although themselves not perfect, these “new” approaches hold the potential to identify the “missing links” between determinants, and consequently enhance value creation by increasing the transparency and our understanding of decision situations.

Our framework sees sustainable banking as a complex decision problem, where the determinants of sustainability are strongly dependent on diverse stakeholders with different and conflicting values and preferences. As such, it assumes a process-oriented position and will be developed with the direct involvement of professionals from the banking industry.

3. Research problem and methodological background

3.1. Research problem

This study aims to analyze the conditions and key determinants that support sustainable banking; since, as previously noted, integrating sustainability into the banking activity is not an easy task. Not only are there a considerable number of decision makers with different and conflicting values and preferences involved, but there are also a large number of determinants of sustainability to be considered. While it is true that this makes the integration of sustainability in banking strategies and decisions more challenging, it is also true that this is an increasingly pressing issue for these financial institutions. A better understanding of the determinants of sustainability and the ways in which they are interlinked, will help bank managers and decision makers to enhance value creation through better, more informed decisions, at the same time as sustainability objectives are moved forward.

3.2. General overview of the methodology

Although there can be many ways to consider decision problems and decision making situations, when these are multifaceted and multiple criteria are involved, additional demands are placed on the methodological approach adopted. Cognitive mapping has

been argued to be particularly adapted to such situations, not only because it allows the modeling of complex relationships between variables in multifarious phenomena (Carlucci *et al.*, 2013), but also because, as visual tools, maps “*facilitate the representation and communication, support the identification and the interpretation of information, facilitate consultation and codification, and stimulate mental associations*” (Gavrilova *et al.*, 2013: 1758). Indeed, by directly involving participants and fostering discussion between them in order to come to a consensual group map, this methodology promotes greater processual transparency, improves understanding of the decision problem and reduces the likelihood of omitted variables (Peña *et al.*, 2008; Ferreira *et al.*, 2012).

Within cognitive mapping, “Fuzzy Cognitive Maps” (Kosko, 1986, 1992) in particular have been extensively applied to contexts and decision problems characterized by high levels of complexity (*e.g.* Kardaras and Mentzas, 1997; Stylios and Groumpos, 1999; Tsadiras *et al.*, 2003; Kok, 2009; Salmeron, 2009 and 2012; Papageorgiou *et al.*, 2012; Carvalho, 2013). The novelty in FCMs lies in complementing cognitive mapping with fuzzy logic. In FCMs, the relationships between criteria can be represented by positive and negative causality at the same time; the intensity of which is then translated into a number which can go from -1 to 1. The resulting map thus allows for dynamism, by including feedback links between the different variables/criteria (Carlucci *et al.*, 2013), as represented in *Figure 2*, where C_i is criterion or variable i and W_{ij} represents the extent to which criterion i influences criterion j . This relationship (W_{ij}) can be of positive, negative or null causality, depending on whether C_i causes a move in the same direction, the opposite direction or has no impact on C_j .

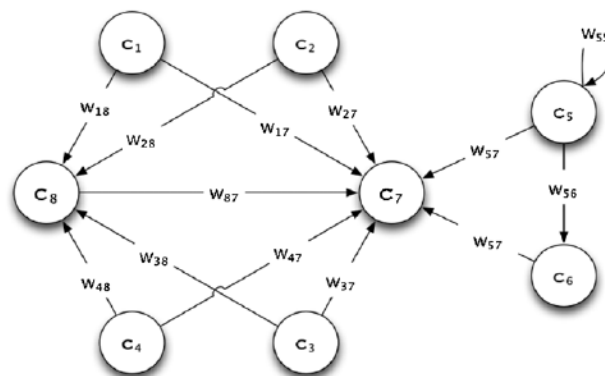


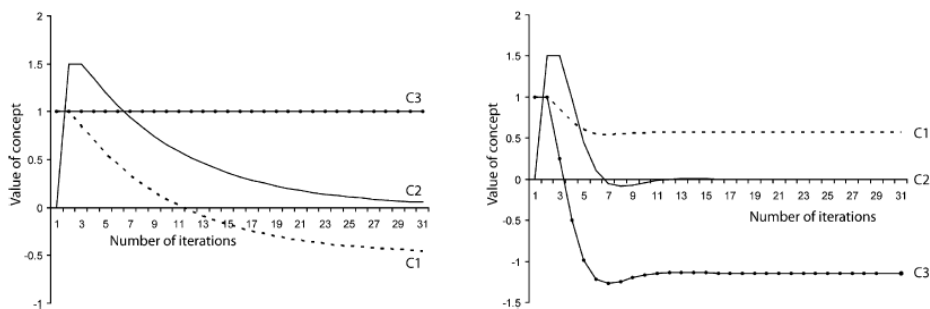
Figure 2. Example of a typical FCM

Source: Salmeron (2012: 3706).

The mathematics behind FCMs can be summarized in the following equation (see equation 1), where $A_i^{(t+1)}$ is the activation level of criterion C_i at time $t+1$; $A_i^{(t)}$ is the activation level of criterion C_i at time t ; $A_j^{(t)}$ is the activation level of criterion C_j at time t ; W_{ji} is the weight of the interconnection between both criteria; and f represents a threshold activation function (Mazlack, 2009; for further details, see also Stach *et al.*, 2005; Papageorgiou *et al.*, 2012; Glykas, 2013).

$$A_i^{(t+1)} = f \left(A_i^{(t)} + \sum_{j=1}^n A_j^{(t)} \cdot W_{ji} \right) \quad (1)$$

Mazlack (2009) clarifies that the overall impact of a change in the value of a particular criterion is given by a new state vector A_{new} , which is obtained by multiplying the previous state vector A_{old} by the adjacency matrix W . “The resulting transformed vector is then repeatedly multiplied by the adjacency matrix and transformed until the system converges to a fixed point. Typically it converges in less than 30 simulation time steps” (Carlucci *et al.*, 2013: 213). Aiming to exemplify this type of exercise, Figure 3 shows the results of a simulation carried out by Kok (2009).



Source: Kok (2009: 125).

Figure 3. FCM stabilization and value convergence points

A ranking (*i.e.* “strength of impact”) of criteria is then obtained, reflecting how the system is perceived in the FCM. This allows: a) the impact of changes in the value of any single concept to be assessed; b) the strength of the impact of concepts on each other to be determined; and c) “what if” questions to be formulated, in order to ascertain the impact on the system as whole of changes, addition or removal of some concepts.

The most common challenge in applying this kind of methodology relates to the difficulty of getting group members (in this case, experts from banking institutions)

together in the same place at the same time, for what are relatively long sessions required to develop a joint cognitive map. Although this is an issue to be taken seriously, we considered that the potential benefits of the application of FCMs to the field of sustainable banking, in terms of contribution to both theory and practice would greatly outweigh this challenge. To the best of our knowledge, this study constitutes the first attempt to identify key determinants (and the “missing links” between them) of sustainable banking using cognitive mapping techniques. We anticipate practical implications for bank managers and policymakers who aim to increase the efficiency of their decisions in terms of sustainable banking.

4. Construction of the fuzzy cognitive map

In this section we present a step-by-step discussion on how the FCM approach was used to identify key determinants of bank sustainability, and the dynamics between them.

4.1. Participants involved

With regard to the participants in this type of study, Yaman and Polat (2009: 387) argue that “*using a group of experts has the benefit of improving the reliability of the final model*”. As such, we sought to set up a professional panel, in this case constituted by banking experts. After several unsuccessful attempts, due to availability restrictions and incompatible schedules, we were finally able to form a panel with seven participants. This final group was comprised of three regional directors, two bank branch managers and two bank branch front office employees, from the five largest banks operating in Portugal. Although “*the expert panel number is quite difficult to establish and no study has been conclusive with respect to it*” (Salmeron, 2009: 276), seven can be considered a very reasonable number of participants for this kind of research in particular, since “*the consultant [i.e. facilitator] will relate personally to a small number (say, three to ten persons)*” (Eden and Ackermann, 2001: 22). Furthermore, the group’s heterogeneity allowed different perceptions on sustainable banking to be confronted, enriching the discussion underlying the whole process. The expert panel was brought together during an intensive 7-hour meeting, which was conducted by an experienced facilitator assisted by an ICT technician.

4.2. Identifying concepts and quantifying relationships

The group meeting started with an initial clarification of the research objectives and a presentation of the principles of FCM. The aim was to ensure a common understanding of the purpose of the session among the participants. Having established this common ground, the group was asked the following trigger question: “*Based on your own values and professional experience, what are the determinants of sustainable banking?*”. This provided the focus for discussion and allowed the “post-its technique” to be applied. This technique consists of writing what the decision makers consider as relevant criteria on post-its (*i.e.* one criteria per sticker), and sticking them on a large piece of paper (Ackermann and Eden, 2001). The process is grounded on continuous debate among the expert panel members and should be repeatedly executed until they are collectively satisfied with the outcomes achieved. In the next stage of the process, the post-its are organized by areas of concern (or clusters), which allows for additional discussion on the meaning and significance of each criterion. Once the areas of concern have been defined, each cluster is then carefully analyzed, so the post-its can be reorganized in a means-end-based structure (*i.e.* the most important/strategic concepts are put at the top of the cluster and the least important are put at the bottom). *Figure 4* illustrates the process followed in this study.



Figure 4. Snapshots of the “post-its session”

Once there is agreement within the group with regard to the form and content of the cognitive structure developed, this phase of the process is considered to be concluded, and a “strategic” or “collective” map is obtained. In our study, the final version of the map, which is partially illustrated in *Figure 5* and represents the group’s agreement on the key

determinants of sustainable banking, was developed using *Decision Explorer* software (www.banxia.com).

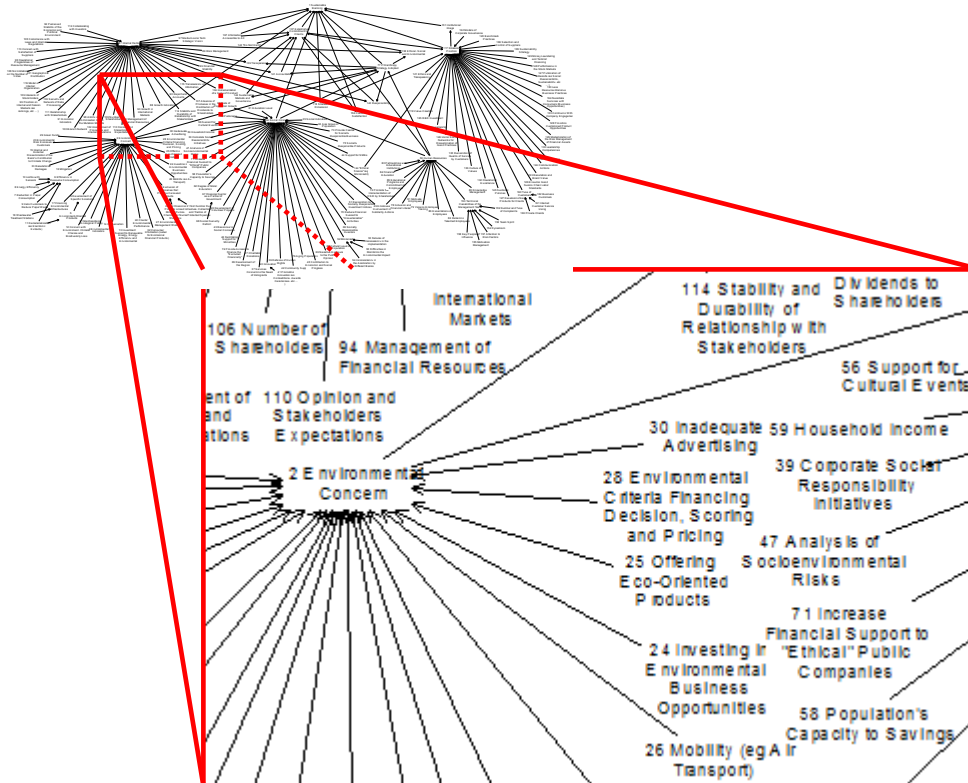


Figure 5. Part of the collective map developed

The final version of the map contained 167 determinants of sustainable banking, and for this reason could not be totally displayed in this paper. However, the contribution of this approach goes beyond the mere identification of criteria. It adds value by allowing vast amounts of information to be analyzed; and through the insights brought by the experts involved in the process (Ferreira *et al.*, 2014). The process is (and was in the current study) inherently subjective, but in practical terms, cognitive map allowed the panel members to be provided with a holistic view of sustainable banking, which they considered extremely useful.

In moving forward in the construction of a FCM, the agreed upon collective map was rebuilt using the *FCMapper* (<http://www.fcappers.net>) and *Pajek* software (<http://pajek.imfm.si/doku.php>). As complements to *Decision Explorer*, these two

software packages allow the intensity of the links between variables to be dynamically analyzed. *Figure 6* presents the new layout of the cognitive structure, where the numbers stand for the determinants of sustainable banking previously identified.

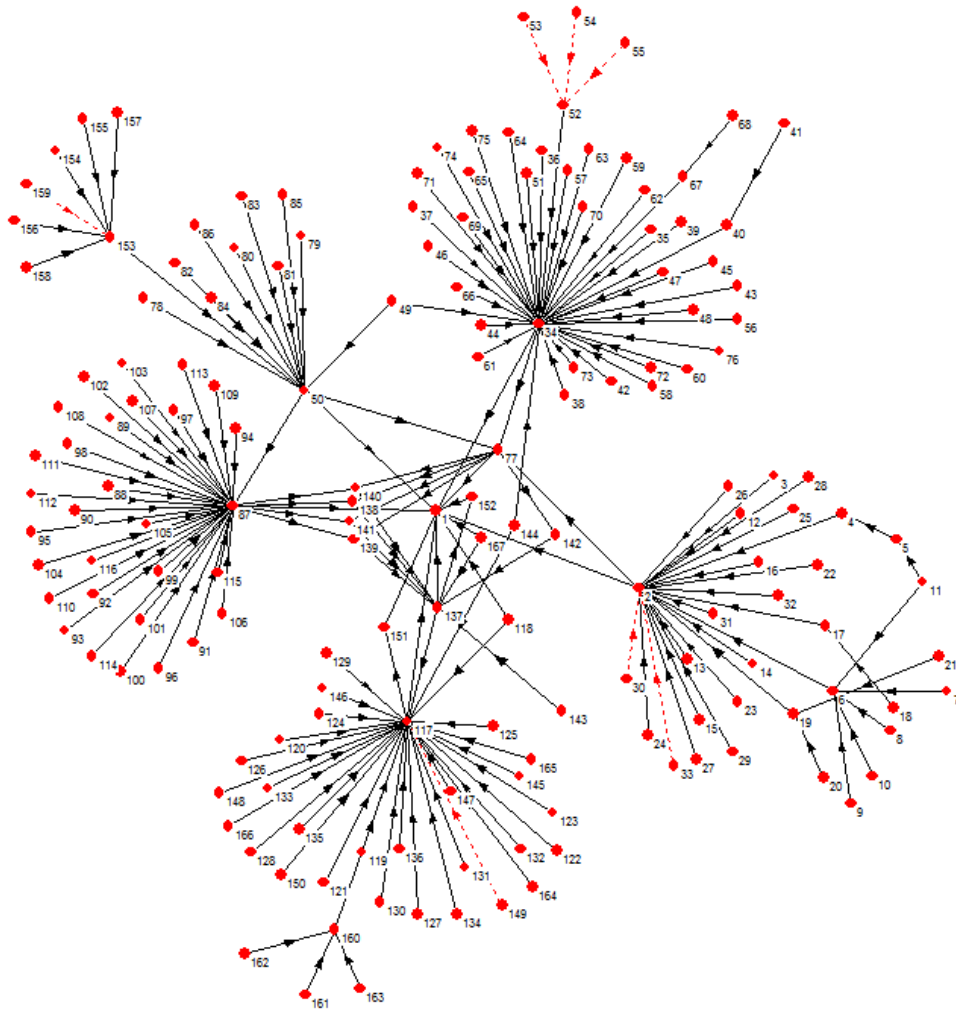


Figure 6. [Initial] Structure of the FCM

The panel members were provided with *Figure 6* and asked to analyze the intensity of the links. *Figure 7* illustrates this analysis, which was performed for all the clusters and where the intensity of each link ranges between -1 and 1 (*cf. subsection 3.2*).

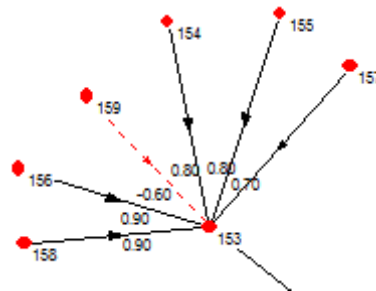


Figure 7. *Quantification of relationships*

These degrees of intensity expressed by the group were then introduced in a 167 x 167 adjacency matrix. Again, size restrictions mean that this matrix cannot be displayed in this paper. However, *Figure 9* exemplifies the matrix used: N_i stands for criterion i and e_{ij} represents the intensity degree between criteria i and j , as defined by the expert panel on a collective basis.

	N_1	N_2	...	N_{N-1}	N_N
N_1	0	e_{12}	...	e_{1N-1}	e_{1N}
N_2	e_{21}	0	...	e_{2N-1}	e_{2N}
...
N_{N-1}	e_{N-11}	e_{N-12}	...	0	e_{N-1N}
N_N	e_{N1}	e_{N2}	...	e_{NN-1}	0

Source: Stach *et al.* (2005: 380).

Figure 8. *Adjacency matrix*

The development of the adjacency matrix served to promote additional discussion on the results and helped define the study recommendations (Yaman and Polat, 2009; Salmeron, 2012; Carlucci *et al.*, 2013).

4.3. *Interpreting the research outputs*

Several static and dynamic tests were carried out throughout the study; and, “*through a proper neural network computational model, [...] what we can get is an idea of the ranking of the variables in relationship to each other according to how the system is perceived in the FCM*” (Carlucci *et al.*, 2013: 216). This criteria interaction allowed the most relevant determinants of sustainable banking to be presented in *Table 1*.

Table 1. Major determinants of sustainable banking [based on centrality]

Determinants	Reference	Outdegree	Indegree	Centrality
Social Concern	34	1.80	28.10	29.90
Strategic Position	117	1.799999952	25.2	26.99999995
Internal Factors	87	4.10	22.70	26.80
Environmental Concern	2	1.50	17.40	18.90
Human Resources	50	2.40	8.90	11.30
Commitment to Clients	137	2.599999905	6.1	8.699999905
Philanthropy Strategy Adopted	77	5.00	2.60	7.60

These results are, naturally, context-dependent, meaning that they could have been different had the panel of experts been another or had the session had a different duration. (for details, see Ferreira *et al.*, 2014). However, it is important to note that in addition to the results themselves, the approach followed allowed for discussion among experts and promoted a better understanding of the determinants that influence sustainable banking.

A centrality index was calculated for each criterion comprised in the FCM. Due to the high number of criteria (*i.e.* 167), only the ones with greater indices were included in *Table 1*. In particular, *Social Concern*, *Strategic Position* and *Internal Factors* present the highest centrality indices (*i.e.* 29.90, 26.99 and 26.80, respectively). The way each criterion contributes to the calculation of these indices offers real insight into the dynamics behind sustainable banking, supporting the premise that “*FCMs are simple, yet powerful tools for modeling and simulation of dynamic systems, based on domain-specific knowledge and experience*” (Papageorgiou *et al.*, 2012: 45).

As Salmeron (2009: 275) points out, “*from an Artificial Intelligence perspective, FCMs are supervised learning neural systems, whereas more and more data is available to model the problem, the system becomes better at adapting itself and reaching a solution*”. Indeed, the results obtained in this study suggest that FCMs hold great potential for operational planning and improvement of sustainable banking, which is of prime concern for banks and society at large.

4.4. Limitations and recommendations

The knowledge-based representation of sustainable banking resulting from the construction of the FCM allowed the group members to: (1) identify objective and subjective determinants of sustainable banking; (2) identify key feedback loops and analyze the dynamics of the system; (3) engage in meaningful discussion throughout the meeting; and (4) provide insights that can improve our understanding of sustainable banking.

Naturally, this proposal is not without its own limitations. As already pointed out, the process followed is subjective in nature and its context-dependence discourages direct extrapolations. In addition, and as argued by Stach *et al.* (2005: 372), “*FCM development methods are far from being complete and well-defined [...] the development of FCM models almost always relies on human knowledge [...] and] strongly depend on subjective beliefs of expert(s) from a given domain*”. Balancing pros and cons, it should be underlined, however, that these limitations are arguably more than compensated by the exchange of ideas underlying the negotiation process and by the insights brought to the system by the panel of experts, which might go undetected by simple applications of statistical methods alone (*cf.* Stach *et al.*, 2005).

5. Conclusion

There has been significant progress in the field of sustainable banking in recent times. Notwithstanding, existing contributions fall short of clearly identifying the cause-and-effect relationships between the determinants of sustainable banking. A knowledge-based representation of sustainable banking has been identified as a research priority for the development of sophisticated decision support systems, because, as noted by Kim and Lee (1998: 303), “*knowledge engineering is one of the most important tasks in developing expert systems. One of the primary objectives [...] is to develop a complete, consistent and unambiguous description of the knowledge base*”.

Based on this premise, and taking a constructivist standpoint, this paper made use of FCMs to, through the discussion and negotiation of a group of experts: identify the main determinants of sustainable banking; define them; determine their interactions; create a visual map of the whole system; and analyze its dynamics.

The results of this study can be expected to contribute to the literature, not only in what refers to sustainability strategies in the banking sector, strategic knowledge asset management and operational research, but also at a methodological level. By reducing the number of omitted criteria and increasing our understanding of the relationships between variables, this study strengthens previous claims that fuzzy logics (and FCMs) can provide an important alternative for overcoming some of the limitations associated with the methodologies currently most in use in the industry (*cf.* Keršulienė and Turskis, 2011; Glykas, 2013). Indeed, sustainable banking decisions are characterized as being complex, subjective, and fuzzy in themselves; which makes them a particularly appropriate context for the application of knowledge-based frameworks. FCMs, as neuro-fuzzy systems, are able to incorporate expert knowledge; and as such hold powerful and far-reaching potential to analyze and model complex decision problems, where there is scarcity of information or data, as is often the case in sustainable banking situations.

As discussed, our proposal is context-depend and not without its own limitations. Therefore, it would be of interest for future research to: (1) replicate the study with another set of banking experts, in order to determine the robustness of the research outcomes; (2) replicate the process followed within another country; (3) compare the results obtained from different methodological applications (see Xu and Ouenniche, 2012); or (4) extend the proposal to other contexts. Any such advance in our understanding of sustainable banking, can be used to create (or improve) new strategies.

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The model of knowledge management system supporting sustainable growth in machine-building industry enterprises

Adam Gumiński*, Katarzyna Dohn, Adam Gumiński, Mirosław Matusek, Wojciech Zoleński

Department of Organisation and Management
Silesian University of Technology
44-100 Gliwice, Akademicka Street 2A, POLAND

** Corresponding author*

Structured Abstract

Purpose –The main objective of the paper is to present the model of management system supporting knowledge processes and integrating economic, social and environmental factors in the activity of machine-building enterprises. Successful management in all areas of enterprise’s activity is determined by processing of adequate knowledge in business activity. Machine-building enterprises are crucial elements in creating sustainable growth by decisions at all stages of new product deployment. The great importance for machine-building enterprises is reducing the level of operational risk. It means the need to have the adequate knowledge to improve chances of profitable contracts and to avoid unfavourable ones.

Design/methodology/approach – The model and the system structure were worked out on the basis of research study undertaken in machine-building enterprises. The studies were conducted as qualitative research in 38 Polish machine-building enterprises located in Silesia, recognized as small and medium-sized companies (the target group for which the system was dedicated). The research was conducted in the form of direct interviews with managers using structured questionnaires. As a result the model of knowledge management system was determined and the IT system supporting knowledge management in machine-building enterprises on the basis of the proposed model was worked out.

Originality/value – The value of undertaken research was the model of an information system supporting knowledge management in the execution of contracts in machine-building enterprises. The integration of such solutions as: expert systems, case-based-reasoning, knowledge object management system, dynamic research simulation system enables taking into account economic, social and environmental factors in decision-making processes at all stages of a contract execution.

Practical implications – The model and the proposed IT system support decision-making processes in such areas as: construction, supply, production, distribution and service. The functionalities of the system enables supporting employees responsible for the process of a contract execution, especially project and top managers. At all stages of projects’ execution managers have the opportunity to take into consideration economic, social and

environmental factors in decision-making processes. The important IT tools implemented in the proposed system, in the context of sustainable development, are risk management in the entire contracts' execution and the support in the selection of managers and project team members.

Keywords – sustainable growth, knowledge management system, expert system, machine-building industry enterprise.

Paper type –Practical Paper

1 Introduction

The operation of a manufacturing company is determined by a combination of production factors such as raw materials (environmental resources), financial resources (economic factors) and workload (social factors). The activity of a company brings about such effects as goods or services and waste materials of different type (e.g. pollution). According to the sustainable growth theory, it can be assumed that while accomplishing their objectives, the companies can simultaneously reduce their impact on the environment. The realization of sustainable growth principles at the company level means that the economic and ecological systems are combined. The management, in line with the sustainable growth principle, necessitates the introduction of such planning strategies and company operation policy which would be able to predict a potential, negative impact of such a policy and to undertake measures to counteract it or at least considerably reduce its consequences. An effective realization of the sustainable growth concept in Polish manufacturing companies can be only successful when the strategic realization of vision and mission as well key decision-making processes are supported by multivariate tools and processes of knowledge management which allow for the criteria and conditions involving the principles of sustainable growth.

Effective and efficient realization of knowledge management processes is a key factor contributing to a more productive operation of a company, in particular with respect to manufacturing companies which make use of high-tech solutions and where a product is dedicated to a specific customer (Jashapara, 2006; Kisielnicki, 2008; Kowalczyk, Nogalski, 2007; Szmaj, 2013). A complicated system of internal processes in such companies (Dohn and Gumiński, 2012; Dohn and Gumiński and Zoleński, 2011) necessitates the application of IT solutions which support knowledge-based processes, i.e. knowledge acquiring, storing, transferring and processing in the operation of a company

as the best supportive instrument of decision-making processes which require both quantitative and qualitative processing (Nonaka and Takeuchi, 2000).

The paper presents the research model, the results of the carried out research studies in the selected Polish machine-building companies, the model of knowledge management system and the IT system based on it. The worked out system is dedicated to small and medium-sized machine-building companies. The main objective of the proposed model of knowledge management system is to support decision-making processes during the realization of a contract portfolio and also to facilitate the realization of company's management strategy in terms of its sustainable growth.

2 Literature review

2.1 Knowledge management background

Nowadays organizations recognize that knowledge and its effective development, deployment and exploitation represent a fundamental source of sustainable competitive advantage (Schiuma, 2009; Schiuma et al., 2008).

The literature on the subject offers many approaches to the problem of knowledge management, viewed both from the theoretical perspective and from economic, practical experience (Nonaka, Takeuchi, 1995; Davenport, Prusak, 1998; Hall, Paradise, 2005). In some approaches knowledge management is treated as information technology (knowledge management software) and others treat it as a management philosophy which has little to do with economic practice (Ferrari, de Toledo, 2004). As it was proved by J.Pfeffer and R.Sutton (2002), in practice there is a big discrepancy between the accumulated knowledge and the ability to apply it. It results from the fact there are no approved models or procedures which might assist the companies as a kind of guide. Such a situation might be the direct result of differently understood interpretation of knowledge and the management of knowledge, in particular when viewed from the perspective of theoreticians or practitioners of management. A comprehensive approach to the problem of knowledge management has been proposed by G.Probst, S.Raub and K.Romhardt (2004). In this approach, knowledge is treated as a core around which the whole structure of knowledge management is built. The authors claim that this is the only concept which allows us to translate the problems of management into the problems connected with knowledge, making knowledge the basic category of management.

Sveiby and Lloyd (2009) conclude that the main features of the organization that enters the phase of knowledge organization are: intangible assets and exploiting the limited resources of the knowledge era. Grover and Davenport (2001) argue that the processes of knowledge management are located between information and the sources of income in the organization (e.g. services rendered or sold products), aiming towards the acquisition of knowledge, the definition of knowledge and the knowledge transfer (Roblek et al. 2014).

2.2 Fundamentals of sustainable development in business environment

Over the years, many business organizations, governments, local agencies, and non-governmental organizations have been promoting sustainability, encouraging the establishments of regulations, activities for sustainable production and consumption, education processes (Lukman, and Glavie, 2006).

One of the key challenges which the sustainable growth is facing is the fact that it requires a new and innovative approach to decision-making and to the way of thinking. While the advances in the fields of knowledge and technology contribute to the economic development, they are also offering some potential to provide assistance in solving the risks and hazards threatening the stability of social relations, natural environment and the economy. New knowledge and innovation in technology, in management or in public policy is challenging for the organizations and forces them to make new choices in everyday business operation, in particular with respect to products or services and in view of the impact on the natural environment, people or national economies.

The literature provides many approaches and many definitions of sustainable growth.

But understanding sustainability is a complex task. Berke (Berke, 2002) believes that sustainability may be the next paradigm or "framework to dramatically shift the practice of local participation from dominance by narrow special interests toward a more holistic and inclusive view".

On the other hand (Roosa, 2008) is asking himself the following question: is "sustainable development" a policy, a set of policies, a management philosophy, an agenda, a new set of solutions, a new set of problems, or all of these? Can sustainability, an abstraction, be defined and how could it possibly be measured? What solutions, if any, does it offer? Is sustainability worth pursuing?

Undoubtedly the concept of sustainable development needs to be incorporated into the policies and processes of a business (Dally, 1990). It will require new cultural orientation and extensive refinements to systems, practices, and procedures. Besides the imperatives of creating a sustainable and profitable business are compatible to the best interest of human society and the natural environment. The sustainable view of a business is that the business world is a part of the natural and social system. It is intertwined and has dramatic implications in the absence of one or the other (Wong, 2010).

In view of the above, one can argue that the concept of sustainable growth is a new proposition of a new and qualitatively better form of conscious and responsible individual and social life, where the development is taking place together with and in accord with the surroundings, both social and natural, and where the ecological limitations and social expectations are taken into consideration. The functioning mechanism of the concept of sustainable growth can be narrowed down to the realization of three basic objectives (Skowroński, 2006):

- 1) ecological – which consists in preventing the degradation of the environment and the elimination of environmental risks,
- 2) economic – which means that basic material needs of humanity should be satisfied with the use of engineering and technology friendly to the environment,
- 3) social and humanitarian – which ensures social minimum (liquidation of famine, poverty and misery), health protection, the development of spiritual aspect of man (culture), safety and education.

2.3 Impact of knowledge management on sustainable growth

Taking into account the main assumptions of both knowledge management and sustainable growth, one can argue that although they are two different disciplines, some aspects of knowledge management overlap the activities characteristic for sustainable growth.

The empirical authors' studies show that in various sectors of industries, the prudent use of knowledge while factoring in the importance of societal demands and the conservation of the ecosystem will derive great returns to the stakeholders of the organization.

Table 1 presents the relation between the process of sustainable growth and the results of knowledge management (Wong, 2010).

Table 1

Framework of sustainable development versus knowledge management

	Sustainable development (SD) activities	Sustainable development (SD) impacts	Knowledge management (KM) outcomes
1	Commitment to Stakeholders	Staff	Positive Responds to KM Initiatives
2	Innovation in Products/Services	Skills	Development of Capabilities and Intellectual Capital
3	Redefining Policies and Legislation	Structure	Re-engineering Processes
4	Awareness and Changing Mind-set	Shared	Values Learning Organization
5	Mobilizing Science and Technology	Systems	Knowledge Management Systems
6	SD Practices to Foster Social and Human Capital	Style	Business Transformation
7	Measurement, Review, and Recognition	Strategy	Reward and Recognition

Source: Wong, 2010

Many authors emphasize that knowledge can be considered as critical foundation for sustainable development innovation (Laszlo and Laszlo, 2002; de Sousa, 2006; Sheng and Sun, 2007; Brzóška, 2012). Mohamed and Stankosky say that sustainability now acquires its meaning in the midst of a knowledge-centered worldview that remains intrinsic in what it could be termed as the socio-scientific order. Such a knowledge-centred worldview and its domains of action, the socio-scientific order, being unified on the basis of a uniquely epistemological premise of unity of knowledge, is also of an extensively ethical and moral kind. Nonetheless, they presuppose that achievement of these goals all at once is impracticable. Consequently, the aim should be founded on a reasonable compromise that considers the proportionality of the contribution of each of these elements to sustainability. Therefore, striking the balance between economic growth and environmental issues is highly recommended by investigators such as Daily and Huang (2001), who emphasize the importance of ecological sustainability, but call for a balance amongst economic development, technological progression, and natural resources protection.

2.4 Specificity of Polish machine-building industry enterprises

Machine building industry is a branch of heavy industry. The machine building sector covers the production of machines used in other branches of industry. The products fabricated by this sector involve among others the machines for mining industry, steelmaking, energy production, agriculture and also machine tools and engines.

The sector combining the manufacturers of machinery and equipment in Poland has a very wide range of suppliers from different branches of industry. You can distinguish here the suppliers of basic production means such as: energy, water and other public services, suppliers of raw materials and other materials or components for the production of final products as well as the suppliers of machines and equipment used in manufacturing processes. An overwhelming majority of machine tool manufacturers produce their machines from ready-made intermediates. Hence, the rising trends in competitiveness or production quality is largely determined by the suppliers of purpose machines: CNC machine tools, welding machines, bending machines, grinding machines, etc. It should be underlined here that a significant contribution of the suppliers to the generation of costs in companies and their dependence on the quality of raw materials and intermediates offered by the suppliers. The customers in the sector of machinery and equipment can be divided into several groups: individual customers, private companies, the ones which purchase products from this sector to apply them further in the manufacturing of their own final products, e.g. automotive, building construction or mining sector, as goods applied in supporting processes: storing, transport, institutional customers, wholesalers and home or overseas dealers – intermediaries in the trade of machines, own subsidiaries (Matusek, 2013). With respect to factors which determine the financial result of the analysed companies, it should be singled out among others such factors as the share of the buyers in the sales value for a given company, knowledge of the buyers about market offer and the number of competitors in the sector.

In the sector involving the manufacturers of machinery and equipment, the greatest impact on the competition state is exerted by buyers. These are usually institutional customers who have perfect knowledge about the market and specific, growing expectations involving safety, quality and also ecological conditions of machine operation (Matusek, 2013; Kramarz M., Kramarz W., 2011).

Business processes are realized in line with the standards formalized in the quality management system, safety management system and environmental management

system, whereby the machine building manufactures can ensure proper functioning in accordance with the principles of sustainable growth.

Furthermore, the buyer-companies purchase products in large quantities, making the manufacturer dependent on them to some extent. The most important competitiveness factors involve the level of technology and innovation. Innovative activities have principally the character of product or process innovations, and therefore, in order to be viewed as competitive, the companies must ensure knowledge acquisition, storing and transferring, in particular by the engineering staff (designers, top management and supervising staff) (Matusek 2013).

3 Research methodology

3.1 Characteristic of research procedure

In order to work out a model of knowledge management in Polish machine-building companies, a research procedure was proposed in which three basic stages were singled out (Fig.1):

1. The first stage consisted in the studies carried out in the selected companies of machine building industry, involving the analysis of the implemented procedures of information processing to support the management as well as the analysis of knowledge sources. This stage was divided into two parts. In the first part questionnaire studies were carried out which were to answer the following questions:
 - what are the key business processes in the investigated companies?
 - how is the information system organized in the investigated companies (formalization level, applied procedures)?
 - what elements of the sustainable growth concept are reflected in the realized business processes in the investigated companies?
 - which management systems are applied and what is their application scope (quality management, environmental management, safety management, risk management)?
 - to what extent the implemented management procedures allow for the principles of sustainable growth? Where and what type of necessity

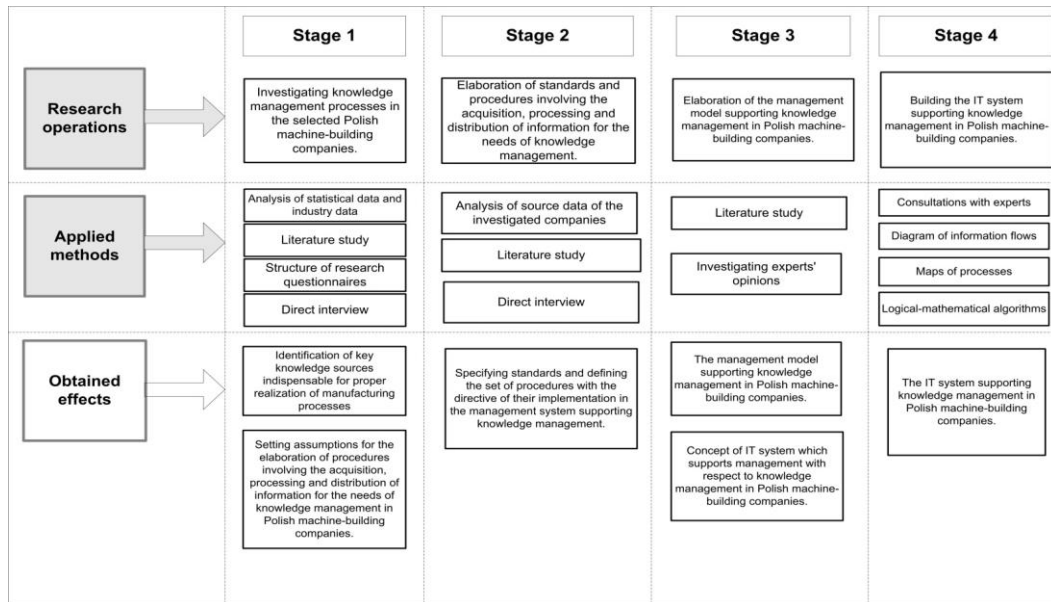
occurs in the order realization process which involves frequent application of “non-routine” information sources¹?

- what information tools and to what extent are applied in the customer’s order realization by the investigated company?

In the second part the prepared research questionnaire paper was to answer the following questions:

- are there any procedures of information processing which support the management of knowledge, and what type of procedures?
 - what are the potential sources of knowledge in the investigated companies?
 - what are the key areas of knowledge, allocated accordingly to its main recipients?
 - what are the applied solutions, methods and tools in knowledge management processes, i.e. knowledge acquisition, storing, transferring and processing in the activity of other investigated companies, and, basing on the above, how are the deficits determined involving the support of knowledge processes with IT solutions?
2. The second stage consisted in the elaboration of knowledge extraction procedures and the methods of its formalization and registration in the investigated companies, which, in effect, yielded the specification of standards and a set of procedures with the directive of their implementation in the field of knowledge management.
 3. The third stage consisted in building of the management model with respect to knowledge management, and ultimately the IT system supporting the knowledge management in Polish machine building companies.
 4. The fourth stage consisted in the elaboration of the IT management system supporting knowledge management in the machine-building companies.

¹ *Non-routine sources of information are understood as e.g. the necessity to create non-standard reports, solving untypical problems, need to contact external experts etc.*



Source: own preparation

Fig. 1. Research model

The carried out research studies in the selected machine-building companies had a qualitative character. The investigation studies of that type are frequently carried out with the help of such tools as questionnaires for collecting data, interviews for in-depth analyses of problems, focus groups, observing the work in progress (Liebowitz et. al., 2000). Such tools offer the opportunity to make other observations and to understand how the management of knowledge is perceived by employees.

The research studies were conducted in the form of directed interviews with the representatives of the companies with the use of structured research questionnaires. The group of respondents was made up by owners, company managing directors, managers of units responsible for the development of new products and for the implementation of technologies (e.g. engineering department, technological preparation of production).

The questions involving the sources of knowledge and the application of the instruments supporting knowledge management were grouped allowing for knowledge management processes, i.e. acquisition, storing, transferring and application of knowledge. The respondents were assessing the level of current use of a given instrument in the scale from 0 to 6 (Likert's scale), where 0 meant no use and 6 meant intensive use of the instrument.

In addition, the respondents assessed the target state, i.e. they assessed the implementation necessity of a given solution in the investigated company.

3.2 The selection of the research sample

The research studies involved the sector of medium-sized and large machine-building companies from the Silesia voivodeship (due to the highest concentration of companies of that type in the area of Upper Silesia). The studies covered 38 companies (which accounts for 9.5% of the total number of machine-building companies in Poland), allowing for the size of the company and its economic activity sector.

The selection of companies was premeditated and was made basing on the following:

- size of the company (sale volume, employment level);
- industrial sector in which the company is operating;
- expenditure on research and development projects;

Basing on the accepted research assumptions and the declaration of non-objection of the company owners involving the access to information and consent to carry out research studies, 4 groups of companies (altogether 38 companies) were singled out, and the knowledge processes realized in those companies were subjected to research studies. The group comprised small-sized and medium-sized companies (it is the target group for which the system is being elaborated) including:

- general purpose machine-building companies (8),
- mining machine-building companies (15),
- machine-building companies for defence industry (6),
- machine-building companies for automotive industry (9).

Table 2 Characteristic of research sample

Assumption	Result
Classification criteria defining the population of companies	<ul style="list-style-type: none"> – size of company – medium-sized and large companies (employment level above 50 people), – industry sector in which the company is operating (machine-building companies for mining industry, for defence industry, machines and equipment for automotive industry, machine tool-building companies), – location of the company – Silesia voivodeship , – level of technological advancement – medium or high.
Population of companies	402 companies (acc. GUS data on 31.12.2010)

Research sample	38 companies (9.5%), including: <ul style="list-style-type: none"> – 15 companies from mining sector – 8 companies from machine tool-building sector – 6 companies from defence sector – 9 companies from automotive sector.
Method of data collection	Direct interview with the use of a research questionnaire with the members of top management staff

Source: own preparation

3.3 Research results

The main objective of the carried out research in the selected Polish machine-building companies was to elaborate methodological assumptions needed to build a management model with respect to knowledge management in a machine-building company and to determine the scope of problems and elements which should be taken into account in the elaborated model. In addition, the research studies made it possible to determine the functional range of the IT system which supports knowledge management in a machine-building company.

By and large, the conducted research analysis in the selected machine-building companies rendered the acquisition of effects with respect to the following:

1. Identification of the structure of IT system and management processes.
2. Identification of key processes realized within the management of contracts portfolio in particular functional areas (designing, supply, distribution, supporting processes), allowing for the factors determining the sustainable growth of a machine-building company.
3. Identification of knowledge processes supporting the management of contracts portfolio (acquisition, storing, transferring and utilization of knowledge).
4. Determining knowledge deficits in key business processes in the realm of contracts portfolio management.
5. Determining the applied information solutions supporting the management of contracts portfolio.

In effect of the analysis of management systems in the investigated machine-building companies, the following information were determined:

1. Structure of management processes,
2. Management methods and tools,

3. Formalization level of routine and non-routine information indispensable for management,
4. Applied management systems (of quality, environment, safety),
5. Applied IT solutions supporting the management,
6. Functional range of the applied and planned for implementation IT solutions.

Table 3 presents the information involving the applied management systems, the number of used management systems independently for each group of companies.

In 36 companies (out of 38 subjected to research) the quality management system was introduced in line with the standard ISO 9001. It should be emphasized that in the majority of companies this standard is a foundation on which management processes are based. In the majority of the investigated companies there was a high level of specificity as to formal scopes of activities allocated to managerial and technical positions. Due to the cooperation with overseas contractors, the certification complying with other standards was implemented in some companies.

Table 3 Applied management systems in the analyzed machine-building companies

Management state	Group A	Group B	Group C	Group D
Quality management system in compliance with ISO 9001	13	6	8	9
Quality management system in compliance with other standard	2	3	2	7
Environment management system in compliance with ISO 14001	2	2	1	5
OHS management system in compliance with PN 18001	7	3	4	6

Source: own preparation

The system of environmental management being in compliance with ISO 14001 and the system of OHS management being in compliance with PN 18001 were only implemented in 10 investigated companies.

The quality management systems and connected with them certificates are viewed as an instrument used to create the image of a company and to enhance the competitiveness of its products. In some cases appropriate certificates are required by contractors. The usefulness of quality management systems for the perfection of processes realized in a company is assessed as high, but only in the areas where the formalization of procedures is well-founded. The implementation of formalized, detailed

procedures is sometimes confronted with certain mental barriers, with respect to both employees and the management staff. Getting used to very far-fetched formalization takes time. It should be also emphasized that detailed formalization of procedures is not always possible and justified. Besides, also high costs and large labour intensiveness generated by the implementation and maintenance of these systems are indicated.

It must be underlined that there were considerably fewer implementations of environmental management systems or OHS management systems. The said systems were introduced later so they can become common in the analysed companies in the future. In terms of the realization of the sustainable growth strategy in the analysed machine-building companies, the environmental management and OHS management should be formalized.

With respect to the analysis of knowledge management processes in the analysed companies, the following information was collected:

- key factors for the development of a company,
- the scope of decisions and activities in the selected sector of knowledge management,
- applied and provisioned for implementation methods and tools supporting knowledge processes (knowledge acquisition, codification, transfer and utilization),
- knowledge deficits in knowledge management processes (acquisition, storing, transferring and utilization of knowledge) supporting the management of contracts portfolio.

The respondents from top management level indicated to very different advancement level of knowledge management in their companies. In some companies full cyclic knowledge audits were carried out in recent years, and in other cases the respondents emphasized the need to carry out knowledge audits without specifying any definite realization period. In many cases the interviewed managers accentuated the significance of information and knowledge as the key factors contributing to the development of company, yet as to implementation, the management of knowledge was treated by them as an issue which can be dealt with in the future. The managers rightly affirm that the infrastructure of knowledge management requires a lot of financial expenditures and time, and the positive effects show up relatively late.

Knowledge acquisition is a significant component of knowledge management in every company. The companies of machine-building industry should be particularly open to new technological solutions and to new solutions involving modern methods of organization and management. The carried out research studies illustrated the following knowledge deficits with respect to knowledge acquisition:

- lack of procedures of knowledge acquisition involving the problems with contract realization,
- insufficiently refined procedures involving knowledge acquisition from customers,
- lack of the verification of significance level of the codified knowledge,
- limited potentials allowing to take over the hidden knowledge from employees,
- insufficiently refined procedures involving the acquisition of knowledge about the experience of employees and experts connected with the realization of contracts.

Knowledge storing in manufacturing companies is taking place in three knowledge repositories: in the minds of employees (in the form of implicit knowledge), in documentation in paper (in the form of explicit knowledge) and in computer databases (in the form of codified knowledge). Of particular importance in the analysed companies is the unique knowledge of the employees involving engineering and technology, being stored in their minds as implicit knowledge which should be processed into a codified form.

The carried out research studies show the following knowledge deficits involving knowledge storing:

- insufficiently refined procedures involving the storage and updating of electronic documents,
- insufficiently refined procedures and tools involving the storage and updates of the knowledge on contracts,
- limited knowledge resources about the competence of employees and external experts.

The transfer of knowledge in a company allows the employees to access knowledge resources indispensable in various technological or managerial processes. To satisfy such an objective, it is necessary to ensure appropriate IT infrastructure for knowledge transmission. The transfer of codified knowledge is realized mainly through electronic communication channels. And the transfer of non-codified knowledge is realized mainly

in the form of formal and informal meetings of employees, knowledge fairs and mentoring programs.

The carried out research studies exhibited the following deficits involving knowledge transfer:

- insufficiently refined procedures involving the formation of task force teams within the scope of contracts being in progress,
- insufficiently refined procedures involving internal trainings and lectures,
- limited infrastructural potentials involving the exchange of knowledge between employees.

The use of knowledge requires that the effective realization of the remaining processes of knowledge management is ensured, i.e. the processes of acquisition, storing and transfer of knowledge. The use of knowledge presupposes an appropriate processing of knowledge resources for a definite objective supported by various IT systems which involve among others data management systems, knowledge management systems and new generation systems.

The carried out research studies indicated the following deficits involving the use of knowledge:

- limited utilization of assessment tools for realized contracts,
- limited utilization of codified knowledge in the implementation of process innovations,
- limited utilization of codified knowledge in the implementation of product innovations,
- insufficient potentials in the access to contextual technological and managerial knowledge during the realization of contracts portfolio.

The analysis involving the applied IT solutions demonstrates that none of the analyzed companies introduced a fully integrated IT system supporting the management. The analysis concerning the applied methods and tools of knowledge management shows that the changes in the functionalities of the applied IT solutions in machine-building companies are unavoidable and they are viewed as an on-going process resulting from the adaptation of business processes in a company to dynamically changing internal and external conditions. The respondents expect functionality in systems which are not fully integrated, but appropriately prepared to satisfy the needs of a given company. The

effectiveness criterion for the systems integrated with respect to knowledge management illustrates that the financial and non-financial expenditures are too high as compared to the obtainable effects.

The carried out research studies revealed a huge diversity range of IT tools implemented in the analysed machine-building companies in terms of the assortment and scale of production, organizational structure and economic-financial condition. The analysis shows that there is a great deficit of IT applications with respect to management support in the majority of the investigated areas. In order to define necessary measures to be undertaken to provide machine-building companies with IT technology, it is necessary to conduct a detailed analysis of technical requirements as well as to define internal and external capabilities and conditions for the implementation of IT solutions. The assessment involving the utilization of IT tools in the analysed machine-building companies obtained from the top managerial staff shows that there is limited satisfaction with the functionality of the implemented IT solutions and cautious approach to their further development.

4 The model of knowledge management system supporting sustainable growth in machine-building industry enterprises

4.1 Assumptions to build a management model supporting knowledge management

Taking into account the operating conditions of Polish machine-building companies, the assumptions involving the fabrication of knowledge management support model in a machine-building company were defined in detail. These assumptions on the one hand allow for external conditions connected with the aspect of competitiveness facing the company, and on the other hand they allow for internal conditions connected with the range and scale of business processes realized in line with the principles of sustainable growth. Basing on the carried out analyses, the following assumptions of the model structure were accepted:

1. The concept of the model is based on a fundamental assumption that the support of knowledge management processes should contribute to better effectiveness of contract realization, which is related with better efficiency and prowess of business process realization in the area of supply, production, distribution and supporting processes with the principle of sustainable growth taken into consideration.

2. The support of knowledge processes ensures the access to contextualized knowledge involving decision-making problems in all functional areas connected with the realization of contracts portfolio.
3. The model allows for the following internal and external engineering-organizational conditions of knowledge management in machine-building companies:
 - machining-assembly type of production has discrete character of high complexity,
 - a great share is made up by unit production, including the production of large machines, mainly as the make-to-order production,
 - the activity of the analysed companies is particularly sensitive to the changes of economic situation. The sensitivity to downturn is higher and more violent than the reaction to the improving economic condition,
 - proper operation of a company is conditioned by high competence of the employees in terms of engineering and organizational skills, principally in the field of production preparation (designers, technologists, the staff of the production organization department),
 - with the unit production, the viability of the company's operation is affected by many different low-stability factors, in particular such as order portfolio, parameters of contracts signed with customers (the price of a unit product can be very different), contract parameters with suppliers and subcontractors (prices can be very different).
4. The processes supporting knowledge management allowed for in the model encompass the scale and range of the applied IT tools, needs involving necessary changes of these tools and the changes of engineering-organizational conditions involving the operation of the analysed machine-building companies.
5. The model allows for the existing state of knowledge deficit with respect to IT tools supporting knowledge processes, i.e. acquisition, storing, transferring and utilization of knowledge in all processes of contract portfolio management (designing, supply, production, distribution, supporting processes).
6. The tools supporting decision-making processes in particular functional areas allow for economic, social and environmental criteria.

4.2 Description of the management model supporting knowledge management

For the needs involving the construction of the model of management support system concerning knowledge management, a general structure of works carried out in the process of contract realization in machine-building companies was accepted:

1. Preliminary offer – is supposed to find out if a company is able to execute the order. If yes, as the following step the estimate price is quoted, where the experience from the execution of similar products in the past plays an important role.
2. Proper offer – when the estimate price of the future machine is accepted by the buyer, the department of design and technology, basing on the accepted assumptions, works out the required construction and production technology. The above information is transferred to the procurement department where potential suppliers of materials and components needed for the production process are identified. Basing on the above procedures, the price of the mechanical construction together with labour costs are determined.
3. Realization and control over contract execution – after the agreement has been signed between the company and customer, the execution of contract is taking place, i.e. details of constructional and technological requirements are defined, orders are made by the procurement department and/or work outsourcing is taking place, as well as the production with the use of company's own resources. Simultaneously, the progress in the execution of the realized works is controlled on a regular basis.

In each of these stages one of the key tasks (frequently ignored in practice) is risk management and compliance with the strategy of sustainable growth. The authors constructed a model (Fig.2) which is oriented on the processes ensuring the settlement of a knowledge management system which would facilitate business processes realized in machine-building companies and enhance their effectiveness. The constructed system is supposed to enhance the usability of knowledge indispensable for the realization of a contract and to concentrate on important information which are crucial in terms of the value of the realized processes. Hence the model was based on the concept of Porter's value chain. A functional approach to the process realization was applied, and then the processes were divided into the processes of designing, supply, production and distribution. At the same time the said processes are realized within the frames of the

existing company structure and they take advantage of the results of previously executed contracts stored in the knowledge repositories at all management levels.

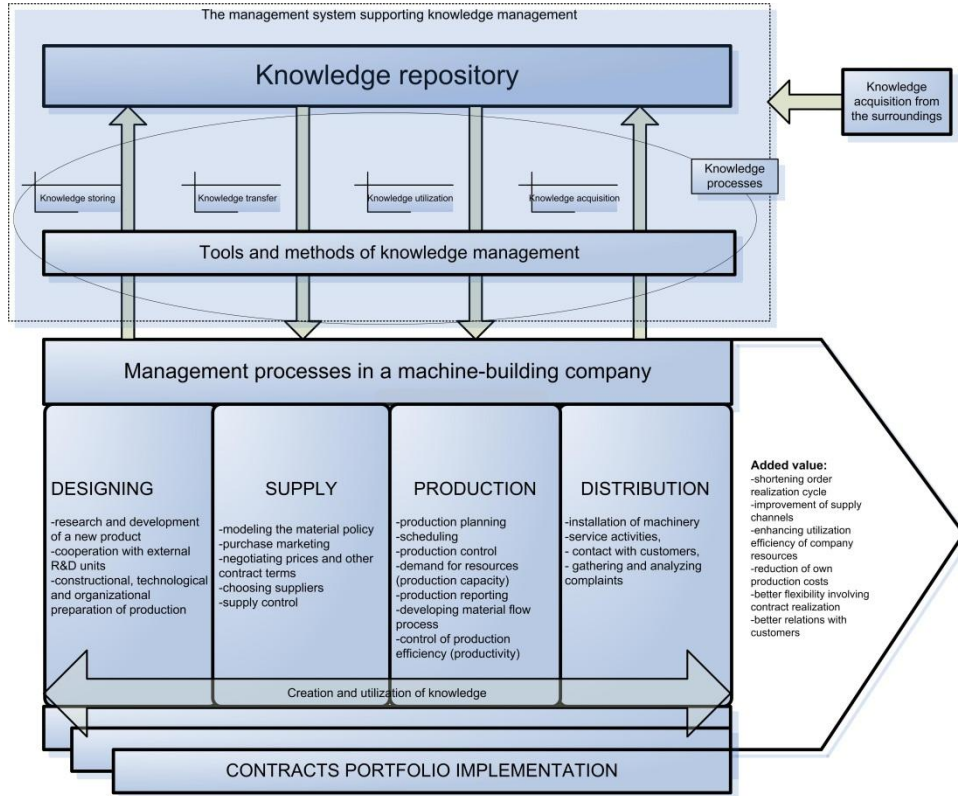


Fig. 2. Model of the management system supporting knowledge management
Source: own preparation

4.3. The computer management system supporting knowledge management in a machine-building company

Basing on the prepared model, an IT system supporting knowledge management in machine-building companies was worked out. A general structure of the system was presented in Fig.3.

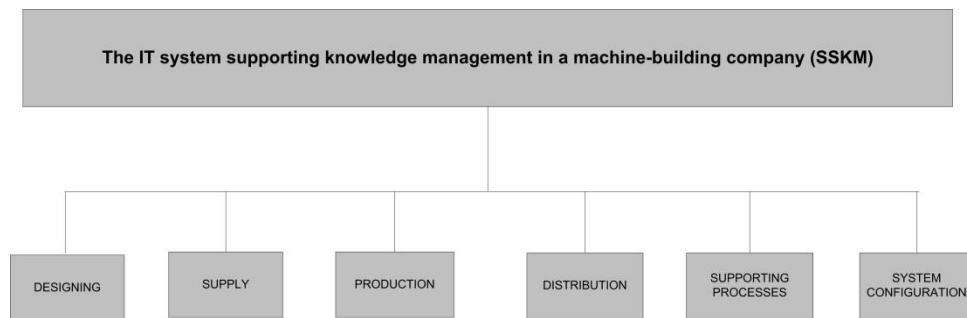


Fig. 3. Main modules of the management support system involving knowledge management in a building-machine company

Source: own preparation

The module “DESIGNING” comprises the following options:

- preliminary analysis of contract,
- support of designing processes,
- management of contract risk involving designing.

The module “SUPPLY” comprises the following options:

- analysis of suppliers,
- management of contract risk involving supply.

The module “PRODUCTION” comprises the following options:

- support of contract realization involving production scope,
- management of contract risk involving production.

The module “DISTRIBUTION” comprises the following options:

- customers,
- service,
- management of contract risk involving distribution.

The module “SUPPORTING PROCESSES” comprises the following options:

- database about contracts,
- risk management of contracts portfolio,
- human resources management.

The module “SYSTEM CONFIGURATION” comprises the following options:

- users of the system,

- work environment of the system,
- safety of the system.

The presented structure of IT system has been focused on supporting decision-making processes with respect to contracts portfolio management. It results from the need to provide a comprehensive support of knowledge processes in the preparation, realization and control of contracts to ensure their efficient realization in line with the principles of sustainable growth. The contracts which comply with specific requirements of a customer should be approached individually making use of the company's knowledge resources with the overall objective to support in the best possible way the realized business processes. In order to ensure effective storing of knowledge and its processing within the frames of the elaborated system, appropriate tools supporting knowledge processes must be allocated (Table 4).

Table 4 - Allocation of tools supporting knowledge processes to the management processes of contracts portfolio in a machine-building company in the System Supporting Knowledge Management

Management processes of contracts portfolio	Knowledge processes			
	Knowledge acquisition	Knowledge storing	Knowledge transfer	Knowledge utilization
Designing	KOMS (record of individual experiences of employees, record of good and bad practices used in designing area). ES (acquisition and codification of knowledge in the form of expert system rules) CBR (codification of experience in the form of cases)	KOMS (storing experiences in the hypertext form) CBR (storing knowledge in the form of verified cases)	KOMS (updating and sharing knowledge with system users) RM (updating and sharing knowledge on risk with system users) CBR (possibility of knowledge sharing through the access to cases-base, training staff on the basis of verified cases)	KOMS (use of electronic procedures to monitor business processes in designing) ES (preliminary analysis of engineering-organizational conditions of contract realization) ES (preliminary estimation of contract price) ES (preliminary legal analysis of a contract) CBR (simplification of the estimation process of the introductory contract price, fast and reliable response to the customer's queries)
Supply	KOMS (record of good and bad practices in supply, codification of procedures used in supply) ES (acquisition and codification of procedures used in	RM (storing knowledge on risk in supply area) KOMS (storing experiences in the hypertext form) CBR (storing knowledge in the form of verified cases)	RM (updating and sharing knowledge on risk with system users) KOMS (updating and sharing knowledge with system users) CBR (possibility of knowledge sharing	ES (preliminary selection and assessment of suppliers) KOMS (use of electronic procedures to monitor business processes in supply area) IPCS (supporting the

	supply area) SDRS (supporting the interpretation of system archetypes in supply area) CBR (codification of experience in the form of cases)		through the access to cases-base, training staff on the basis of verified cases)	value judgment of experts in supply area) CBR –(support for designers, purchasing dept. staff, ensuring high supply level, lowering the number of complaints, high quality of goods)
Production	KOMS (record of good and bad practices used in production area. Codification of procedures used in production area) ES (acquisition and codification of procedures used in production area in the form of expert system rules) SDRS (supporting the interpretation of system archetypes in production area)	RM (storing knowledge on risk in production area) KOMS (storing experiences and description of good practices in the hypertext form)	RM (updating and sharing knowledge on risk with system users) KOMS (updating and sharing knowledge with system users)	KOMS (using experience involving the realization of contracts portfolio) KOMS (using experience, good and bad practices in production area) ES, KOMS (use of electronic procedures for business processes monitoring in production area) ES (preliminary analysis of resources availability) SDRS (analysis involving the impact of disruptions on production process) IPCS (supporting the value judgment of experts in production area)
Distribution	KOMS (record of good and bad practices used in distribution area. Codification of procedures used in distribution area) ES (acquisition and codification of procedures used in distribution area in the form of expert system rules) SDRS (supporting the interpretation of system archetypes in distribution area)	RM (storing knowledge on risk in distribution area) KOMS (storing experiences in the hypertext form) KOMS (storing good practices in service area)	RM (updating and sharing knowledge on risk with system users) KOMS (updating and sharing knowledge with system users) KOMS (sharing good practices in service area)	KOMS (analysis of customers' complaints) ES, KOMS (use of electronic procedures for business processes monitoring in distribution area) ES (supporting the analysis involving possible decisions in distribution area) IPCS (supporting the value judgment of experts in distribution area) KOMS (use of good and bad practices for servicing needs)
Supporting processes	KOMS (record of good and bad practices used in supporting processes. Codification of procedures used in supporting processes) ES (acquisition and codification of experts' knowledge in the form of expert system rules) SDRS (supporting the interpretation of system archetypes)	HRM (storing information about external staff and experts) RM (storing knowledge on risk involving supporting processes) KOMS (storing experiences in the hypertext form) ES (storing knowledge about the structure of business processes in the form of interactive decision trees)	RM (updating and sharing knowledge on risk with system users)	KOMS, ZZL (localization of knowledge sources, searching information on experts and expert opinions) RM (monitoring risk involving supporting processes) HRM (selection of designers team for contract realization) HRM (selection of project manager for contract realization)

Source: own preparation

Applied tools:

CBR – Case-Based Reasoning

ES – Expert System

KOMS – Knowledge Objects Management System

RM – Tool supporting risk management

HRM – Tool supporting the management of human resources

IPCS – Interactive paired-comparison system

SDRS – System of dynamic research simulation

4.3.1 A tools supporting risk management

Due to a specific character of the analysed machine-building companies and consequently a higher level and scope of a potential risk, it is extremely important to identify risk factors connected with the realization of contracts portfolio. The identification of risk factors of a single contract should be approached as an iterative process, and therefore it should be carried out in several steps, both by the people responsible for the realization of the contract and by the remaining people involved. The tool makes it possible to enter the information involving risk factor, basing on the selection from the list of risk factors, basing on the previously entered information (involving the completed contracts) in a given area and the category of risk.

The tool supporting risk management in a machine-building company can facilitate the realization of the following functions:

- storing knowledge on risk factors allocated to a specific contract, allowing for engineering, economic, ecological and social aspects,
- qualitative analysis of risk factors allocated to a given contract,
- analysis of the information on the assessment of risk factors at the stage of preliminary identification, at the verification stage after the proposition of preventive measures has been worked out and at the stage following the realization of contract,
- storing experience from the risk analysis as the outcome of a comparative analysis of risk factors during the realization of a contract and after its realization.

4.3.2 A tool supporting processes of human resources management

The proposed tool supporting processes of human resources management is used principally to improve the management effectiveness of contracts portfolio as a feedback from the customers of machine-building companies. The tool comprises 4 main functionalities:

- file of employees,

- file of external experts,
- competence matrix of employees,
- allocation of human resources to contracts.

By the implementation of the tool supporting the management processes of human resources, the following objectives can be obtained:

- enhancing the effectiveness involving the utilization of knowledge, skills and experience of external employees in the realization of specific contract tasks, allowing for the principle of sustainable growth,
- facilitating the analysis of human resources of a company and work demand, allowing for specific competence within the frames of contracts being realized,
- refining the monitoring and assessment processes of employees involved in the realization of contracts,
- ensuring the backup of expert knowledge in the preparation of solution concepts,
- enhancing the competence and qualifications of employees which allow for engineering, economic, environmental and social issues,
- ensuring an optimal selection of internal and external trainings for the employees in line with the identified knowledge deficit in particular processes,
- ensuring effective allocation of tasks between employees and augmenting the transfer of knowledge,
- enhancing the engagement and participation of employees in the realization of contracts,
- raising the formalization level of management processes of human resources in effect of the introduction of electronic procedures and documents.

4.3.3 Structure of the hybrid system Case Based Reasoning CBR and the expert system

Case Based Reasoning makes use of specific knowledge stored in the situations experienced in the past, referred to as cases. The CBR method is applied for the solution of new problems through the adaptation of the results which have been already applied for the solution of previously encountered problems. A new problem is solved by finding a similar case in a set and by applying the solution associated with the found case. The CBR system is characterized by the ability to learn through the storage of solutions of previous problems and sharing them for the solution of new problems in the future. The

operation cycle of the system based on CBR method can be described by means of four main processes (Aamodt, Plaza, 1994):

1. Retrieving the most similar case or set of cases,
2. Reusing the knowledge comprised in the found case for the solution of the problem – in many instances the solutions proposed by the system will have to be modified. A new solution is generating a new case in the cases-base.
3. Revising the proposed solution,
4. Retaining the experiences for further utilization for the solution of new problems.

The main objective of the CBR method is to find in the base the cases which are most similar to the one defined by the user. In many practical applications, a new problem is codified in the form of a query whereof form depends on a specific solution. The query can have the form of text, pairs of 'question-answer' type, database queries. Frequently, it is not possible to find one single, most suitable case for a given problem. Therefore, in the next algorithm step the solution must be adapted to the current situation. Usually, the new worked out solution is written down in the cases-base and then it can be applied in the future. While building the model, a hybrid of reasoning system was applied on the basis of cases and expert system. The expert system supports CBR at the adaptation stage of the found cases. The rule-based expert system RSE has been designed to cooperate with small knowledge modules which can be integrated, forming a larger knowledge base. The knowledge in the RSC system has the form of standard Horn rules. The rule-based expert system consists of three basic modules: a module supporting the interactive edition of knowledge bases, a reasoning-calculating module (an interpreter of rules), a clarification module (offers the clarification involving the run of the reasoning process and its results). The system being created supports the process of supplier selection when there is a necessity to change the supplier of material/services, to outsource certain activities to respective suppliers in order to enable the realization of the order made by a client, at the stage of designing, selection of designers, components and subassemblies.

Another problem to be considered involves the choice of technology which can facilitate the search of similar cases. The method most frequently quoted is the nearest-neighbour method and inductive retrieval. The nearest-neighbour method attempts to find similar cases, searching the neighbourhood of a given problem. An inductive retrieval is an alternative to the method described above. This method is applied in so called learning

systems and in systems which make decisions on the basis of decision trees. The nearest-neighbour method is a relatively simple technique of searching similarities. Yet, it has a drawback, which is the searching speed. To find the best match, the question (in the form of case) has to be compared to every question written down in the base. Furthermore, the similarity is determined by comparing each of the attributes. In effect the method is becoming inefficient when the number of cases is very large. In the proposed system this drawback can be minimized by preliminary filtration of the cases.

4.3.4 Knowledge object management system and rule-based expert system

The knowledge object management system (KOMS) enables the registration and ordering of knowledge presented in the form of unified, standard elementary objects. An elementary knowledge object combines together a unified formal structure and the possibility to register different types of data (text, graphics, numbers and others, also more complex ones e.g. any objects of MS Office package). Knowledge objects can be ascribed different attributes: describing, classifying and valuing, verbal and numerical (e.g. ordinal number, updating time, information source, significance assessment, credibility assessment). Elementary knowledge objects can be combined with one another with superiority-inferiority relations or with any other hierarchical or network relation. Also the registration of free objects, unrelated to other objects, is possible.

Computer support involving the realization of sequence (single path) procedures, described by a sequence of consecutive, executive instructions given always in the same order, can be narrowed down to the interactive feeding and searching of information (in particular the descriptive or graphic ones) which the executor needs in further activities. Knowledge in the Knowledge Object Management System is organized in the form of hypertext in the way ensuring that the user, depending on current, individual needs and has access to information of an appropriate level of specificity.

The procedures with selection instructions (multipath ones), in which the composition and order of activities depends on some situations unknown in advance, are supported by KOMS, providing descriptive information interactively and by the Rule-based Expert System RSE which is reasoning backwards. The selection of the first action is made by the expert system, basing on the information about the initial state of the factors which have influence on the realization of the procedure. In further steps, the expert system asks the executor a question about the result of the previous action and

about possible changes of other factors which may have influence on the run of the procedure, whereupon it selects another action.

The rule-based expert system RSE can work with knowledge modules stored in Horn rules tables. Standard Horn rules are the implications with one conclusion whereof conditional parts have the form of the conjunction of statements. Apart from the standard system which is reasoning forwards and backwards, the RSE consists of three modules: tools supporting the interactive edition of knowledge bases, a reasoning-calculating calculation spreadsheet and the tools for graphic presentation of knowledge and visualization of reasoning paths. Using these modules, expert microsystems were created to cooperate with small knowledge bases containing from a dozen to several dozen rules created by the user and related to the currently carried out tasks.

4.3.5 Interactive Paired Comparison System

The Interactive Paired Comparison System IPCS supports the creation of significance ranking of objects subjected to qualitative assessment. The description of sustainable growth frequently involves the significance assessment to be conducted with respect to various phenomena which are not similar to each other. The direct ordering (ranking) of the significance of a numerous set of various objects is difficult since in such a case the information about all objects must be retained in the memory. It is not necessary when objects are compared in pairs. Yet the standard comparing method of two objects in pairs is very labour-intensive. To order a set of n objects, $(n^2-n)/2$ comparisons must be carried out. In the IPCS system an innovative, interactive, paired comparison method developed by the author was applied, which consists in combining the comparative assessment of two objects with the current sorting of the set. The choice of pairs and the order of comparison result from the sorting algorithm (realized by the IT system), and they depend on the responses given by the user in the preceding comparisons. In effect, the number of comparisons can be reduced to the value below $n \log_2 n$ comparisons. For example, to create a ranking of 100 objects, it is enough to carry out no more than 534 comparisons instead of 4950 when the standard method of paired comparison is applied.

4.3.6 The system of dynamic research simulations

The system of dynamic research simulations SDRS is used to investigate hardly predictable behaviour of complex systems, basing on the models of system mechanics. P.M. Senge presented the concept of system diagrams (Senge, 2006) which characterize typical structures and behaviour of systems, or in other words, system archetypes. System archetypes include among others such concepts as: growth barriers, investing and deferred benefits, short-term improvement before long-term deterioration, harmful corrective measures, anomalous benefits of a leader, avalanche-style escalation, oscillations in the systems with feedback (“bullwhip effect”), ‘tragedy of the commons’. These archetypes well characterize the conditions of sustainable growth. The system diagrams proposed by P.M. Senge illustrate in a simplified way the most important features of systems, in particular positive and negative feedbacks. The simplifications that occur in system diagrams are in some cases too large, whereby the behaviour of the systems can be incorrectly understood. The system of dynamic research simulations enables a more precise representation of system archetypes. In particular in SDRS it is possible to allow for nonlinear relations and to distinguish between dynamic properties of objects, such as dead time, inertia, accumulation in time.

4 Conclusions

The development of world economy is enforcing the widespread use of IT tools supporting the management of knowledge. The changes taking place in machine-building companies with respect to the functionality of the applied IT solutions are unavoidable and are viewed as a continuous process resulting from the adaptation of business processes in these companies to the dynamically changing internal and external conditions. The proposed model of management support involving knowledge management and the IT system built on the basis of this model and dedicated to Polish machine-building companies is the response to such a demand.

In effect of the carried out research involving knowledge management in machine-building companies, the diagnose the IT system was undertaken in the investigated companies to determine functionality deficits with respect to knowledge processes and to define the indispensable functionalities of IT tools which should be implemented in the IT system supporting knowledge management. As a result of the carried out research studies involving the analysis of quality management system, risk management and

environmental management, the model was built which in a coherent way comprises the engineering, economic, social and ecological factors and conditions and which is a tool to be applied for supporting business processes in the operation of a machine-building company in terms of sustainable growth.

The proposed concept of a model has been focused on supporting business processes taking place during the realization of contracts portfolio. The structure of the model reflects the needs involving the support of knowledge processes in the preparation, realization and control of contracts portfolio in all execution areas (designing, supply, production, distribution, supporting processes).

The implementation of the proposed IT system in a given machine-building company must be preceded by the adaptation process of knowledge bases and to some degree the functional structure. Of great significance is the commissioning stage of the project within which a thorough pre-realization analysis should be carried out, and which will define the factors determining the effective implementation of the system in a specific internal and external conditions.

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The Many Faces of “Innovation Ecosystems”: Investigating and Reflecting the Ecology of Decision- Making as Core of the Topic

Eva Gatarik

Department of Corporate Economy
Faculty of Economics and Administration
Masaryk University
Lipová 4a, 602 00 Brno, Czech Republic

Structured Abstract

Purpose – The problem we are concerned with in understanding modern developments are short-sighted managerial decisions. The question is: What kind of “knowledge” is necessary to support, improve and enable meaningful decisions in an organization? Why and when would it be essential to gain additional knowledge? How could it be provided or processed? Considering that the information society is trusting too much in computational techniques, we analyse the relation between algorithms and actions to be taken in a new way, and argue that we need an enhanced education of managers to improve their decision making towards ecologically sound innovation, and thus sustainability.

Design/methodology/approach – We propose to design a scientifically founded and justified method for a sound understanding of the relation(s) between justifying arguments (leading to decisions), and their relation to reality, i.e., the underlying (unconscious) classifications and categorizations, and the impact they have on handling a complex reality. This method, resting upon research in model theory and systems theory, can be turned into locally applicable heuristics to improve decision making, and impact evaluation. It is a sort of enhanced multidimensional semantics to settle the question: When and why is it impossible to reduce managerial decisions to simple information processing algorithms?

Originality/value – Our methodology puts in evidence that purely economic arguments, which are used to justify decisions, are definitely incomplete. Our approach can also explain how certain disadvantages in the organizational context come about, namely by misuse of algorithms, and suggest what can be done to solve this kind of problems. As a consequence, we argue that we need dynamical and open systems for developing and integrating knowledge, also to support innovation arising from cooperation across organizational boundaries.

Practical implications – The main result will be to show how our analysis of the relation between language, information/knowledge and reality can be applied to support the coming about of good decisions as a basis for ecologically sound and successful innovation, and thus sustainable development of an organization. The proposed new way both of “documenting” knowledge as well as “arguing” within an organization can help to reach not only better decisions but also new ways of understanding the coming about of,

for example, economic success, and how to balance the local institutional logics of professionals and the proposed managerial decisions effectively.

Keywords – Ecology of decision-making, Innovation, Complexity, Knowledge management, Institutional logics

Paper type – Academic Research Paper

1 Mindless Adopting as Organizational Foresightfulness? Introducing a New Ecological Approach to Decision-Making in Organizations

Today, in an age of mounting competition and vast technological change, we may easily gain the impression that in business, at least in the context of toggling enterprises, innovation is understood to be the one and only “magic cure” and the essential ready to go tool to solve any problems as soon as there are economic signs of mischief within an enterprise. If an enterprise wants to do better than anyone else and be relevant to their customers (as far as this is assumed and understood to explain the business success or profit of that enterprise), there is a need for “innovation” in the sense of new approaches and perhaps even “capabilities” within its organization to be able to go on. The question, however, is: How should we go on in practice, i.e., without having too much to alter in our own thinking and quasi-natural explanations about the world?

So, one usually proposed idea which may lead to competitive advantage of an enterprise via creating innovation is to bring together cross-functional teams from within that enterprise to work towards a common goal to improve the situation. These teams should span both across multiple disciplines and across lines of business and industries as the story goes. However, can we really rely on just bringing those groups of professionals (and their “institutional logics”, Thornton, Ocasio & Lounsbury, 2013), together and wait till they solve our most complex problems?

Well, of course, looking from outside upon the matter “communication” of knowledge is important. Yes, and there should be a good climate or culture of cooperation and all kinds of social aspects need to be taken care of as well. But is this really enough? Yes and no! We should not just believe in “blind evolution”. We still need to develop an “eye for the essential”. This means that letting language “take care of itself” (when we translate

from one field of specialists to another) is not enough. An “ecological stance”¹ to take care of the interaction between individuals and the “changing” environment in which they live, e.g., a business ecosystem understood as a complex adaptive business environment where self-organization, emergence, co-evolution and adaptation are at work, may be helpful. This will allow for a good combination of knowledge, i.e., “content” as well as “action” in sense of application, innovation and fostering the transfer of expertise, phantasy and problem solution capabilities.

In his famous book “The Black Swan: The Impact of the Highly Improbable” Taleb (2008, p. 111) refers to Bastiat in writing that “if both the positive and negative consequence of an action fell on its author, our learning would be fast.” This point is both positive as well as dangerous, if we do not think ahead and keep our language open ended, i.e., keep it unsaturated, so that new meanings or interpretations can be used to give a new view. Thinking ahead means that we have to connect the causality of actions with our explanations, i.e., the “if, then” from the factual area with the “if, then” from the realm of argument, thinking and logic. If we do not see the connection between action and result both logically and causally, we shall not be able to learn nor feel any responsibility for our actions. Taleb (ibid.) goes on to point out: “But often an action’s positive consequences benefit only its author, since they are visible, while the negative consequences, being invisible, apply to others with a net cost to society!”

Before going into detail about the “ecological style” and the “ecology” of persuasion within an enterprise and its environment, and therefore the “ecology of decision-making”, as far as it depends on more than logic, we want to provide a sort of framework for the analysis of such a persuasion. This could help us to depict how the knowledge or rather expertise available within a profession group, like HR, IT, marketing or finance specialists, within an organization can be identified and conveyed (translated) to another group, especially to managers. Consequently, it may provide a new way of conveying (translating) content by combining the latter with social knowledge, and emotional understanding and evaluation as pointed out by Damasio (2003), and thus means of selection for acceptability.

So, one of the main aims of our contribution is to provide both an argumentation and a practical tool for the enhancement of knowledge of the decision-makers in an organization as also Pisano & Shih (2012) call for. The point is that we need much more

¹ Tsoukas (2005) calls it “style” with respect to considering complexity in organisations.

in the managerial boards than just the intuition of generalists with a “feeling for the future”. Decision-makers in organizations need to be able to visualize the future in a way which allows them to act appropriately and in a corrective manner as they go along (decide and act). Thus, built upon our former theoretical and practical investigations we want to suggest and argue for a new way of how and why to provide the knowledge, not just the information, for decision makers in organizations. But this means in the sense of Taleb (ibid.) that they have to stay open minded and not just to believe in the existence of the white swans when black ones may be around as well.

One point should be clear: We seem no longer to be able to simply rely on bringing together groups of professionals, and managers themselves are of course also a kind of professionals, to solve the most obvious, urgent or complex problems. We think that one of the important problems concerns the communication or processing not only of information but of knowledge to provide a valid basis, or “ecosystem”², for decision making within an organization, especially towards innovation.

Considering modern economic developments, especially with respect to the management in and of enterprises, we can easily find examples where we can wonder what is going on there, both in the sense of not agreeing upon outcomes or rather results of measures on the one hand, and thinking about the arguments that seem to justify those results despite of the fact that we do not like them. Quite often the so called “initial success” of a measure applied in an organization leads to transpose the technique(s) into other fields and we expect positive results there as well, or at least positive parameter values which we think are signifying positive results. This non-reflected adopting (isomorphism in the New Institutionalism, DiMaggio & Powell, 1983) built upon a short term evaluation can lead in the long run to economic disasters, as Pisano and Shih (2009, 2012) argue by considering and analysing the long term consequences of applying the managerial technique of outsourcing not only for individual enterprises but also for the whole American national economy. Consequently, Pisano and Shih (ibid.) claim that we need a new education of (top) managers. In developing their argument, we want to add that it is also necessary to find out what could be done about this kind of so called “short sighted” managerial decisions and why.

² Expressions like “ecosystem” or other metaphors from ecology need to be transposed carefully and the term “eco” in all those connections should not just be identified with environmentalism which would be too narrow for our purposes or context. In general, we should be careful about metaphors, especially if borrowed from other fields of research, with respect to explanation and prediction of causal developments.

To solve this problem and to ground further practical steps in organizational practice theoretically, we have developed a framework of analysis resting upon (1) modern system theory, and in this context on research in complexity, e.g., in Santa Fe, (2) model theory and (3) semantic logic (Barwise & Etchemendy, 1994) as well as most recently on (4) the work of Nowak (2012) who allows us to provide a new point of view upon the evolutionary selection mechanisms, especially in the context of cooperation, enforcement and acceptance of actions as well as arguments. Nowak's (ibid.) selection mechanisms are linked up with the logical acceptance of arguments, and establish the connection between reality and language to process relevant information in a way we propose to consider systemically with the help of our framework of analysis called LIR (Language – Information – Reality). However, LIR is not only a means of investigation but also of application as positive results in the practice of organizational development prove (Augl & Hochrainer, 2007; Gatarik & Born, 2012).

We have already referred to Pisano and Shih (2009, 2012) and want to stress again that we need to identify a way allowing us to process that kind of information which is relevant for knowledge necessary for an improvement of decision making in organizations to be able to find decisions whose results will be valid and ecologically acceptable in a long period of time, and thus will provide sustainable success of an enterprise and its environment.

2 The New Ecological Approach of Decision-Making in Organizations Taken Apart

2.1. Reflexivity and Causality

Taking up the idea, or metaphor, that the knowledge of a firm is situated in the heads of its employees we tend to “get hold” of those heads. What is essential at this point is to use the distinction between an explanatory use of this idea and its descriptive use. The practical consequence of such a distinction is that in the context of organizational life we are guided by the metaphor and look primarily at the knowledge that, implicitly, is prevalent in a firm and more or less preserved as experience within the set of employees. We definitely can look at it and think that we can transport it, sometimes indirectly by providing experience that leads to some insight. There is enough discussion available in

the literature to know about the obstacles and all the techniques to get hold of this knowledge without being really able to “put the finger on it”. Of course, a lot of this knowledge can also be put into words as we can observe experts who use their notes and/or hand them out to their colleagues. However, if we look carefully, we will find out that these notes are something like “road marks” to reproduce results or experiences which help the experts in orientating in the(ir) world and act due to their own experiences respectively. Using notes is more or less comparable with the use of a static map, a map which does not depict the world literally. We still need a kind of extra knowledge which allows us to evaluate and correct the results of our actions. So, the real point is neither just processes (causal connections) nor just structures (reflexivity in the language). However, it is appropriate to see the distinction as an expression of the difference between explanations, which need not be taken literally descriptive as they necessarily are simplifications built upon a certain aspect of analysis, and thus need to be re-interpreted (by some kind of extra knowledge) into the reality, and processes, which can be used as literally action guiding conceptions, though they eliminate creativity, and thus flexibility and innovation when the moment of reflexivity is missing.

We argue that most of our problems stem from a kind of misconception how knowledge comes about and how it applies properly when we, again, have to look for “selecting” and for selection mechanisms (e.g., cooperation as discussed below) what kind of knowledge is appropriate with respect to a problem and its long term solution in an organizational context. But how to achieve this selection and is it not arrogant and preposterous in some sense to think one can select the necessary kind of knowledge in accordance with a problem and its solution appropriately (and beforehand)? This would mean that we select admissible solutions in advance.

2.2. Refining and Combining Background Knowledge towards Flexibility and Innovation in the Model-Theoretic Systemic Framework of Analysis LIR

Knowledge, as we want to emphasize, mediates between language and reality and defines our dealings with information which by itself is codified linguistically and which determines the relation/reference of language onto reality. In the communication of knowledge, we have to take into account the multidimensional background knowledge of an addressee – see the knowledge components or rather the knowledge roles experiences/expertise E, common sense/user knowledge/folk knowledge F,

rules/routines/knowledge by calculi K, structure/explanatory/model knowledge M in Figure 1.

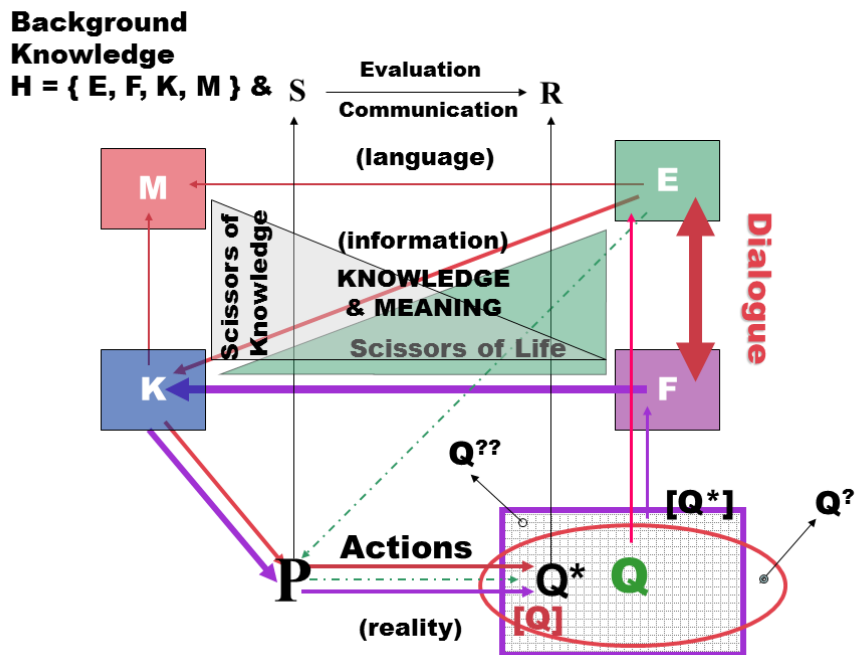


Figure 1: The model-theoretic systemic framework of analysis LIR (Language – Information – Reality) with the Scissors of knowledge and life

If we want to communicate the changing of a state P into a new state Q (in the world, in our attitude, in our understanding and in knowledge) or even if we want to make it understandable or want to produce the insight into this transition in the head of an employee/addressee, we have to explicate the means of representation in use (e.g., a language) and clarify which components of the background knowledge are responsible of relating the signs of the language onto special sections (selected parts) of the world. The causal connection of a situation or problem P and another situation, a solution Q, after the search/quest for some “holy grail” of knowledge within the given world is linguistically mirrored in the acceptance of the passing from a description of P as stimulus S to a description of Q as response R, and is a foundation of communication.

The state transitions from P to Q correlate with the fact that the transition from S to R in language is (logically) admissible. This acceptance of language can be amplified or

weakened by changing the relevant components of background knowledge which are responsible for acceptance and sense making in language. The real acceptance and therefore the success of the communication of knowledge (especially if we are dealing with building up or transferring new points of view or even new frames of reference) depend on the interplay of the respective components {F, K, E, M} of the background knowledge summarized and depicted as H. The Scissors of Life and Knowledge therefore concern the difference in the acceptance of (problem) solutions Q according to the use of the background knowledge F, E, M applied to the routines or rules K for causally producing or bringing about Q.

Roughly speaking, this means that the classical form and the set of documentations of information and of the rules, routines or procedures K for handling and using information do not suffice to grasp completely the expertise E present in people, e.g., due to manufacturing experience and the epistemic resolution level generated by this experience, and especially do not grasp the innovative potential of correction via background knowledge E, which is essential in *applying knowledge correctly* (in Figure 1 depicted as a difference between the outcome Q? provided and evaluated by an expert via knowledge E and the outcome Q?? provided by a lay-man via knowledge F). This potential of expertise is necessary to prevent the rules/routines from being overused or exploited in an unreflective manner, and therefore can lead to wrong applications of knowledge and especially of explanations.

2.3. The Form of Life in the New Organizational Ecology of Decision-Making

The following idea conforms to the conception of “Knowledge as a Commons” introduced by Hess and Ostrom (2007). The term Commons refers to “a resource shared by a group of people and it is often vulnerable to social dilemmas” (Hess & Ostrom, 2007, p. 349). It was recently taken up by Pisano and Shih (2009, 2012) as they introduced their concept of Industrial Commons as a way how to restore competitive advantage not only of the United States.

In our context it would mean that if we look at the interplay between expertise and experience given in E and the common sense or cultural knowledge given in F (see Figure 1) and then introduce an organizational structure and culture based on reflection and communicative cooperation to support this interplay, we can enable sharing experience/expertise and thus conveying knowledge via dialogue in order to change the

relation between E and F and transform the given background knowledge in F into an extended F^* by enriching the epistemic “resolution level” of the available background knowledge (see the discussion of von Foerster to link understanding with experience by acting in von Foerster, 1993, especially pp. 101-103). Applying an extended background knowledge F^* to the routines K (see Figure 1, especially the triangle $K|F|E$) can produce new (problem) solutions Q^* , i.e., innovation, which still can be accepted in F by way of simply applying the techniques that lead to success in every-day life but cannot be corrected by knowledge F.

Practically, an organizational structure and culture which cultivate knowledge as a Commons can enforce the necessary dialogue and the sharing of experiences/expertise between E and F, and in this way they can essentially influence the success of problem solutions of a system. We think that this dynamical dialogue can improve developments of a system, especially in supporting innovation in the realm of routines and rules K, and as a further consequence it can improve the competitive advantage and the general survival not only of a specific organization (understood as a regional “knowledge node”) but also of its environment, e.g., a region, as a whole.

3 Applying the New Ecological Style of Decision-Making in Organizations as a Chance for Creating Innovation Ecosystems

In the sequel, we want to apply the extended framework LIR (see Figure 2) in a more concrete manner, i.e., as a process model, to implicitly define the idea of an ecosystem of innovation. It may resemble in some sense the Canvas method (Osterwalder & Pigneur, 2010) but it goes far beyond especially with respect to its model-theoretic background and foundation in combination with the systemic approach by Senge (2006), and especially with respect to cooperation as mechanics of evolution according to Nowak (2012).

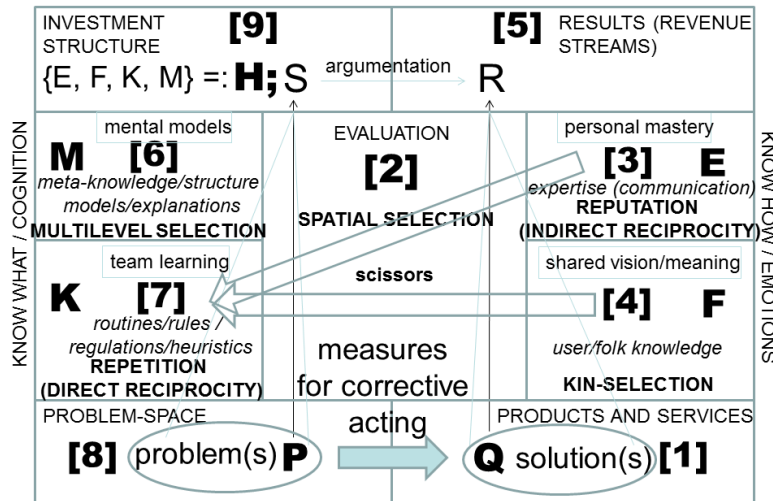


Figure 2: LIR (Language – Information – Reality) as a process model to analyse and understand the coming about of successful innovations via ecosystems and as model to support innovation ecosystems³

Let us therefore start with an observed, given result Q [1], e.g., a successful product or any other *accepted* problem solution within a set of them [Q] (see in Figure 3). This is where evolution theory comes in and the way in which it is extended by Nowak (2012). We do not only want to explain why the elements of the set Q are accepted but also how they are selected, and why they are successful in the evolution of mankind. Nowak (ibid.) explains this with the help of “mechanics of cooperation” built upon five rules.

So, there are (available) problem solutions or products which are accepted (according to agreed-upon values) by the members of an enterprise as well as people in its environment (not necessarily just customers), i.e., there are “evaluations” at hand [2] connected with these products [Q] in a realm of a “social network” where individuals interact with each other more often than others. Nowak (2012, p. 271) calls this spatial selection [2] and formulates the first rule: “The benefit-to-cost ratio must exceed the average number of neighbours per individual.” These systems specific value propositions (to bring in the systemic approach of Senge, 1999, 2006, 2008) provide a connection or a link to all other factors/elements of the scheme LIR and in a loose way correspond to the

³ The numbers in Figure 2 depict the path of the analysis and not the causal path from problem P to solution Q. The cooperation supporting evolutionary terms repetition, reputation, spatial selection, kin-selection and multilevel selection originates in Nowak’s *SuperCooperators* (2012).

5th discipline (Senge, 2006). By “loose” we mean that we apply the idea of “family resemblance” of Wittgenstein (1953) which roughly means that the concepts in use (stemming from Canvas, Senge and LIR) overlap, i.e., they are not identical in the sense that there is one single thread that makes up the “rope” (of argument) as such (to use a well-known metaphor of Wittgenstein’s).

Since it is our aim to reproduce the acceptance of a set of problem solutions [Q] via innovation resting upon expertise in E, we have to consider the internal structure of the social networks. Therefore, the next step in the analysis of the coming about of a set of good problem solutions [Q], i.e. accepted products or services, and thus the economic success of an enterprise, is to identify the [3] reputation (or indirect reciprocity) as a further rule of cooperation” introduced by Nowak (2012, p. 270) to support successful selection in evolution (as a competition and survival advantage of an enterprise explaining the acceptance of products or services on the market, so to speak). This second rule is at work when there are repeated encounters within a group of players especially with background knowledge E. Indirect reciprocity according to reputation for the exchange of knowledge leading to better results of the application of a set of rules in K via expertise in E is essential in the context of generating innovation. We must face forthcoming encounters. In the human society, Nowak (ibid.) argues, indirect reciprocity relies to a great extent on communication. He and his group found that “indirect reciprocity” can only “promote cooperation if the probability of knowing someone’s reputation exceeds the cost-to-benefit ratio of the altruistic act.” The altruistic act manifests itself in exchanging knowledge for creating an innovative problem solution, and presupposes trust. This is his second rule to support cooperation which he illustrates by the phrase: “I scratch your back and someone will scratch mine.” In our framework LIR reputation or indirect reciprocity corresponds to personal knowledge [or experience] in E (if we are looking for knowledge-based creativity). Here it is essential to take into account “nodes of knowledge” which also correspond to the idea of “personal mastery” (Senge, 2006), i.e., we have to find out where knowledge is relevant for creative problem solutions (experiences and expertise) and where it is concentrated such that it can be transferred or communicated. We are looking for the knowledge which we think is essential for the generation of problem solutions.

Thereupon, following our path of analysis of coming about accepted and innovative problem solutions in form of products and services, we concentrate on “kin-relationships”

[4] as the third selection rule introduced by Nowak (2012, pp. 271-272) which we can combine with cultural and social “folk-knowledge” F as the background knowledge which is important for the common use and acceptance of results Q as well as containing the possibility of cultural and in a broad sense ecological corrections with respect to the “acceptance” of proposed solutions. It is also the place where “ethics” (understanding “how far we can go”) can come into the picture. Nowak (ibid.) concentrates on the bonds of family and of common ancestry as decisive. We cooperate with close kin and defect with strangers, and there are, of course, dangers in it, too. Nowak (ibid.) formulates it as his fifth rule and calls it Hamilton’s rule: “The coefficient of relatedness must exceed the cost-to-benefit ratio of the altruistic act.”

Only afterwards, step [5] in Figure 2, we should analyse the “results” as often considered and argued by the top management to be causally produced and characterized by well selected parameter values. They must, however, not become the core or drive of invention.

In [6] we introduce a sort of view from outside which makes up the explanatory power M and corresponds to Senge’s “mental models”. These can make up what we consider as a *European competitive advantage* due to a host of cultural diversity in E and F. In Nowak’s terms this is called “multilevel selection”. As the fourth rule of cooperation it recognizes how, in some circumstances, selection acts not only on individuals but also on groups. According to Nowak (2012, p. 271) “multilevel (group) selection allows for the evolution of cooperation provided that one thing holds good: the ratio of the benefit-to-cost is greater than one plus the ratio of group size to number of groups.” As a rule it works well in many small groups but not so well if there are few large groups.

In general, our aim is to reproduce success of an enterprise in understanding the way in which this success comes about, and to explain that it does not depend on the manipulation of monetary parameter values in the first line: These values concern primarily the use of rules K via background knowledge F, i.e., the extended and innovative knowledge is missing. In the context of reproducing success of an enterprise it is also important to recognize the distinction between innovation and creativity by way of analysing the connection of experience in E to explanatory knowledge in M. leading to expertise with its innovative power.

What is furthermore relevant are in [7] the rules, routines and procedures in K in accordance to LIR which can be understood as the visible “core activities” of an

enterprise both in the production as well as the relation to the common sense knowledge F and therefore to Senge's "shared meaning" [4]. The step [7] corresponds to the fifth rule of cooperation by Nowak (2012, p. 270) called "repetition" or "direct reciprocity". Nowak (2012, p. 270) illustrates it by the sentence: "I'll scratch your back and you scratch mine." According to Nowak (ibid.), "direct reciprocity can lead to the evolution of cooperation only if the probability of another encounter between the same two individuals exceeds the cost-to-benefit ratio of the altruistic act." The production of results Q based upon a pure relation between K and F is the real core and point of critique in our analysis (see Figure 3).

In the sequel, we should look at the "original problem space" [8] and the available resources for possible solutions where the special knowledge of an enterprise and of other knowledge nodes, especially from other firms comes in.

The last (but not least) factor of analysis concerns the "investment structure" [9], such that one can calculate R from S by using relevant background knowledge $H = \{F, K, E, M\}$, structural hypotheses and extra knowledge by content (expertise).

Caveat: The approach is not safe against the possibility of misuse, i.e., of "freezing" in the knowledge about some system (organization and its environment), if we use the tool as a sort of static, universal language. In order to prevent mistakes, we need pre-knowledge, engagement and motivation. Each knowledge node has its own epistemic resolution level. Solutions, which are created, are understandable by the cultural autonomy of the single nodes. If, however, we use some digital technique for networking, we have to apply them in such a way that they just take over routines and leave open elbow room for individual exchange of experience and common creative problem solutions. It definitely must not replace real-life communication and we must take care to build up human attitudes to produce real success of communication, which is not solely reduced to rules, roles or norms. One must not overlook the fact that success cannot be reproduced by simply adding up the success of the producing parts. Senge summarizes this idea in "The Necessary Revolution" (2008), where he also takes care of the importance of ecology.

To understand the limits of the applicability of LIR as a process model, if it is just used as a means for the identification and analysis of, for example, business models (as in the case of the so called Canvas method by Osterwalder & Pigneur, 2010), we also need to take into account the Scissors of Knowledge and Life, or Meaning (see Figure 1): We

are rather looking for an extension of the local background knowledge F to some specific background knowledge F*, which guarantees the successful (and reflective, i.e., open for corrections) use of rule/routines/heuristics to (re-) produce results (products, solutions) with the help of the use of common sense background knowledge (as guiding our decisions in real life actions). F* will contain the specific knowledge/skills prevalent in a space (social network or region⁴), which is more than just a receipt to produce “results” on the basis of selected/prefixed parameter values. What is created is consciousness about the meaning/sense of the results of our analysis of business and “knowledge” models (Weick, 1995, 2009; Rullani, 2012). The aim, of course, is to prevent mistakes in the application of rules by evaluating “results” according to the background knowledge E and F*.

The idea leading further into this direction is to identify the necessary problem solution knowledge (explaining the local acceptance of results) and to yield the foundation for a “Geography of Knowledge”. Geography concerns the relation between a map and the reality it refers to (and therefore the reliability of maps in order to be used for our orientation in some world). This idea is depicted in Figure 3, which is the theoretical basis for our extension of the original scheme LIR as a process model. C combines E and F as common-sensical knowledge and is realized in Commons. A combines K and M and concerns abstracted knowledge.

4 Final Reflections on the New Ecological Approach towards Organizational Decision-Making in Order to Support Innovation Ecosystems

In this chapter we want to discuss a short example which recombines classical attitudes in science with the ecological style in the sense of Toulmin, and gives a new meaning to the ideas of Tsoukas and others arguing in his line but in a broader context and with a greater chance for practical application on the one hand and reflection on the other. Furthermore it helps to identify the place or rather space where communication and use of expertise are essential for creating innovation ecosystems, and how innovation is linked to creativity.

⁴ Consider in this context the story of Swatch in Switzerland analysed by Schulz (1999) or Wegelin (1999) as an example.

The ecology of decision making comes into play when all components in Figure 3 are dynamically interconnected, i.e., when the top level illustrating justifying argumentations $S \rightarrow R$ and the bottom level illustrating causality $P \rightarrow Q$ are connected properly, and the need for a switch of knowledge roles expertise E , user knowledge F , rules K , and meta-knowledge M is taken care of as well as the need for an endeavour/an active and constructive striving to understand something well, and not just to wait for a translation into one's own epistemic world.

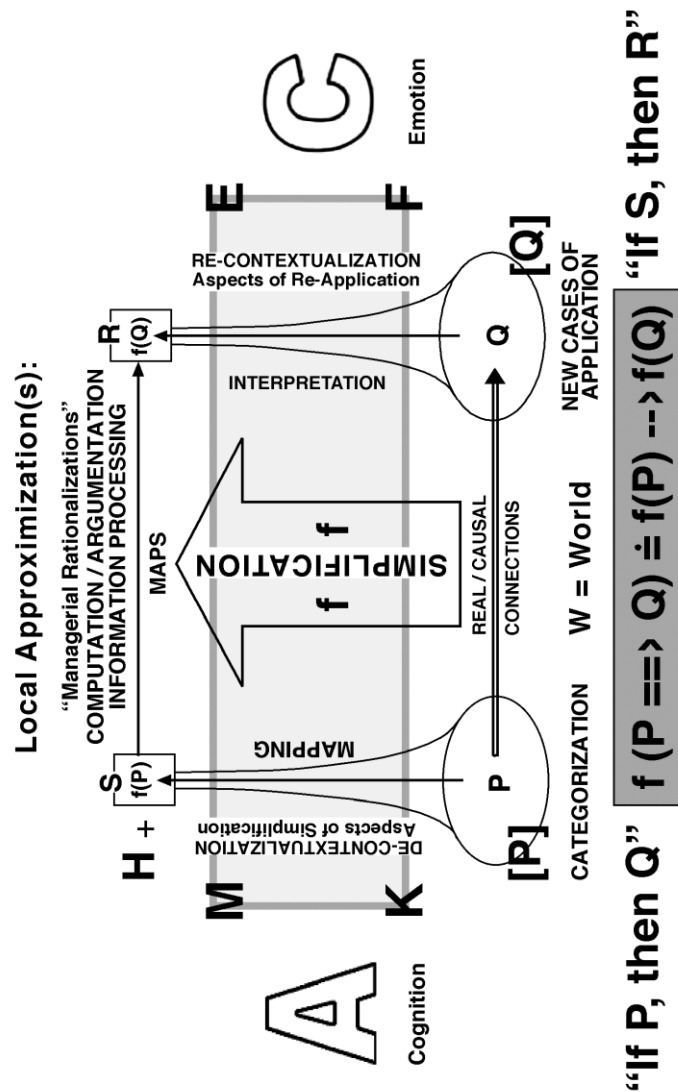


Figure 3: The core of the model-theoretic systemic framework of analysis LIR (Language – Information – Reality)

In Figure 3, P designates a given or constructed or assumed problem or any kind of starting situation that should either be transformed causally or by the application of systematic means of production into some result Q or some proposed solution in quest of which we were searching. The abstract mapping f from the bottom (the reality part) to the top level signifies the use of some means of representation (a language or a map) and especially the simplifications which we use to map reality onto this means. Thus, via feedback we create (quasi-) equivalence classes of similar cases in reality by bracketing them into [P] or similarly [Q]. This kind of reductionistic approach is an epistemic technique and should be called de-contextualization and not mixed up with ontological approaches. The top level uses background knowledge H consisting of all or some of the knowledge components invented to classify our knowledge and to process information encoded in signs (also parameter values if they stem from measurements). But the processing of information corresponds only in a middle realm of experience to our causal experiences which is expressed by the formula to capture a locally approximative homomorphism (a structure preserving mapping). The most important part is re-applying or projecting the top level onto the bottom level. Whereas the relation between [P] and S or $f(P)$ from bottom to top is many-one, the other relation, i.e., top-down, is one-many, which means we need a “corrective” interpretation of application provided by experience and expertise E in using rules K, and especially dialogue between experts in E and users in F (to enrich background knowledge F), not only within the same group of professionals but also with the members of the surrounding world (ecology) in general.

Figure 3 is in some sense the elaboration of the famous quote by Bateson (“The map is not the territory.”), which goes back to Korzybski, i.e., it elaborates the idea of how to understand the ecology of decision making, and therefore to know where the limits of some of those techniques are we are usually told to be inescapable.

But now let us fill the abstract framework with a fictitious example such that no living people might be affronted: Consider a country where there has been some change in the political situation. Originally, there had been factories with some technical knowledge, e.g., in producing cars. Now, there is a firm from some culturally completely different country but, of course, for technical application this might be irrelevant. To have a plant to assemble parts of the cars there would pay off, the management thought. All they had to do was to write a good programme how to assemble the parts and then let go. This corresponds with the set of rules K used by the workers to be hired in that country who

had some background knowledge F together with relevant technical experience. But where did the decisions of the management come from why did they think that their decision could be reduced to some formal understanding of the economic situation. Their background knowledge was, of course, specific economic knowledge with some weak understanding of what was essential in producing a car. After some time in the country there appeared some problems in context of repairing cars. The background knowledge of assemble line workers was not enough to solve the problems, the old sources for knowledge and teaching were gone, and no new ones could be built up, no one would invest in knowledge and expertise. One point is that in the beginning there was background knowledge in form of special expertise of the workers available. The picture or map in managers' heads was just a shortcut in explaining the success in the beginning, and this picture was parasitic on the pre-knowledge of the workers to cut the story short, the foreign firm gave up and withdrew their plant again. The original country had lost in two areas: Firstly, they had spent money to support the foreign firm because they promised employment. The foreign firm made profit but gave up after some time. But the original country also had lost the knowledge of the people, who were there to have the technical know-how to operate the system, and they did not invest in any education comparable or necessary, and they did not have anything by themselves to compensate the loss of employment. Now, this is a fictitious story and you can neatly explain what was going on within the framework in Figure 3.

The ecology of decision-making should be self-explaining: We have to take into account all the relevant factors in Figure 3 to reach good decisions with the chance to correct actions $P \rightarrow Q$ if the results Q are not really acceptable.

Tsoukas (2005) quotes Toulmin (1990) to stress that the ecological style of decision-making needs to embrace complexity by reinstalling the importance of the particular, the local and the timely. We therefore have to acknowledge connectivity, recursive patterns of communication, feedback, non-linearity, emergence, and ineffability.

One of the most important topics Tsoukas (ibid.) stresses is to think through the difference between verbs and nouns, i.e., as we like to put in between processes and explanatory structures, in Figure 3 the relation between E and M or in general the right side of communal knowledge C comprising F and E, and the left side of abstract or explanatory knowledge A comprising K and M.

Finally, with the help of LIR we can provide arguments why the ecological stance, approach or style is useful and we can explain it, and not just derive from some cases where it is successive, and then will find that the cases for the success have not been well identified. With the help of LIR, we can recombine classical approaches with new techniques, technologies, and an understanding of their limits. In this way, LIR can support emergence of innovation and help to evaluate the results of new applications.

5 Conclusions

There are three main practical conclusions which can be drawn with the help of the introduced ecological approach to organisational decision-making and which provide evidence for its applicability:

(1) Whenever we try to reproduce “results” in practice and try to invent more or less formal rule systems or even expert systems (in the sense of Artificial Intelligence), we must not institutionalize them as a means to replace creativity. Instead they should be used as a means to take over from routines K and create elbowroom to re-enforce real creativity as a necessary precondition for innovation, flexibility; and thus, sustainability in *Innovation Ecosystems*.

(2) Whenever we think we have identified rules K to produce results in a strict way we might remember that they rest upon simplifying categorizations of parts of reality (Figure 3), and the success of the application depends on our ability to use them reflectively which explains their real success.

(3) Strictly following a set of rules is not enough to reproduce success. It is not its real explanation. But instead it is the creative and innovative coping with reality by cooperation of people with different kinds of expertise. This is where the five rules by Nowak concerning the mechanics of cooperation create a competitive advantage and survival in evolution.

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The dual control systems of agile teams: exploring knowledge management issues

Maria Carmela Annosi*, Jens Hemphälä, Mats Magnusson,

IPD, School of Industrial Engineering and Management
KTH Royal Institute of Technology
Brinellv. 83, SE-100 44 Stockholm, Sweden

Antonella Martini , Laura Peonia
DESTEC, Università di Pisa
Via Diotisalvi, 2-56126 Pisa, Italy

* *Corresponding author*

Structured Abstract

Purpose –This paper aims to contribute to the exploration of micro-foundations for innovation in autonomous team-based firms. It describes how different types of management control systems influence the innovation performance of teams through an extensive field study of a large scale agile implementation. It reveals the moderating role played by different kinds of managerial control systems and by perceived time pressure on teams in the relationship between a team’s absorptive capacity and its innovation performance.

Design/methodology/approach – A total of 44 individual semi-structured interviews were used to collect data over three separate data collection stages conducted from August to November 2013. All data were triangulated with the qualitative content analysis results of free comments from 121 people, covering different agile roles in the same organizations as above, and embedded in a survey performed in August 2013. Due to the complexity of the topic and the lack of prior studies investigating the effect of agile implementation on team learning and innovation capabilities, an abductive research approach (Peirce, 1931) was selected as a suitable method.

Originality/value – The empirical results indicate that a team’s beliefs on the importance of learning strongly influence its self-regulated learning behaviours. They represent the configuration of AC meta-routines underlying the concept of absorptive capacity (Lewin et al., 2011) at the team-level, conducive to teams’ exploration activities. Moreover, the antecedents for a team’s exploitative and exploratory innovation activities are presented and two types of managerial controls for driving exploitative innovation activities are identified. Additionally, team-level absorptive capacity was analysed, since it is a less explored, but important construct, leading to a team’s exploitative product innovation.

Practical implications – This study’s findings have a number of implications for practice. The results imply that autonomous team-based organizations may be better off not using

one single standard control system to manage all their teams. In fact, beyond securing a team's access to knowledge, management needs to provide teams with differentiated means to develop necessary competencies and capacities for understanding, assimilating and using the knowledge they retrieve. In addition, management should influence a team's beliefs by valuing the tasks requiring innovation and transmitting sustainable values to teams through their mission and vision statements.

Keywords – Agile, innovation, knowledge stock, control mechanisms, self-regulated processes

Paper type – Academic Research Paper

1 Introduction

Increasingly, the capabilities of organizations to create and transfer knowledge are being identified as a central element of organizational advantage. Kogut and Zander have proposed: "...that a firm be understood as a social community specializing in the speed and efficiency in the creation and transfer of knowledge" (1996: p.503). Adding to theory of the firm, the knowledge-based view contrasts transaction cost theory grounded in the assumption of human opportunism and the resulting conditions of market failure (e.g., Williamson, 1975); the knowledge exchange perspective instead argues that organizations have capabilities for creating and sharing knowledge that give them distinct advantage over other institutional arrangements, such as markets. Some researchers have used this notion to explain the very existence of the firm, especially forms such as the multinational company (Kogut and Zander, 1996, 2003) as well as strategic alliances (Lane and Lubatkin, 1998). However, research regarding the impact of knowledge on performance is arguably scant and characterised by broadness and diversity (Foss, 2007) and a call for more research to build the micro-foundations in the field has been issued (Felin and Foss, 2005; Foss, 2007; Foss, 2011). This 'knowledge governance approach', KGA, focuses on governance mechanisms and their impact on the creation, retention and sharing of knowledge. These governance mechanisms entail aspects such as organization structure, job design, reward systems, information systems, standard operating procedures, etc. This approach focuses on the crucial antecedents to knowledge processes. KGA identifies two research gaps related to the governance of knowledge-intensive firms and, the relationship between knowledge and competitive advantage.

In line with the KGA approach, the aim of this paper is to contribute to the exploration of micro foundations for innovation, especially teams' self-organization of

innovation activities. To this end, a specific set of practices that have gained recent popularity in R&D organisations - agile methods – serves as an empirical starting point to explore the impact of governance mechanisms on knowledge processes and subsequent impact on firm performance. From the view of the present study, agile methods represent a specific set of governance mechanisms that potentially have an impact on knowledge processes. In turn, these knowledge processes have a potential effect on crucial aspects of the firm's competitive advantage. Using an abductive approach from a knowledge-based perspective, two sources of data from a large R&D organisation have been explored. Firm performance in this R&D setting regards both refinement of the old as well as creation of the new, i.e. innovation.

A central contribution of this paper regards the implications of Agile and its main components. The self-regulated team is a key component, making the findings related to research regarding teams and their learning, regulation, and assimilation. The results illustrate that agile implementation has a clear impact on knowledge processes and that these knowledge processes are micro foundations for exploration and exploitation. Testable hypotheses are made based on empirical data together with extant literature. These findings contribute directly to our understanding of the effect of agile methods on a team's self-regulated learning and their knowledge stocks, as well as the knowledge-based micro foundations of competitive advantage. In the present study, Agile serves as a vehicle to pinpoint and illustrate potential micro foundations of general knowledge governance structures and their significance for competitive advantage, which builds on March's (1991) work on exploration and exploitation. The present exploratory study is focused on specific agile practices that are not necessarily used in all organisations. Generalisation of findings and subsequent hypotheses are thus made for the knowledge processes and their identified antecedents on a level of abstraction that is argued to be important beyond mere agile practices.

2 Theoretical background

2.1 Micro Foundations of the Knowledge-Based View

A number of researchers have suggested that knowledge exchange may facilitate socio-economic outcomes. These researchers base their arguments on separate theories and do not necessarily claim a knowledge-based view. These theorists can be found in

social capital research (Nahapiet and Ghoshal, 1998; Subramaniam and Youndt, 2005) and creative climate research (e.g., Scott and Bruce, 1994; Kylén and Shani, 2002). Nahapiet and Ghoshal (1998) claim that the special capabilities of organizations for creating and transferring knowledge are identified as a central element of organizational advantage. In their perspective, social capital is especially useful since its value also extends beyond the boundaries of the firm. Partly based on Nahapiet and Ghoshal's research (1998), in Subramaniam and Youndt's (2005) view, social capital is not only a conduit of knowledge transfer; it also refines the evolving body of this knowledge. Social capital was found to positively influence incremental innovation, as well as radical innovation. Research on the creative climate indicates support for the proposition that knowledge exchange and communication facilitate innovation. The research on creativity initially focused on organizational environments either hindering or supporting individual creativity (e.g., Scott and Bruce, 1994). Their findings support that leader-member exchange, innovative role expectations, resource supply and systematic problem solving style, as well as a climate that supports innovation are significantly related to individual's innovative behaviour. Kylén and Shani (2002) support the positive effect of a knowledge creation interaction climate on the self-rated efficiency of the product development process, while a defensive interaction pattern has a negative effect on efficiency. Defensive interaction patterns are characterised by withholding knowledge and not sharing good ideas. Knowledge creating interaction patterns were characterised by learning from mistakes, listening patiently, and having openness to knowledge. Although these aspects are related to efficiency, they regard the product development process and could, thus, also relate to innovation processes. However, there are some fundamental issues when attempting to create synergies from this research. Summarising their 2002 review of research on the knowledge-based view, Eisenhardt and Santos state that this research is very useful for understanding internal knowledge transfer, but that it is less helpful in dealing with performance issues since this research stream does not address key issues of strategy such as the nature of competitive advantage and implications for firm performance. In Eisenhardt and Santos' review of knowledge-based research, only two studies of knowledge transfer between business units (i.e., Brown and Eisenhardt, 1998; Lord and Ranft, 1998) actually measure performance. Hence, only indicative research regarding the link between KBV and innovation is present in extant literature. Underlining the breadth and diversity in the field, Foss (2007) notes the multitude of

interests, disciplines, methods, results, and philosophical underpinnings treated in this research. Cutting across these areas, Foss (2007) calls for more research to build the micro-foundations in the field, something that had previously been lacking. This approach was coined as the ‘knowledge governance approach’, KGA, and focuses on the deployment of governance mechanisms and their influence on knowledge processes (i.e. the creation, retention and sharing of knowledge). These governance mechanisms entail formal aspects of management of the organisation, e.g. organization structure, job design, reward systems, information systems, standard operating procedures, accounting systems and other coordination mechanisms. A basic claim in this approach is that the mechanisms are crucial antecedents to knowledge processes. KGA addresses two main research gaps: (1) the governance of knowledge intensive firms and, (2) the relationship between knowledge and competitive advantage. From the view of the present study, agile methods represent a specific set of governance mechanisms that potentially have an impact on identifiable knowledge processes. In turn, these knowledge processes have a potential effect on firm competitive advantage.

2.2 Agile scrum methodology

Agile methods consist of a group of practices for software development created by experts (Agerfalk and Fitzgerald, 2006). Agile practices face an unpredictable world relying on “people and their creativity rather than on processes” (Nerur et al, 2005, p.75). In particular, Scrum is the best-known agile method. It is illustrated as a software development process which relies on self-organizing teams and is divided in short iterations called “sprints”, lasting from one to four weeks (Rising and Janoff, 2000). A team’s activities are organized based on the product backlog (Moe and Dingsøy, 2008), which contains the product feature list, prioritized by the product owner (Cohn, 2009)., According to scrum principles, teams attend several ceremonies during a sprint:

- Sprint planning, at the beginning of the sprint, during which the product owner gives the list of prioritized features to the teams (Cohn, 2009);
- Daily stand-up meetings in order to discuss the team’s work progress, plans for the ongoing day and potential impediments (Moe and Dingsøy, 2008);
- Demo or Review, at the end of the sprint, to show the product owner, management and other teams what was completed during the sprint;

- Retrospective meeting, at the end of each sprint, to reflect collectively on how teams are performing and how to improve (Cohn, 2009).

The key factor for Scrum's applicability is that the system development process is extremely complex (Schwaber, 1997). Its results can be influenced by many aspects, so planning ahead, as the waterfall approach prescribed, in this case turned out not to be suitable (Moe and Dingsøy, 2008). Therefore, Scrum is organized to adapt to change, relying on strict mechanisms of process controls, with short and frequent feedback loops and continuous planning (Moe and Dingsøy, 2008). Moreover, the higher the project's complexity is, the more the controls result indispensable to increasing its flexibility, reliability and responsiveness and to controlling the risks (Schwaber, 1997). It has been debated that agile software development approaches are best fit to explore new fields and to support people having innovation and creativity as their highest priorities (Highsmith, 2002). Nevertheless, there is a remarkable lack of studies investigating how creativity and innovation develop in software development in general and how they are influenced by agile methods (Conboy and Morgan, 2010). This is in line with Dybå and Dingsøy's, (2008) literature review on agile scrum methodology, which reported only one case study of Scrum prior to 2006 and stated that most studies on agile methodologies were centered on the phases of introduction and adoption of agile methods (Dybå and Dingsøy, 2008), whereas fewer studies investigate its effect on innovation (Abrahamsson et al., 2009). Moreover, Dybå and Dingsøy (2008) also discovered that the applied research methods, in particular for data collection and analysis, were not rigorously described. Hence, they reported the need for more reliable studies in agile research to analyze its benefits and limitations. This paper aims to fill this gap and focuses on how agile teams self-organise their innovation activities. So at least one important question arises from the discussion reported here:

RQ1: What are the organizational factors and the self-organizing team's characteristics that influence their innovation performance?

3 Research design

3.1 Research setting

Four organizations within the same international company in the telecommunications industry were selected, following a purposeful sampling (Patton, 1990). Three of these

firms dealt with feature development activities and selected scrum methods for organizing their work, while the other firm developed product concepts and adopted a lightweight approach to Scrum. The product development activities were endorsed by cross-functional and cross-product teams made up of 7 people on average with different previous competences as designers, testers and system analysts. According to scrum principles, each team's work was organized in three-week iterations called scrum sprints. These organizations started the agile transition in 2011, which was considered completed by the end of 2012 when all their people were assigned to different agile teams. Our analysis started in August 2013, so one year after the complete transition.

3.2 Research method

An abductive approach (Peirce, 1931) was selected in consideration of the topic's complexity and the shortage of rigorous studies investigating the long-term effects of agile implementation on team learning behaviors. Moreover, all results were triangulated with a secondary data source, consisting of free comments taken from a global survey launched for the same organization in the same time period. This helped to increase the reliability and validity of the study's results.

3.3 Data collection

A total of 44 individual semi-structured interviews were performed by the research group, trying to comprise the different agile roles in the four organizations involved. The first round of interviews included the main agile roles (product owners, scrum masters, agile team members) and high level management, selected through a purposeful sampling (Schatzman and Strauss, 1973). In contrast, the second round of interviews involved middle level managers that were added to the initial sample, following a theoretical sampling (Draucker et al, 2007), in order to examine the origins of agile control mechanisms acting over the agile teams. As a third stage, some old participants were contacted again to confirm specific concepts, and other agile team members were interviewed to validate the emerging ideas. Data collection ended as saturation of data was achieved. Different interview templates were developed for the different roles, in order to focus attention on peculiar aspects related to the interviewees' roles. Each interview lasted almost 60 minutes and was recorded, transcribed and sent for confirmation to the interviewees.

3.4 Data analysis

The selected approach was inspired by abductive reasoning (Peirce, 1931). This was particularly suitable due to the lack of studies in the literature and the researchers' lack of experience on the topic. The researchers' aim was to generate new ideas and theoretical models to describe the impact of agile on team learning behaviours. The analysis started with as few preconceptions as possible, but with a solid background in organizational learning studies and agile characteristics in order to remain sensitive to interpretations and meanings on related emerging concepts (Glaser, 1998). Thusly, the literature was used as a fundamental source to shape emerging concepts, as suggested by Glaser (1998). In particular, literature review, endorsed after the first interviews, focused on control mechanisms, self-regulated learning/innovation strategies and absorptive capacity. The coding processes (Glaser, 1992) were performed on the entire data set in order to detect different themes, cluster them into categories and sub-categories and obtain a codebook. In particular, the coding process relied on different stages of analysis.

First, open coding was performed through a repeated reading of all data and an in-depth line-by-line examination in order to identify provisional concepts (codes). Relying on an external independent researcher, the identification of codes was performed twice from scratch. The first time it started from the analysis of team member interviews and the second time from those of middle managers. The categories were obtained by clustering the identified codes through comparison and analysis of belonging to a specific analysis dimension.

Axial coding (both hierarchical and non-hierarchical) was executed to organize identified concepts into macro categories, as well as to define related categories and hierarchical relationships with respect to their categories. During this process, the relevant literature studies results were considered as another source of 'data' and constantly used in the definition of emerging categories to be integrated in the nascent theory (Glaser, 1992). As a result, macro categories were detected and linked to the appropriate theoretical concepts enabling the development of the theoretical framework represented by the initial codebook that was generated.

This process was helped by the use of a qualitative data analysis program (MAXQDA 10plus®). The same codebook was then applied to the secondary source of data. It was enriched with new categories as new themes emerged in the text. Additionally, again with the support of MAXQDA®, the code co-occurrence models described as the applications

of “two or more codes to a discrete segment of text from a unique respondent” (Namey et al., 2007, p.145) were generated. This evidenced potential linkages between the codes belonging to the innovation category and the ones related to the other categories in the developed codebook. In fact, ignoring the context that derived from the underlined associations between codes, accidental code co-occurrences could emerge in models developed. So, in order to identify code co-occurrences that truly describe multiple concepts the analysis of relationships with the innovation codes was further analysed through a strict examination of the text done by means of the following steps:

- all the clusters of codes that resulted directly involved were identified through the overview of coded segments involved in code co-occurrence instances;
- the text corresponding to the overlapping parts in each cluster above was read to understand the nature of the relationships between codes in terms of causality, mediation, and moderation;
- paradigm models (Strauss and Corbin, 1990) were developed by scanning all the clusters and showing emerged relationships between the codes related to team innovation and the most significant one influencing them.

All the identified linkages between different codes, and consequently categories in the models, were validated and enriched through the analysis of previous literature studies. This facilitated: 1) identification of each team’s core behaviours, 2) comprehension of the influence each team’s core behaviours and environmental factors had on their innovation; 3) extraction of variables from the codes, and 4) the formulation of testable hypotheses.

4 Results and discussion

In this section, the results of the cross-case analysis over the four organizations involved are reported through the presentation of a preliminary evidence-based model describing how teams handled their innovation activities. The crucial relationships among the most relevant concepts belonging to the innovation category and the others from the selected key categories are shown here. This has been done by distinguishing between the performance of exploratory and exploitative product innovations in order to improve our understanding of the limits and constraints involved in both types of innovation, allowing us to generate different hypotheses for them.

4.1 Overview of identified codes tied to teams' exploratory and exploitative innovation activities

Two codes emerged for the description of each team's innovation performance and were identified as indicators of the team's exploitative and exploratory innovation performance. A brief description of them follows in Table 1. In the next section, the antecedents of these codes are presented.

Table 1: Overview of identified codes tied to teams' innovation performance

Code	Brief description	Main quotes
<i>Absence of product improvements since people are losing competence</i>	This refers to a team's exploitative product innovation performance. It confirms that teams were generally very aware of their limits due to the lack of proper knowledge in relation to the existing product domain.	<i>"Hence, I feel there is not that much space or possibilities for innovation, because you have to know a concept really good to understand its limitation. If you are new to an area, then you cannot see the limitations. To know where you want to go, you have first to realize where you have been."</i>
<i>Absence of new product ideas within teams</i>	This refers to a team's exploratory product innovation performance. It underlines the team's low ideation performance in the product domain.	[What are Innovation opportunities in Agile team? What kind of innovation is it?] <i>"The innovation opportunities, I think, are very limited; the times when we have seen innovation with items we worked at as a team, the suggestions have come from outside the team, like pre-study author or by testing with another organization".</i>

4.2 RQ1: Overview of identified antecedents of teams' exploratory and exploitative innovation activities

The list of antecedents to *"absence of product improvement since people are losing competence"* and *"absence of product ideas within teams"* is provided in terms of the codes having a direct or indirect effect on them. Their description is complemented by the information of their category and sub-category within the developed codebook and is enriched with exemplificative quotes (see **Error! Reference source not found.**).

4.3 Paradigm model for teams' exploitative product innovation performances

The relationships among the above codes belonging to different categories and a team's exploitative product innovation performance were explored in the data set. Their

nature was identified and distinguished in term of causality, mediation, and moderation. The following model relied on a further triangulation of results coming from the secondary source of data that was used for validation and is displayed in Figure 1.

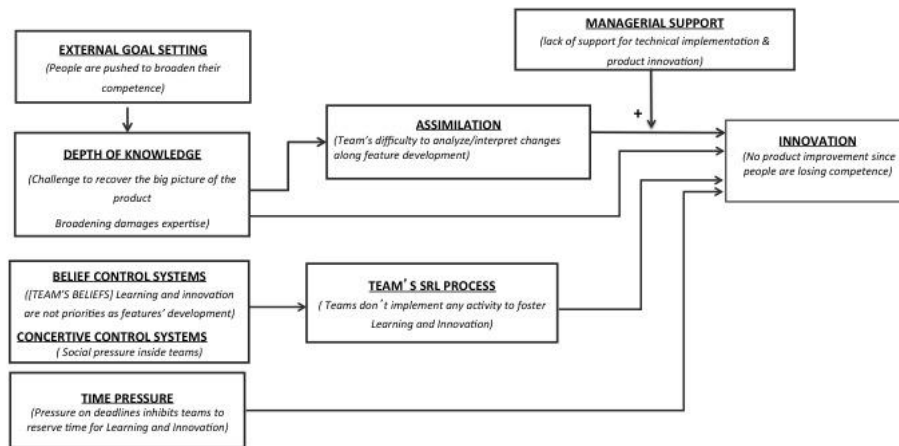


Figure 1: Paradigm model for teams' exploitative product innovation performance

Direct and indirect antecedents to the concept “no product improvement since people are losing competence” are displayed. The model explained the linkage between exploitative innovation performance and: 1) the depth of a team’s prior related knowledge, 2) the way the agile teams assimilate new product knowledge related to the current product development, 3) the team’s self-regulated behaviour for innovation and learning. Moreover, it highlighted the team’s external and internal conditions influencing these results: 1) the managerial support for technical implementation and product innovation; 2) the pressure on deadlines; 3) the external goal setting for the team’s competence broadening; 4) the team’s belief and internal normative controls.

Category	Code	Brief description	Main quotes
External goal setting	<i>“people are pushed to broaden their competence”</i>	This concept describes the new working condition for teams since the agile adoption. Compared to before, when people in teams took care of impacts on a specific part of the product, now they are asked to implement features affecting different product areas. In order to facilitate the transition to agile, the managerial roles in the organization put in place a strong communication policy encouraging people to embrace new learning domains and to always broaden their competences.	<p><i>“One benefit is that designers are together with testers, that we reduced handovers, and we find a lot of problem earlier than in waterfall way.”</i></p> <p><i>“On the other hand difficulties come when you are forced into new areas without having the knowledge in that area” [Team member]</i></p>
Team depth of knowledge	<p><i>“challenge to recover the big picture of the product”</i></p> <p><i>“knowledge broadening damages expertise”</i></p>	<p>These concepts refer to the way a team’s and a person’s knowledge stocks are becoming renewed following the agile transition. It reports a team’s problems to collect relevant information to obtain the whole picture and connect what team members already know with what they are acquiring.</p> <p>Moreover, the concept of <i>“knowledge broadening damages expertise”</i> tells about the team members’ difficulty to delve into the new knowledge they are acquainting due to the rapidity of the information change they are involved in along the continuous iterative development.</p>	<p><i>“I think I had a better overview about what was going on, I was involved in having a sort of big picture, but now there are lots of different teams in different locations working with these things so you can’t be more aware about this big picture and lose the overview” [Team member]</i></p> <p><i>“I’m learning a lot because of these new areas all the time to work with, but my feeling is that we are learning small pieces from all the places, you are not good in anything, you know a little bit of that and a little bit of that, you are not succeeding in being good in anything, you are not expert in anything. This is the downside of it” [Team member]</i></p>
Team absorptive capacity	<i>“teams’ difficulty to analyse and interpret changes along the feature development”</i>	This is related to a team’s difficulty to follow the rhythm of the feature impact changes they are called to work on due to their low	<i>“Teams need a longer time to understand which subsystem will be affected by a new feature, this is not an efficient way of working” [Team</i>

		familiarity with the product and its intrinsic complexity.	member]
<i>Managerial support</i>	<i>“lack of support for technical implementation and product innovation”</i>	This concept gives the idea of managerial behaviour towards teams regarding product learning. In the agile implementation, managers in the organization intended self-regulation of teams in a broader sense, giving them complete autonomy in their activities. In fact they removed any form of guidance and direction facilitating their work and replaced them with a stronger focus on knowledge sharing within the teams and in the organizations.	<p><i>“Before when we worked in the waterfall, we had a competence area where we were quite taught now we really don’t know how to do, we need to ask a run or we need to find out by yourself, we don’t have a real support. We have a lot of areas with not one supporting so it could take some time. You need to get into, it could take weeks.”</i> [Team member]</p> <p><i>“People should have the personality and mindset to share, they need to understand that through sharing they can help the team itself to be better”.</i> [Line Manager]</p>
<i>Team belief control system</i>	<i>“learning and innovation are not priorities as developing features”</i>	This concept tells about the strong focus on feature development teams have inhibiting them to spend time for learning and innovation. The huge amount of routines they follow in their implementation of agile are mostly conceived to foster product development activities and influence teams’ belief leading them to perceive feature development as their highest priorities. This is in line with what reported in Edmondson (1999).	<i>“Our team learning opportunity is not much, we have been working with 2 features at the same time, we had pressure for deliver those features and we don’t have much time to dedicate to learning. It is not the priority as developing and delivering features so we don’t spend time on learning”.</i> [Team member]
<i>Team concertive control system</i>	<i>“Internal social pressure inside the teams”</i>	This concept reveals the presence of “concertive control” within the life of agile teams, in agreement with what reported by	<i>“But I must say that I think the innovative part may be impacted negatively if you do it that way, I’ve the control on what you decide so there is a pressure to go</i>

		Whitworth and Biddle (2007) who identified this as one of the most common dysfunction of agile teamwork. The concept of concertive control in self-managing teams was introduced by Barker (1993) in describing the dominance of normative group control that may become constrictive to the individuals within it.	<i>through this kind of work package as quickly as possible especially if you are in a team and you cannot follow up on each other about what people are doing and everyone knows what everyone else is doing. For the innovation it is important to have freedom and time to think” [Team member]”</i>
<i>Team self-regulated learning processes</i>	<i>“teams don’t implement any activity to foster learning and innovation”</i>	This concept confirms the scarce attention that teams devote to innovation and learning activities.	“[Product Innovation opportunities in the Agile context]: <i>There is no specific activity for that”</i> . [Scrum master]
<i>Time pressure</i>	<i>“pressure on deadline inhibits teams to reserve time for learning and innovation”</i>	This concept is referred to the feeling of stress and strong involvement in feature development loops that the agile team members experienced. This is clearly seen as an inhibitor for any other activity than feature development one.	<i>“Concerning the stress, you feel, in agile the way of working is stressful. The management wants us to deliver code every day for testing to find out if new code breaks legacy functionality. But the delivery process is not good enough, when people make mistakes you have to roll out back and many people are waiting for you. It is not so effective this way of working. It should be modified somehow.” [Team member]</i>

Table 2: Antecedents to the code *“absence of product improvement since people are losing competence*

4.3.1 Analysis of the relationships with the concepts related to the following categories: external goal setting, depth of knowledge, knowledge assimilation and managerial support.

The relationships among the above categories could be interpreted in the following way. Team members were strongly encouraged to stretch their product competences by working on different product areas and covering roles other than their own within the team. Due to their limited time to absorb new product changes in areas where they did not have familiarity, they experienced some difficulties in connecting the new product concepts to the overall picture of the product. Additionally, people were inhibited to sustain their core competences with updated information leading them to hardly maintain their product expertise. The lack of solid product background inhibited the assimilation of new concepts coming from the team's enlarged product development activities and the generation of new product improvements since they did not feel able to master any product change. This was worsened by the absence of any external team support for technical implementation, thus making innovation happen within the team. This is supported by the following statements:

“For smaller improvement of the product, the difficulty is that the competence of the product is more spread out now. We have fewer experts, everyone gets a broader competence but not as in-depth as before. Previously we had more people with a deep competence in a specific area, now it's lacking, we don't have really expert people. So it's more difficult to understand how improvement or innovation can affect the system.”

“I don't know but my feeling is that this way of working is not that good for coming up with good ideas for improvements. We have this called cross-functional teams and it has been very pushy that every member should be able to do everything. As results of that the newcomers in the area, doing them for the first time, do a lot of the tasks. Those persons cannot come up with good improvements. They are fully occupied with learning the block and see how things are working, trying to implement things”.

Building on Coleman's (1990) distinction between macro- and micro-levels of analysis, it is possible to say that all previous relationships have been largely described by

scholars, but limited to the macro-level of analysis. Our study explored the same relationships but at the micro-level of analysis. We investigated the effects of a team's knowledge stocks, absorptive capacity and managerial support on its exploitative innovation performances. In detail, the positive relationship between a team's depth of knowledge and its exploitative product innovation performance is in line with the results obtained by Van Wijk et al., (2012). Additionally the relationship between a team's depth of knowledge and its absorptive capacity is aligned with the results described by Cohen and Levinthal (1990), Volberda et al., (2009 and Lane et al., (2001). However, the relationship between a team's absorptive capacity and its innovation performance follows what was stated in Cohen and Levinthal (1990), Zahra and George (2002) and Volberda et al. (2009). The effect of managerial antecedents on absorptive capacity is reported in Zahra and George (2002), Dijksterhuis et al. (1999), Kogut and Zander (1992), Lenox and King (2004) and Volberda et al., (2009). Hence, the following hypotheses are proposed:

H1: A team's depth of knowledge positively influences its (exploitative) product ideation performance.

H2: A team's knowledge assimilation capability significantly mediates the effect of its depth of knowledge on its (exploitative) product ideation performance.

H3: External technical support positively moderates the relationship between a team's knowledge assimilation capabilities and its (exploitative) product ideation performance.

4.3.2 Analysis of the relationships with the concepts related to the following categories: belief control systems, concertive control system, and teams' self-regulated learning process

The relationship among the above categories can be explained in the following way. A team's priorities were mainly focused on feature development activities that consequently absorbed most of their working time. Moreover, team identity seemed built on the need to accomplish product development deadlines which were constant, continuous and close to each other. So, within the teams, the dominance of normative group controls limited team members' freedom to embrace activities other than product development. All above it inhibited teams from planning any activity to foster learning and product improvements. The following quotes clarify these concepts.

“Now we are working with new products and we have to learn how they work – at least so much that we can see where and how to do the implementations. But to really understand the product (to be able to do improvements) that takes time and how to propose that for an OPO (before you have knowledge about the product you even don’t know if you can propose/do any improvements – spending time of investigation without any outcome isn’t so popular I guess..[sic]). Teams don’t spend time on digging the product, people are just making features.”

“Our team learning opportunity is not much, we have been working with 2 features at the same time, we had pressure for deliver those features and we don’t have much time to dedicate to learning. It is not the priority as developing and delivering features so we don’t spend time on learning.”

Individual value component motivation for engaging in a metacognitive activity, and in more cognitive strategy use, entangles people’s goals for the task and their beliefs about the importance and interest of the task itself (e.g., Ames & Archer, 1988; Dweck & Elliott, 1983; Eccles, 1983; Meece et al, 1988; Nolen, 1988; Paris & Oka, 1986). In the case of agile teams, it seems they have developed the feeling that meeting the continuous deadlines of both the agile framework and the project is something crucial for them to achieve, due to the effect of their induced belief systems. These team belief systems could be explained by their constant involvement in the huge amount of agile routines (see Edmondson 1999), which are mostly conceived to foster project development activities and by the presence of external managerial belief control systems which are used to define and reinforce people’s basic values guiding the organization towards a specific direction (Simons, 1994). Therefore, even though the connection with managerial belief is not evident in the data driven model, looking at the high level management beliefs in the data set, the following code emerged clearly: *“It is more relevant to be efficient than learning and innovating”*. In fact, some high-level managers stated the following.

“My view about the main problem is that we need to be more efficient to produce more and then to be able to innovate. Becoming more efficient is a condition to have innovation in place, we need to implement end users performance improvements and it is hard to get things into the product because, the demand is there but the capability was low”.

“Long term objectives are: we want to half the lead time, improve four times the output, improve ten times the quality, and increase the motivation as in the dialog. In this phase of life cycle, these aspects are more important. The quality is extremely important. Concerning innovation, we don’t have any measurement because they should be innovative to reach all of this !”

Having complete responsibility for feature development from beginning to end, team members felt it worth it to devote their effort to feature development, according to Deci and Ryan (1985, 2000). This led to internalized demands from external environment beyond any explicit managerial request, so that team behaviour resulted self-regulated yet not intrinsically motivated. This kind of motivation, called introjection, refers to the condition where an individual embraces an external regulation but not accepting it as its own (Deci and Ryan, 1985). Hence, team behaviour is not connected to external rewards; rather it aims to establish internal monitoring and applies sanctions and rewards to itself (Deci and Ryan, 1985). Applied to self-managing teams, concertive control develops through the values and norms of team members who enforce this control on each other and all team members are expected to conform to it (Barker 1993). Consequently, people within the agile team may suffer from the team’s normative control and become constricted in the decision of how and if to engage in learning activities (Whitworth and Biddle, 2007). However, people could still be committed to creative cognitive processes and try to solve problems creatively if they have the feeling that the organization gives importance to their work and provides work-related support in tasks requiring innovation (Baer & Frese, 2003; Zhou & George, 2001). Even if, as in this case, there is no empirical evidence about the relationship between a self-regulation mechanism and managerial support, the concept *“lack of support for technical implementation and product innovation”* was clearly identified in the data set and described previously as antecedent of product innovation performance. Moreover, since the concept regarding ideation performance *“absence of product improvement since people are losing competence”* includes the shortage of a team’s depth of knowledge, this leads to considering the effect of a team’s knowledge stocks on the team’s self-regulated learning and innovation behaviours. This is in line with what was reported by Butler and Winne (1995) for individual self-regulated learning process, who argued that: “as self-regulating learners engage in academic tasks, they draw on knowledge and beliefs to construct an interpretation of a task’s properties and requirements. Based on the interpretation they

construct, they set goals.” (Butler and Winne 1995, pp. 248). Drawing on the preceding discussion, the following hypotheses are then proposed.

H4. A team’s self-regulated behaviour for innovation significantly mediates the effect of its belief on the innovation importance and its (exploitative) product ideation performance.

H5. A team’s belief on the importance of innovation is positively influenced by external managerial beliefs.

H6. A team’s self-regulated behaviour for innovation significantly mediates the effect of its internal social pressure on its (exploitative) product ideation performance.

H7. External technical support for innovation positively moderates the relationship between the effect of a team’s belief on the importance of innovation and its self-regulated behaviour for innovation.

H8. External technical support for innovation positively moderates the relationship between the effect of a team’s internal social pressure on the importance of innovation and the team’s self-regulated behavior for innovation.

H9. A team’s self-regulated behaviour for innovation significantly mediates the effect of its depth of knowledge on the importance of innovation and the team’s (exploitative) product ideation performance.

4.3.3 Analysis of the relationships with the concepts related to time pressure

The relationship with the time pressure category can be described as follows. Pressure from current project deadlines and from the short feedback loops, prescribed by implementation of the agile scrum framework, inhibited teams from dedicating part of their working time to learning and innovation activities. Since people were losing their product competence, they felt that their capability to come up with new product improvements was strongly reduced. The following statement from the interviews reports what is claimed above:

“Before we had experience and time for product ideas. Before we had more knowledge about the product (the ones we were responsible of). We got better information about the project (all features) as a whole and could plan/coordinate features/deliveries in a better way.”

This basic finding is in line with what has been reported by other scholars on the effect of time pressure over creativity, when time pressure is perceived as a constraint for

cognitive resources (Andrews and Smith, 1996; Kelly and McGrath, 1985). Thus, time pressure may limit creative cognitive processes in the production of new ideas or in problem-solving activities (Amabile et al, 2002; Scott & Bruce, 1994). However, our empirical results show quite explicitly that team members feel time pressure due to their cognitive resources and are inhibited in their responses to the events (Byron et al., 2010). So, reduced familiarity with the product induced a high level of time pressure, considering the control levers teams are subject to, pushing them towards continuous deliveries. In fact, the concept of ideation performance embeds a lack of proper knowledge, the effect of which is worsen by the presence of time pressure regarding deadlines. Hence, the following hypothesis is proposed:

H10. Time pressure negatively moderates the relationship between a team's depth of knowledge and its (exploitative) ideation performance

4.4 Paradigm model for teams' exploratory product innovation performance

Linkages in the data set between a team's exploratory product innovation performance and the other codes belonging to different categories were analyzed in order to characterize the connection in terms of causality, mediation or moderation. The model presented here clarifies the antecedent to the “*absence of product ideas within team*” concept by describing the relationship between exploratory innovation performance and the team's self-regulated behaviour for innovation and learning. This model resulted much simpler than the previous one, considering that the exploratory innovation seemed to be out of the scope of an agile team's activities. In fact, it did not emerge so frequently in the respondents' interviews, and when it did, confirmed by its own nature, it was not tied to: 1) the way agile teams cumulate their own product competence from the current project development activities; 2) the existing team's knowledge stock; 3) the external conditions imposing teams high rhythm to follow the evolution of the existing product.



Figure 2: Paradigm model for a team's exploratory product innovation performance

4.4.1 Analysis of the relationships with the concepts related to the category teams' self-regulated learning process

The above relationship can be explained in the following way. Teams did not plan for any collective effort to spend on product innovation and learning activities leading them to achieve relevant innovation performance. This was in line with the previous model reporting that a team's priorities were mainly focused on feature development activities that absorbed consequently the most of their working time. Moreover, a team's belief seemed built on the need to accomplish product development deadlines which were constant, continuous and close to each other. A team member reported the following statement:

[What are innovation opportunities within your team?]" *I can see no innovation within my team. We don't produce any ideas.*"

In the case of exploratory product innovation performance, there is no trace of any linkage with: 1) a team's prior related knowledge, 2) a team's knowledge assimilation capability, 3) concertive and belief control systems and 4) the time pressure connected to the project development activities as found for product exploitative innovation. In fact, in this latter case, the opportunity for teams to exploit product/technology are tied to the short window of this opportunity due to the high rhythm of work and the different perceptions about the value of the opportunity itself among people in the teams. Moreover, the missed connection with the depth of a team's knowledge could be explained by Argote's (1999) and Stuart and Podolny's (1996) findings revealing that the depth of knowledge stock may be an obstacle in the development of radical new products. In fact, organizations basing the development of exploratory innovation on in-depth knowledge may fall in the competency trap (Levitt and March 1988), and result in generating core rigidities (Leonard-Barton 1995) that inhibit them from developing a focus on exploratory innovations. Hence, the following hypothesis is posed.

H11. A team's self-regulated innovation behaviour positively influences its (exploratory) product ideation performance.

5 Managerial Implications and Conclusions

This study answers a call for further research into building micro-foundations in the knowledge-based approach (Felin and Foss, 2005; Foss, 2007; Foss, 2011). This

'knowledge governance approach', KGA, focuses on governance mechanisms and their impact on the creation, retention and sharing of knowledge. The results of this study describe and illustrate that Agile has a clear impact on knowledge processes and that these knowledge processes are micro foundations for exploration and exploitation.

The empirical models describing the antecedents for the a team's exploitative and exploratory innovation activities within the agile context were presented. This was carried out under the form of two paradigm models as outcomes of the applied abductive approach in conjunction with a set of research hypotheses. The models contribute to current studies in the literature on the effect of agile implementation on the innovation performance of teams and organizations, whereas the proposed hypotheses identify opportunities for future research and empirical studies.

With our preliminary findings, we have identified two forms of controls that managerial roles should take in order to drive exploitative innovation activities within agile teams. These controls are: 1) managerial support acting as moderator in the relationship between a team's assimilation capability and its product exploitative innovation, yet also as a means to mitigate the effect of concertive controls inside teams and shape more balanced team beliefs by valuing the tasks requiring innovation and transmitting sustainable values to agile teams; 2) external goal setting to solve the trade-off between the need to broaden a team's competence and the possibility for people to retain their core competences.

Therefore, we suggest that there is a need for researchers to build on the interactions between managerial roles in the agile context and the team. In this paper, we have provided rigorous documentation of the different codes that emerged from agile teams and their stakeholders related to the integration of innovation within the agile framework. In this way, we have facilitated a rapid advancement in the field of innovation in the agile context, while also identifying research avenues for further studies.

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Knowledge management in project environment: the way to improve the value of the enterprise organization

Antonio Bassi

Department of Innovation Technology
SUPSI – Scuola Universitaria della Svizzera Italiana - Swiss
Manno, Galleria 2, CH

Structured Abstract

Purpose – This paper aims to study the improvement of project success in organizations by integrating knowledge management strategies with project management practices in a typical project lifecycle, assuming that the projects are the tools by which organizations achieve the strategic objectives.

The knowledge created in the projects environment in almost any case is lost due to inefficiency of the processes of the enterprise organization. This leads to inefficiency in developing processes already done in previous projects.

The proposal highlights the importance of an efficient approach to knowledge sharing demonstrated on a project management level.

Design/methodology/approach – I propose an approach for improving the profitability of the projects through the management of an integrated system of knowledge management in the enterprise organization. The approach involves the definition of the organizational processes of knowledge management that integrate with ISO 21500 project management and the ISO 10006 relating to quality management in project management. I propose the creation of a new area of knowledge ("Knowledge Management") with a process in four of the five process groups (Planning, Executing, Monitoring and Controlling, Closing) in which all the processes defined in the standard are grouped together.

Originality/value - This methodology highlights the need to manage all the knowledge that is generated within a project, from the organizational point of view (historical information, best practices, knowledge of the processes, lessons learned ...) and from personal point of view (experience, knowledge management practices, lessons learned, ...), in order to improve organizational processes, reduce the time of project management and reduce the cost of the project. One of the main objectives is to achieve the continuous improvement in project management.

Practical implications - The outcomes of the application, through the management, in a centralized way, of the knowledge produced in all the projects managed by the enterprise organization and the knowledge obtained by all the people who participated in the projects, allows to reduce time and cost of project management, a better organization of the projects, the growth of intangible capital of the organization and work towards continuous improvement of the organization.

Keywords - Project Management, ISO 21500, ISO 10006, Knowledge Area, Continuous improvement, lessons learned, historical information, Knowledge Transfer, Project Lifecycle, Project Success.

Paper type - Practical Paper

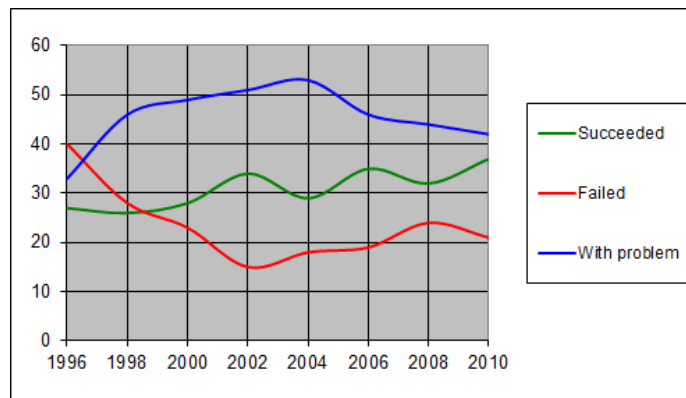
1 Introduction

The Project Management, or rather the science through the definition of processes and rules, governs the management of projects and it is an incredible system that generates knowledge through which organizations, if properly structured, can grow and progress. The Project Management has the primary responsibility, within an organization, to make sure that the projects under his directions, comply with the objectives for which they were started. Projects are the tools by whom companies reach the strategic objectives for which they were created .

The management of the knowledge, produced by a project during its development (eg, planning, execution, control, ...), is one of the most relevant elements in the context of project management, but, unfortunately, it is also one of the elements on which the organizations hardly invest.

If we take as a reference the study that the Standish Group has been pursuing for many years, with the publication of the CHAOS report, which analyzed more than 30,000 projects managed throughout the world in different market sectors, we will note that there are wide margins for improvement to ensure that projects can be more productive and can enable to pursue the same objectives for which the organization was founded.

From the last analysis (2010) it can be seen that the 21 % of the projects is closed before its natural conclusion, 42% comes to an end without having complied with some of the goals such as time, cost and quality. In this context, only 37 % of projects are completed in accordance with the schedule. If you enlarge the scope of the analysis and take as reference the data from 1996 you will observe is in 14 years there has been an improvement in the success of projects by only 10%. If we think about how technology tools, in the same period, have provided in terms of communication, software for business planning, systems analysis to evaluate the performance of the projects, ... , we will see that technology and capacity management of the projects have not growth together.



CHAOS Report - Standish Group

We assess what may be the causes of these unsatisfactory results. There is certainly, among the main causes, low management skills by the project managers, due to a lack of training in the field of project management and the lack of some of the essential attributes that a project manager must have, which should be appointed as soft skills such as leadership, communication skills, problem solving, coordination, but, of course, the main cause is due to the organization and consequently its management. The organization first needs to establish a culture of project management within the organization. The culture of project management is different from other cultures that coexist in an organization. In this context it is possible to find (ie) the culture of marketing, sales and purchases, which are types of vertical culture, develop, (ie) within the directorates or departments. The culture of project management embraces the whole organization for which we can define as horizontal to develop a project one needs to cooperate with all the structures of the organization (marketing, sales, purchasing, legal, finance, operations, ...) and not only with the technical departments which are generally the most involved.

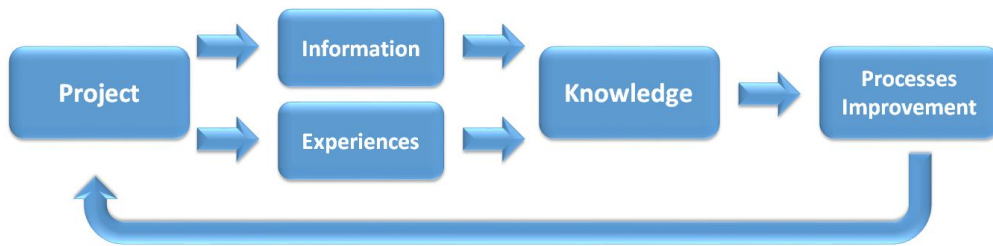
1.1 Project management culture

What does it mean to define a culture of project management within an organization? It means to develop tools and methods for managing projects, communicate and monitor the proper implementation. You cannot use ready-made tools that can provide answers to the organization because every organization is different, and these tools and methods can be defined and applied only through a knowledge of the business organization, processes and project management methodologies. To do this, we could use the ISO norms that have been defined to manage projects and/or activities related to them. They can be referred to the following standards:

- ISO 21500 - *Guidance on project management*
- ISO 10006 - *Quality management systems - Guidelines for quality in projects*
- ISO 31000 - *Risk management - Principles and guidelines*
- ISO 21502 - *Project and program management portfolio - forthcoming.*

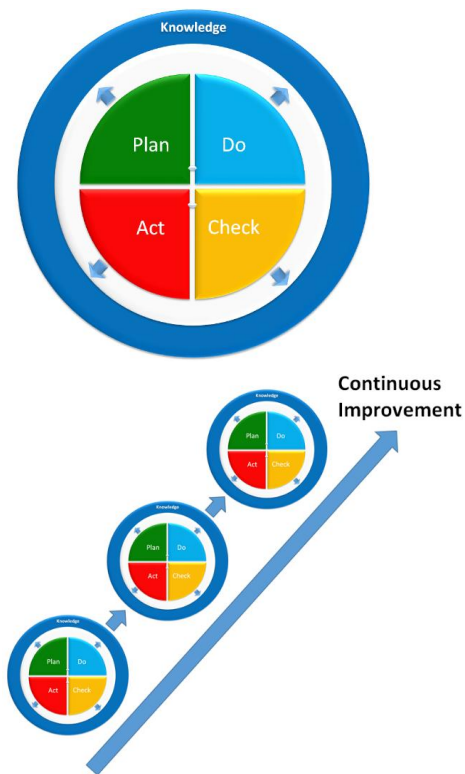
We can add to this list the *ISO 10007 - Quality management systems - Guidelines for configuration management*, for the management of all the documents that are produced by the project during its development. Certainly it cannot be apart from the fact that there must be a strong commitment by the management of the company so the whole organization to operate with unity of purpose .

Culture also means a continuous progress through the improvement of the management of all activities and processes, but how is it possible? The answer is in the management of everything that, in terms of information, is generated in a project: we need to manage the knowledge generated through which you can improve and progress in management activities.



The processes improvement in an organization

This graph could easily integrate the Deming wheel or Deming Cycle, the Plan-Do-Check-Act (PDCA), in order to capitalize the knowledge acquired in a project. This tool is also the basis for continuous improvement of organizational processes through the looping of the PDCA and the use of historical information from previous projects.



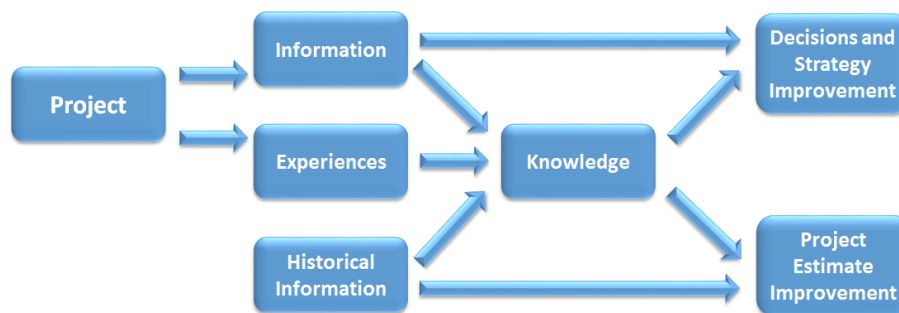
The continuous improvement of knowledge and organizations

2 The importance of knowledge in project management

Let us reflect on what are the implications of such a solution with regard to the management of projects. The collection of historical information of the projects, if it is done correctly, can allow definite savings for projects that will follow if you compare similar projects to those already done in the past you will be able to reuse some components with a double result:

- Reduction of planning time for the reuse of some elements of the project plan;
- Better planning as there it would be based on final data and not on estimates.

Another benefit is due to the experience that is gained by the individual and by the same organization in project management. This experience, if properly exploited, will allow you not to take decisions or solutions that have been proved wrong in the past, allowing, at the same time, through a critical analysis of past performance, the identification of what are the processes and the correct decisions.



Knowledge development cycle

We try to assess what may be the costs and benefits related to use and reuse this model of knowledge. If the processes of project management have been designed in accordance with the logic of knowledge management, thanks to modern communication tools evaluating the cost equal to '0' because the collection and management should take place as already established practice. If you want, however, to quantify the cost estimate, it is approximately 0.005 % of the total cost of the project. Meantime, concerning the benefits, these are more difficult to quantify because they are a function of the type of project to be managed. The benefits will be higher in similar projects to those that have already been done in the past and will strive to '0' for highly innovative projects for which there is not historical information. Therefore it could be said that the benefits can be measured in a scale ranging from 5% to 35% of the time and cost of the planning phase of the project which is estimated at approximately 20% of the total project.

ES . Project Budget = € 1,000,000.00

Storage cost = € 5,000.00

Benefits = from € 10,000.00 to € 35,000.00 (for each project)

The data were obtained from the international community of project managers through a questionnaire. So you can understand the great benefit to be achieved by an organization.

At this point the question arises why organizations don't evaluate this knowledge. The answer is related to maturity, risk appetite and the perspective of management. The management is not often able to recognize the benefits that can be gained from the application of new tools in the medium long term but he focuses on those who are current expenditure that attempt to break down in any way to get the savings. In this way it has, effectively, a reduction in costs on current projects but he can't see the cost savings that would be obtained compared with a minimum initial investment.

Agreeing that is necessary to have a proper knowledge management in the context of project management we see what might be the objectives that is possible to pursue:

- Reducing time and cost of project management ;
- Improving of organizational processes.

It is now necessary to define an organizational infrastructure that enables us to store, manage and exploit all the knowledge acquired by the stakeholders in the organization and management of projects.

3 The new model

The current rules related to the world of project management provide the factual basis on which we can establish the policy of knowledge management in a project. You can start from the ISO 21500 processes that structures the world of project management in 10 areas of knowledge and 5 process groups. The areas of knowledge describing how to manage and plan projects with regard to its main objectives, except for the first area of knowledge 'Integration', in which the plans are integrated and defined the rules of the project, describes the processes that allow you to define and control objectives in relation to:

- scope
- time
- cost
- quality
- risk
- communication
- stakeholders
- procurement
- Human resources.

These same processes are then grouped into 5 process groups that determine how to manage the project:

- initiating
- planning
- executing
- monitoring
- closing.

In ISO 21500 we can find a useful diagram that represents, among other things, the management of knowledge in a project, but unfortunately the activities related to it are

poorly structured and therefore it is too often rejected its use. We start from this point to build the processes and associated activities to develop knowledge management in projects.

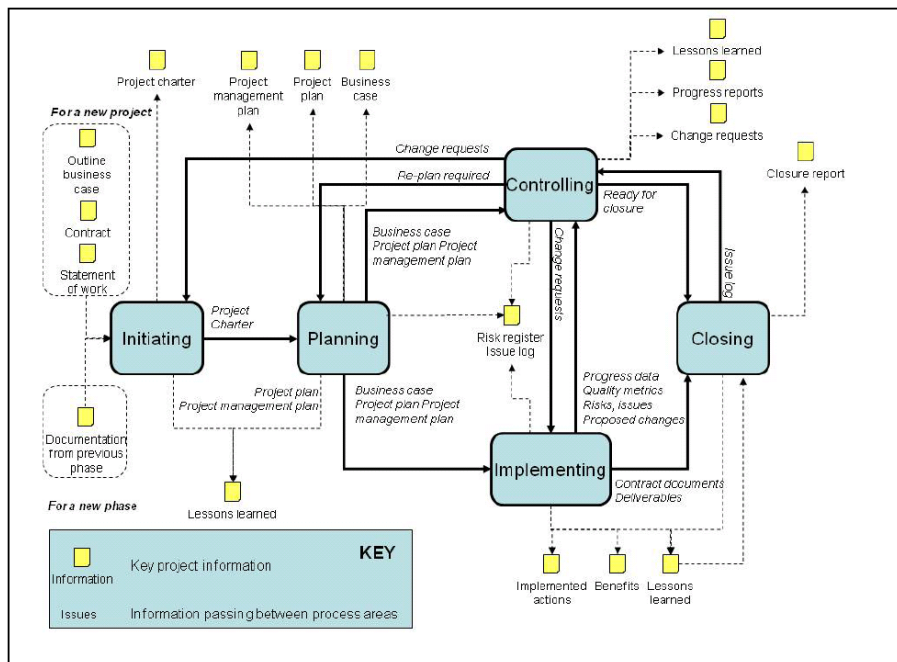


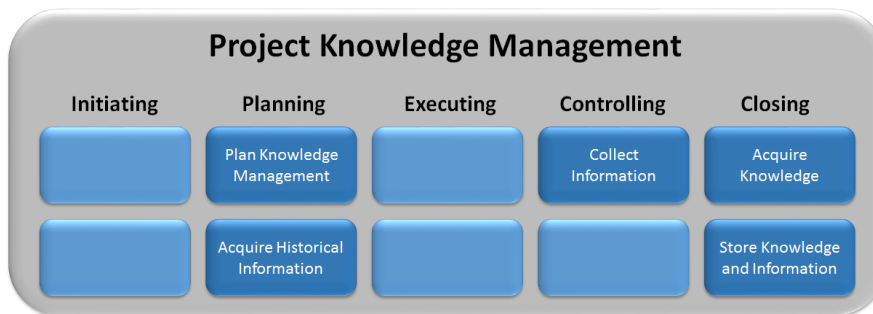
Diagram of documentation in the process of ISO21500

To improve the management of knowledge in project management we start from the definition of a new area of knowledge that is in addition to the 10 previously described. The new area of knowledge is called 'Project Knowledge Management' and consists of 5 processes that refer to three groups of procedures listed above (Planning, Monitoring and Closure).

The description follows the pattern defined by standard ISO21500 in such a way that it can be easily integrated by those who want to make use.

The processes that are added with this knowledge area are:

- Knowledge Management Plan ;
- Acquire Historical Information ;
- Collect Information ;
- Acquire Knowledge ;
- Store Information and Knowledge .

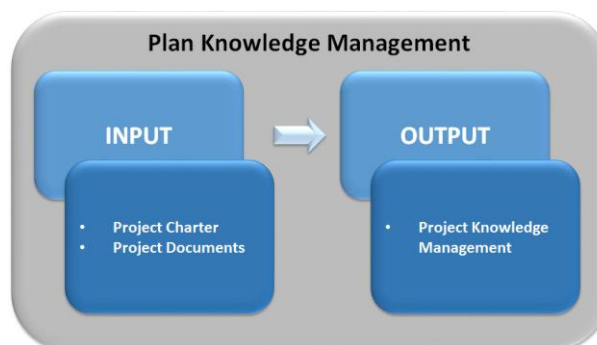


The new area: Knowledge Management

3.1 Knowledge Management Plan

As we can find in all the other areas of knowledge, in the context of planning processes it must be defined the strategy with which the knowledge, gained from previous projects and the current generated by the project, will be managed. The definition of the strategy starts from the analysis of the organizational structure in respect of the definition of the processes that govern it, for the analysis of the ways in which knowledge is managed within the organization, continuing with the assessment and the definition of the characteristics of the project from the point of view of the requirements, deliverables and development strategy of the project as defined by the governing bodies of the projects within the organization.

We suggest you to use an integrated system that enables the management of the project and, at the same time, helps managing the entire knowledge flow, such as a web-based platform that manages the plan and control the project and it is a tool of sharing and exchanging information so that, once closed the project, automatically, all the information generated are automatically archived.



The process 'Knowledge Management Plan'

Input

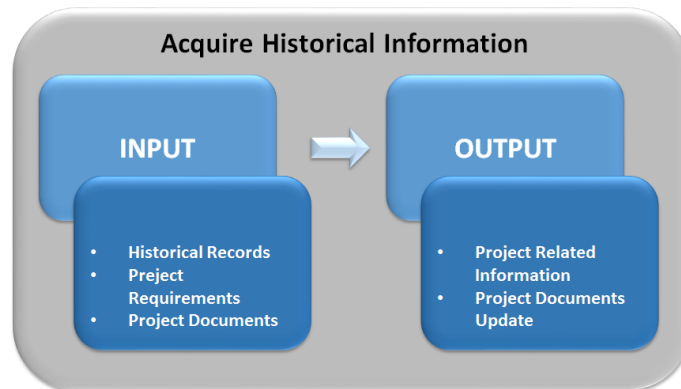
- Project Charter – documents that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities, provide all the initial information issued by the sponsor of the project from the point of view of the requirements, objectives, constraints, stakeholders, risks, quality ...
- Project documents – documents of projects, as defined in ISO and other international standards, contain two main documents: the project management plan and the project plan;
 - o Project Management Plan – defines the guidelines by which the project will be managed. It is defined by the project manager and his team, it is based on the culture of the organization and on the characteristics of the project in terms of complexity, duration and commitment ;
 - o Project Plan – a document that defines the planning of the project. The plan is developed based on what is defined by the project management plan.

Output

- Project Knowledge Management – the plan shows the strategy by which the knowledge will be managed within a project. The plan should be integrated with the organization's processes that already dominate the collection, cataloging and dissemination of knowledge, eventually integrate them based on what are the peculiarities of the project, as well as integrate with Project documents.

3.2 Acquire Historical Information

One of the first tasks that must be developed once the project has been started is to acquire historical information generated by previous projects for the actual project because they may be used in the planning processes. The historical information enhances the planning of the current project using the experience gained in similar projects or even can offer the opportunity to take advantage of planning elements. In both cases there may be important advantages in terms of savings (time and cost) and reduction of the uncertainty of future performance of the project. We will rely, in fact, on the final data because of the result of previous executions and not on a simple planning characterized by uncertainty.



The process 'Acquire Historical Information'

Input

- Historical records – historical information from previous projects. In these records there are stored not only the knowledge generated by the management of the projects, formal and non-formal documents, but also the experience gained by those who have worked on the project in terms of better alternatives, things that could be done in a different way, solutions to problems and conflicts ...
- Project requirements – expresses the requirements that must be met by the project and are part of the definition of the scope of the project. On these basis the project is able to define which are the historical information that must be retrieved to be made available to the project;
- Project documents – have been already been defined in the process 'Knowledge Management Plan'.

Output

- Project Related Information – Information filtered by historical information that can be used by the project in its planning and management according to the characteristics and requirements of the project;
- Project Documents Update – update of the project documents regarding any changes to the management of the documentation.

3.3 Collect information

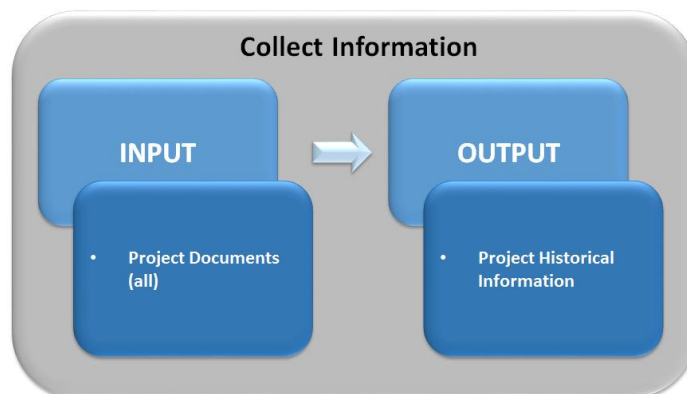
In the normal course of development of the project project documents and other related documents are generated and modified, such as:

- Minutes meeting;
- Presentations;
- Notes/memo;
- Reports;
- Contracts.

To this list it must be added any audio and video recording of meetings and/or events related to work.

All this information must be continuously collected and stored. We must not, in any way, get to the end of the project without have made the collection of documentations yet because, for long projects, the probability to 'forget' some extremely important information increases proportionally to the duration of the project.

This process has been included in the processes of monitoring and control, not for its control function but for the characteristics of this group of processes that have been developed until the project is ended, so it is the appropriate place for this type of activity



Process 'Collect Information'

Input

- Project Documents (all) – in this case, unlike the other processes not only the two main project documents, such as the Project Management Plan and the Project Plan, are taken into account but also the documentation produced by the project to be cataloged and archived .

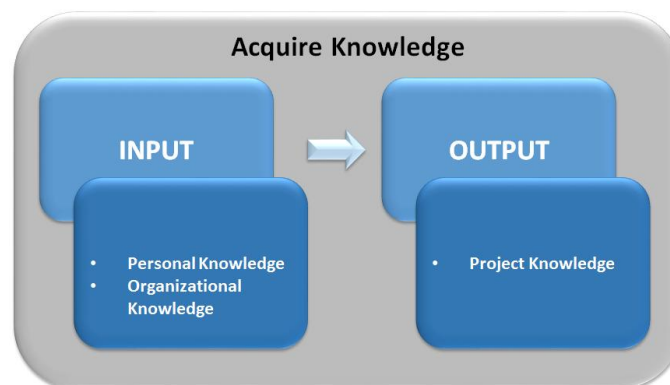
Output

- Project Historical Information – all the information collected within the project (plans, reports, records, memos , ...) are stored and cataloged within the historical information of the project to be made available for the current project, for the later stages, and for other projects that will be managed by the organization.

3.4 Acquire Knowledge

At the end of the project the experiences in the management of the project by the stakeholders and the organization, in terms of successful models must be acquired, so it can be replicated, or in case of failure, so improved, while providing a critical analysis and hypothesis of improvement so new projects do not follow a wrong way and have directions on how to improve the management and imagine new solutions.

It is strategically important to define the tools and techniques that can best support the collection of these knowledge elements, and in some cases, eventually, may be desirable the help of a psychologist for the collection of personal experiences



Process 'Acquire Knowledge'

Input

- Personal Knowledge – collection of knowledge and experience gained by all the participants of the project which could be significant for the management of future projects of the organization.
- Organizational Knowledge – collection of experiences/knowledge gained by the organization as parts of the project that is ending. The collection may be related

to the information that led to the change in the processes or improvement of activities and procedures.

Output

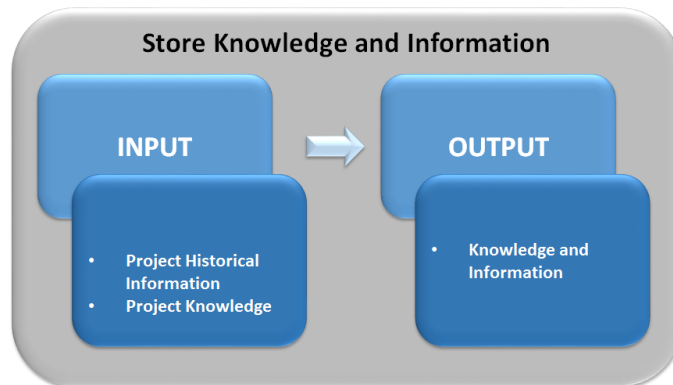
- Project Knowledge – document or management system that collects all the knowledge expressed in terms of experience, that has been generated within the organizational structure and management of the project.

3.5 Store Knowledge and Information

Once the project is ended, all the information that have not been collected so far, must be gathered, such as:

- Formal customer acceptance;
- Documents project closure;
- Sign off;
- Closed contracts.

To these elements it will be added also the collection of knowledge/experiences of each participant in the project and by the same organization. With this information the organization will be able to grow and improve their organizational processes in order to achieve the highest level of organizational maturity model defined by the continuous improvement.



Process 'Store Information and Knowledge'

Input

- Project Historical Information – collection of all closure documents of the project in addition to all the final versions of project documents that are closed to completion.
- Project Knowledge - as defined in the process Acquire Knowledge

Output

- Information and Knowledge – storage of all information including the various levels of knowledge that have been generated.

3.6 Use of Information

All information collected, as we have already said, can be gained from the projects to be undertaken in order to improve their planning or to improve the estimates in order to reduce time and cost, but in addition to these advantages may include even those resulting from the improvement of processes and procedures. In this case it is assumed that the organization is sufficiently structured to be able to have a central project management office also called PMO (Project or Program or Portfolio Management Office). This body will be in charge of analyzing the documentation produced by the projects run by the organization in order to improve:

- Processes for the management of projects;
- Checklist to guide the project team in the performance of their activities;
- Improvement of metrics for project management;
- List of the risks associated with mitigation and management;
- Improvement of the criteria for tailoring the projects;
- Template of projects;
-

In an organization doesn't have a PMO it is be the project manager and his team that will analyze the documentation in order to define the optimal management strategy of the project.

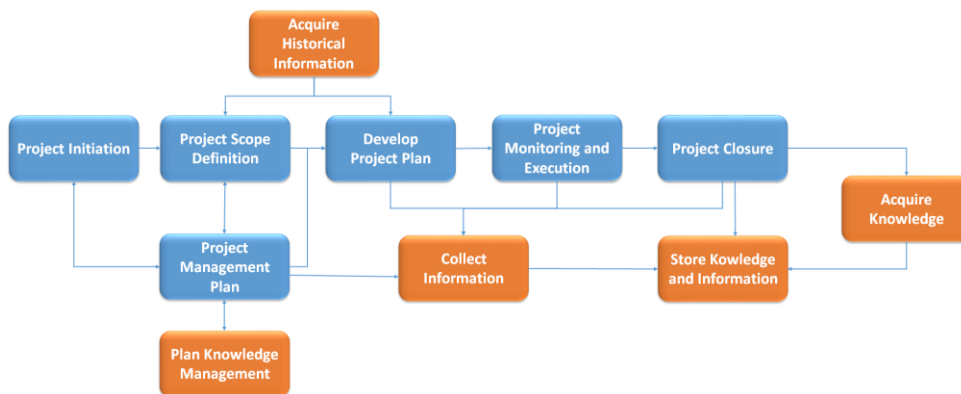
3.7 The reference model

The processes which have just been defined must be contextualized within the design of the processes by which a project is managed. The definition of a unique model is almost impossible because there is not a single model, the process model is defined in

terms of the scope of the project, the organization's culture and experience of the project manager. The only thing you can do is to define the relationship of the new processes in the context of the macro processes of project management. The following figure shows, in blue, the macro processes of project management, unchanging from project to project, and, in orange, the new processes.

The five processes of knowledge management can be grouped into 3 groups:

- Strategy - Project Knowledge Management – defines the strategy for knowledge management in the project;
- Collection of knowledge – collect information and Acquire Knowledge – collects the information and knowledge to feed the knowledge of the organization;
- Knowledge management - Acquire Historical Information e Store Knowledge and Information – distributes the information to feed the processes of planning and gathering of knowledge to feed the knowledge of the organization.



The reference model

4 Conclusion

To take advantage in the knowledge generated within a project in terms of information and experiences we should proceed in these ways:

- Definition of knowledge and project management organizational culture that defines rules and tools to manage the knowledge in relation to the projects management;
- Definition of the organizational processes that support the collection of knowledge in an organization.

Only through organizational culture and processes management, the organization will be able to obtain a costs, duration and risk reduction in project management as well as a reduction in the uncertainty of the results. In this way the project will be able to pursue the strategic goals of the organization with effectiveness and efficiency.

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Gathering knowledge for the needs of strengthening the resistance of a network supply chain

Marzena Kramarz*, Włodzimierz Kramarz
Department of Organization and Management
Silesian University of Technology
Poland, 44-100 Gliwice, ul. Akademicka 2A

** Corresponding author*

Structured Abstract

Purpose – The article aims at presenting a study into strategies of strengthening the resistance in a network supply chain of metallurgic products. The research was carried out in the years 2011-2013. Network supply chains include key chain links for building the resistance. These chain links affect material flows of the whole supply chain through silencing disruptions. Those predisposed to form a strategy strengthening the resistance of the whole network supply chain are organizations fulfilling the assumptions of material decoupling points.

Design/methodology/approach - The research is carried out in two stages: the stage of constructing an analytical model and the stage of constructing three simulation models corresponding to the distinguished variants of strengthening the resistance based. The first stage of the research aimed at indicating possible variants of the strategy of building the resistance of a network supply chain. At the second stage the authors carried out simulation experiments based on three models built in the management system dynamics technique (VensimDSS). The proposed methodology required constructing original tools for measuring disruptions and factors strengthening the disruptions in the form of cards for measuring disruptions.

Originality/value –The value added is grouping of disruptions in risk factors distinguished in terms of the frequency of the occurrence of disruptions and their results. The authors proposed and defined the notion of zones of strengthening disruptions. The zones are formed from sets of factors strengthening disruptions with similar influence on disruptions. In modelling of material flows in the context of the strategy of strengthening the resistance the authors proposed an assessment of the efficiency through elements of logistic customer service: the completeness, the punctuality of realized orders. In simulation experiments, the authors strived to reduce lost sales resulting from deviations in punctuality and completeness.

Practical implications – The proposed approach of gathering knowledge which will allow modelling material flows and constructing the strategy of strengthening the resistance of a network supply chain was verified in a selected organization fulfilling the assumptions of the material decoupling point of a network supply chain of metallurgic products. The IT system composed of a module for identification of disruptions in

material flows and a simulation model is a proposal dedicated to organizations controlling material flows in a network supply chain in the conditions of disruptions.

Keywords – gathering knowledge, material decoupling point, network supply chain., resistance.

Paper type – Practical Paper

1 Introduction

The first stage of knowledge management is knowledge acquisition in the organization and in its environment (Probst, Raub, Romhardt, 2002). Information turns into knowledge when it is interpreted and related to a context by its holder. Knowledge management in supply chains refers to a wide spectrum of issues, including the manner of decision making in particular organizations, gaining and processing knowledge about customers, etc. Relatively little attention is devoted in the research to factors causing deviations from the planned material flows. Gathering knowledge about disruptions is an essential task of the flagship enterprise whose part is to silence disruptions so that they will not transfer to the subsequent supply chains. The flagship enterprise controls material processes in supply chains, coordinates tasks performed by participants of the network and, having knowledge on disruptions in the entire supply chain, stands a chance to strengthen its resistance.

The paper presents the idea of gathering knowledge in order to strengthen the resistance of a network supply chain.

The first part of the paper indicates approaches to building the resistance of a supply chain which have been presented for the past years in the literature. The first part was closed with the expression of the research hypotheses. The second part indicated the author's idea and the resulting methodology of gathering knowledge within the range of disruptions in material flows, referring to contemporary solutions in this field. The worked out methodology was applied in a network supply chain of metallurgic products. The obtained findings were used for developing standard strategies of amplification of the resistance.

2 The resistance of a network supply chain

The complexity of the relations in contemporary supply chains results from dynamic changes in the environment as well as variable recipients' needs. Because of the fact that contemporary supply chains are characterized with a complex structure on each stage of creating the value added, in this paper they will be defined as "network supply chains". Creating network relations is especially justified in extremely innovative sectors and in those industries where products are diversified according to the recipients' needs (Brzóška, 2013; Chan, Wang, Luong, Chan, 2009). Harryson, Dudkowski, Stern (2008) point out that not only the number of network relations but also the variability of their forms constitute the basis which provides the foundation for organizations to develop new ideas and skills using their key competences and resources.

When defining the role of each link in the network it is worth looking at the graph theory. Determining the centrality of the node according to the degrees of tops (numbers of relations built on the entry and the exit by a given organization) often also means the assessment of the popularity or influentiality of nodes. The centrality according to the degrees of tops is useful for determining which nodes are the key ones from the point of view of spreading information or affecting the nodes situated in the immediate vicinity. Another indicator of the role of a node in a network is mediation. Mediation shows which nodes are the most important from the perspective of communication between nodes. Large mediation nodes are potential points of loss of cohesion of the network. Lin, Yang and Arga (2009) notice that the position of a node in the relational sense means authority essential for exerting efficient influence on other participants of the network. Taking into account the social networks theory in characterizing the network it can be noticed that the social status of the node reflects its authority in the form of one-sidedly directed emotional ties - respect, liking, recognition (Czakoń, 2012). Hagedoorn, Roijakkers, Van Kranenburg (2006) remark that the centrality and the popularity of nodes in a network creates a potential for exerting influence on other members of the network. The central link in the network, fulfilling the above-mentioned conditions, is defined in the paper as the flagship enterprise.

During the life of a flagship enterprise networks have features which predispose them to create new relationships. Consequently, these nodes more often than others decide about adding new nodes to the network. The phenomenon of preferential addition of results when creating a network in which a small number of nodes has a very high degree

of networkness. The remaining nodes of such a network have a considerably lower degree of networkness. Preferential adding usually results in the phenomenon of small worlds (cliques).

When referring these features of the flagship enterprise to the supply chain it can be noticed that these organizations are not only partners of their suppliers and recipients but simultaneously they widen relations on a given stage of the supply chain creating network relations. Flagship enterprises in the network, understood in this manner, have an essential influence on the amplification of the resistance of a supply chain.

The resistance of a supply chain is understood as a property (an attribute) of the organization / system involving rules, procedures, methods and management techniques as well as strategies protecting the organization against the negative results of deviations occurring under the influence of disruptions. Certain papers present recommendations for designing a resistant supply chain (Christopher, Lee, 2001; Rice, Caniato, 2003; Chistopher, 2004; Kleidorfer, Saad, 2005; Sheffi, Rice, 2005; Tang, 2006). However, there is not one and only way of building the resistance of a supply chain. Sheffi (2005) notices that every type of disruptions requires other activities so, depending on key risk factors, the way of building the resistance will be different. Consequently, the first step in the research into the resistance of a supply chain is to identify disruptions and factors amplifying them. Deviations in the anticipated and real level of customer service is the most important measure showing the results of disruptions in material flows.

Sheffi (2005), while investigating ways in which enterprises can respond to strong disruptions and conduct activities reducing threats connected with disruptions, claimed that:

- Reduction of bottlenecks connected with disruptions occurs through monitoring, early-warning systems (an increase in the sensitivity of a supply chain), a quick reaction to the change of needs, collaboration and redundance
- Operating flexibility is increased through standardization of parts, facilitating their replaceability (product modularity, product designing from the logistic perspective), the postponed production strategy or mass customization of products (multi-variantness) in response to changes of needs which are difficult to forecast, management of relations with customers and suppliers.

Tang (2006) perceives the resistance as an essential competitive superiority of a supply chain and suggests strategic development via smoothing effects of disruptions

(deviations). He also stresses the meaning of the postponed production strategy, a flexible base of suppliers, multi-modularity flexible transport. Christopher and Peck (2004) define the resistance of a supply chain as an ability of the supply chain to the return to the original state (flexibility) or transition to a new and more suitable state under the influence of the occurring changes (adaptability).

Therefore, the flagship enterprise, which is supposed to strengthen the resistance of a supply chain, can use three approaches: elimination of disruptions, compensation of disruptions, smoothing of deviations. The research presented in the paper the authors focused on strengthening the resistance through the system reaching the state of the original system (compensation of disruptions).

Fig. 1 shows the relationship between the strategies of strengthening the resistance, mentioned in the literature, indicating that certain strategic activities help to obtain the aims of the superior strategy.

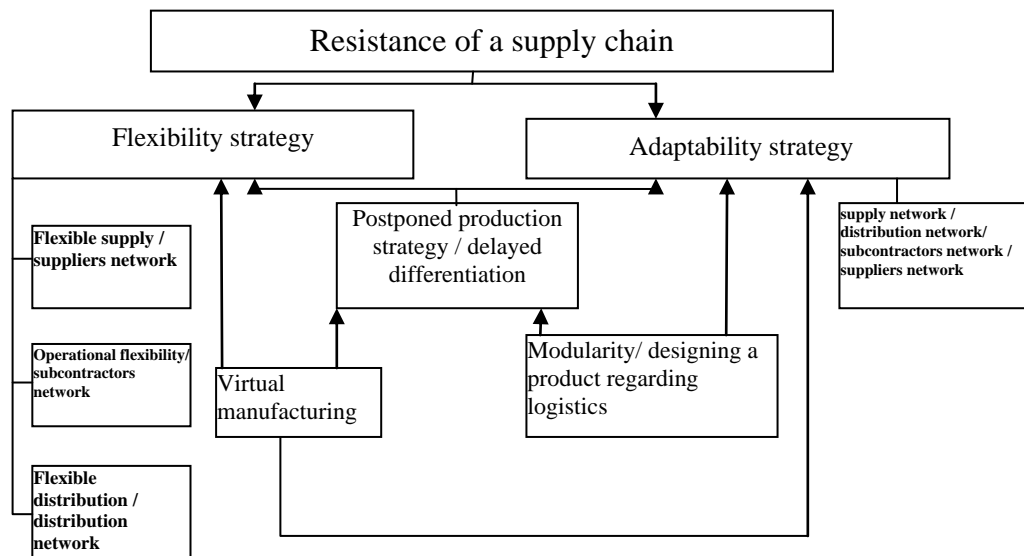


Fig. 1. The resistance strategy

Source: The authors' study

Modularity and designing the product from the logistic perspective is a way for realization of the postponed production strategy and one of possible strategies of product differentiation. Virtual production can help both the flexibility of the organization and its adaptability. Postponed production can be realized via complex network relations between the base enterprise and the subcontractors, and the organization manner can take

into account virtual production. Moreover, the flexibility can be shaped in different phases of the value chain, including on the supply, production or distribution level through network relations. Network relations and the redundancy of resources are shown not only as tools for building the flexibility and the adaptability of the supply chain. The adaptability uses the possibility of reconfiguration of networks constructed in each phase of the supply chain in order to achieve a new level of system equilibrium.

To sum up, the resistance in network supply chains requires describing the structure of a network supply chain, characterizing the enterprises which control the flows as well as defining risk factors and zones of strengthening disruptions. Taking into account these requirements the authors proposed an original methodology of gathering knowledge for the needs of strengthening the resistance of a network supply chain. Two research questions, which became the basis of the put forward hypotheses, were as follows:

Research question 1 What is the influence of risk factors in a network supply chain of metallurgic products on deviations in material flows.

H1. Risk factors affect an increase in the frequency of deviations in material flows

Research question 2 What is the influence of factors strengthening the disruption on risk factors in a network supply chain of metallurgic products

H2. Factors defining the zones of strengthening disruptions intensify disruptions in material flows

3. The concept of gathering knowledge for strengthening the resistance of a network supply chain

The main objective of the research was the construction of the model of strengthening the resistance of the network supply chain from the perspective of the flagship enterprise. This model presents the stage of gathering knowledge and the stage of decision support of the flagship enterprise of a distribution network.

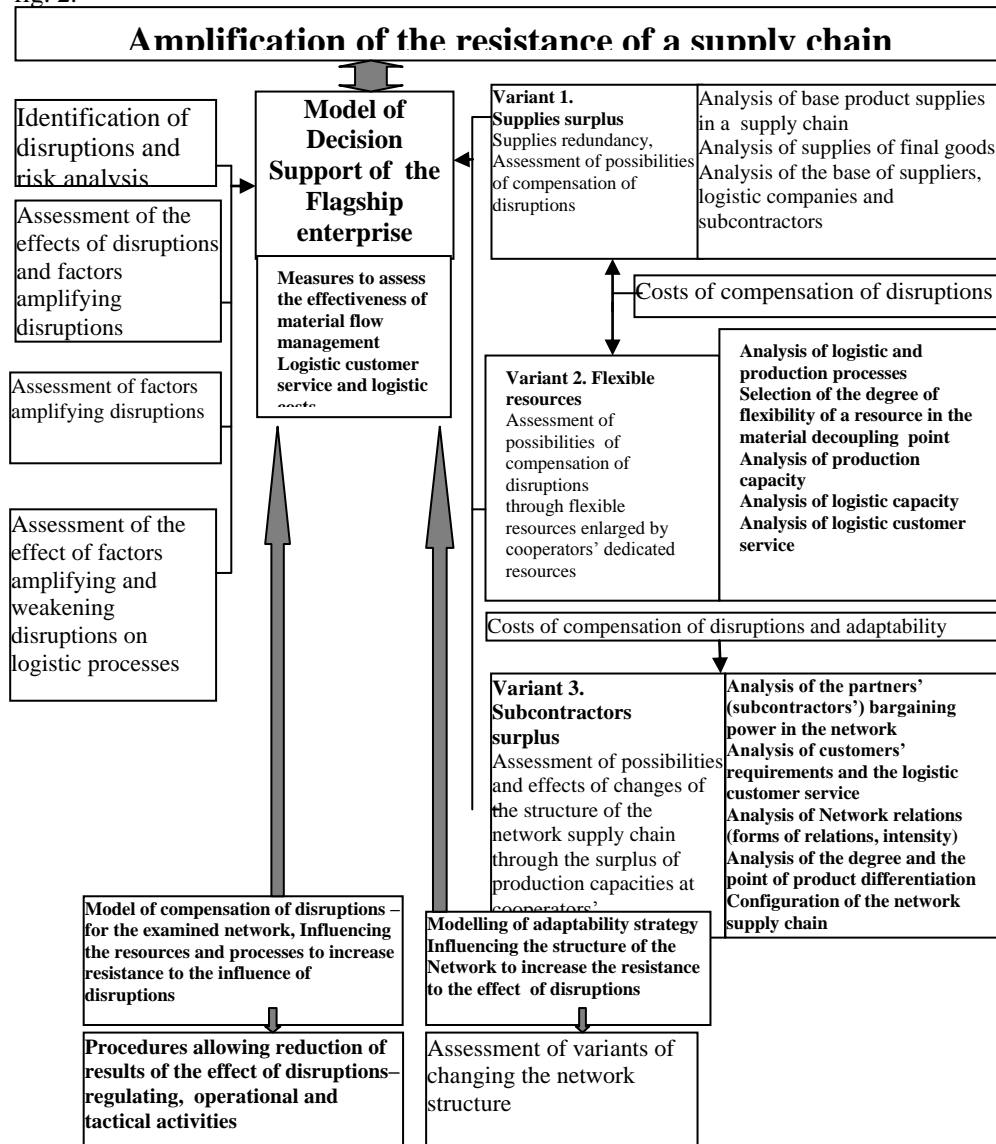
Problems indicated by managers, occurring as a result of including subcontractors into the structure of flows, and the analysis of IT tools in material flow management, induced to channel the research in such a way as to allow working out tools permitting identification and assessment of disruptions as well as an analysis of decision-making variants connected with compensation of disruptions, through considering two options depending on the frequency of the appearing disruptions (Machado et al, 2007; Chopra et

al, 2007):

- flexibility allowing compensation of disruptions via designed mechanisms (e.g. the flexibility of resources, the supplies surplus, the redundance of subcontractors, suppliers, logistic co-operators),
- adaptability involving a change of procedures or network structures

The adopted decision-making range of the material decoupling point was presented in

fig. 2.



Source: The authors' study

Fig. 2 Strategic decision support system of the flagship enterprise

In the research the authors used secondary data gathered for analysing a network supply chain of metallurgic products concerning formation of supplies as well as initial data in the area of the identification of disruptions and assessment of their influence on material flows.

Gathering the initial data was conducted by means of the diary method (Dohn, Gumiński, Matusek, Zoleński, 2013; Di Caprio, Santos-Arteaga, 2009). The measurement tool was a questionnaire called the "the disruption measurement card". The questionnaire contained both closed as open questions. The research conducted by means of disruption measurement card aim at:

- determining which disruptions are not caught by the IT systems supporting material flows in the investigated organizations,
- limitation of potential disrupting factors, selected on the basis of the literature research, to the ones essential for the investigated supply chain.

Disruption measurement cards were made available in three research objects which are different stages of the supply chain of metallurgic products. The cards were filled every day for 6 months by workers of different organizational units. The obtained data were converted in the STATISTICA software.

The process of the analysis of disruptions is a multi-staged one (Blackhurst, Craighead, Elkins, Handfield, 2005). At the first stage the authors suggested using the cause and effect analysis for identifying the relationship between disruptions and deviations. Thanks to this, this stage of research was conducted according to the following steps:

- identifying deviations in material flows,
- indicating the relationship: a deviation in material flows - a result of the disruption (organizational results, e.g.: difficulty in functioning of the process, lack of workers, equipments, lack of materials, lack of information, financial results, including costs connected with extraordinary transport, costs of lost sales),
- identifying the place where the disrupting factor occurs (the base enterprise, the supplier, the subcontractor, transport processes),
- identifying factors strengthening the disruption
- assessment of the total of losses connected with the appearance of the deviation.

The classification of disruptions is based on the system approach which allows

dividing disruptions according to the following phases: entry, inside the system, which involves processes of transformation and exit. The cause and effect analysis allows sorting out the investigated variables in the following sets: deviations in material flows, factors causing disruptions, chain links of the supply chain generating disruptions, factors strengthening disruptions. Thanks to such an approach it is possible to assess the power of their influence on deviations in the realized processes. The set of factors causing disruptions was categorised into endogenous factors connected with the characterization of the order, with the characterization of the base enterprise and with the characterization of the partner, and exogenous actors connected with the environment of the process of order completion.

At this stage research the authors:

- conducted pilot studies which confirmed the thesis that current IT tools were not sufficient for strengthening the resistance of network supply chains
- identified the most frequent deviations in material flows and their results for organizations in a network supply chain of metallurgic products
- defined risks factors distinguished in respect of similar frequencies of the occurrence of disruptions
- defined zones of strengthening of disruptions.

Factors strengthening disruptions as well as risk factors were distinguished by means of the factor analysis.

In the disruption measurement card factors causing disruptions were left in the form of an open question, allowing workers who filled the questionnaire every day to name freely the event which caused deviations in material flows. It was a conscious approach to the manner of measurement which aimed at catching all possible events, and not only those which were known to the author of the questionnaire while creating it. The mentioned disruptions were characterized descriptively in respect of the reasons of occurrence and the results, the subject responsible for the occurrence of a disruption, and they were assessed according to the power of the influence on the organization according to the organizational and financial criterion. The manner of rating the power of the influence of disruptive factors was provided in the table. Factors strengthening disruptions in material flows were also assessed every day. Respondents marked if a given event took place on that day and, if they rated (in the event of a positive response) what power of influence it had on disruptions in material flows.

The obtained results were compared with the knowledge on disruptions, identified through practical IT solutions (ERP class systems), which are used currently.

The integrated ERP system allows simulation of various activities and their analysis, and consequently better planning and management of processes in an enterprise. The ERP system is supplemented by the SCOR reference model. It combines perfectly the business knowledge with the knowledge on possibilities of the implemented IT systems.

All the processes inside the supply chain can be divided into three areas: processes situated above the enterprise, processes connected with the enterprise and processes situated below the enterprise. These areas create the following relationships (Szymanowski 2006, Chopra S., Meindl, 2004):

- Customer Relationship Management - CRM),
- Internal Supply Chain Management - ISCM),
- Supplier Relationship Management - SRM).

Internal Supply Chain Management (ISCM) involves the internal activity of an enterprise, beginning from task planning to completion of customers' orders, and is characterized with a strong integration with CRM and SRM systems.

Supplier Relationship Management (SRM) refers to cooperation between producers and their suppliers, their joint construction of strategic plans, negotiations, monitoring and assessment of the organization of supply processes.

Summing up, it can be stated that present IT technologies involve most of logistic areas, enabling decision support of an enterprise, inventory control, organization of transport routes and any types of tactical and operational logistic activities. The identified gap of the mentioned IT tools is their difficulty in identifying and analysing disruptions at the stage of creating network relations.

In connection with the above, the authors developed an IT tool compatible with the ERP system, aimed at recording disruptions and analysing deviations in material flows. It is a tool from the area of management information systems (MIS). The tool involves a module for gathering knowledge regarding disruptions in a network supply chain (fig. 3).

The proposed procedure is universal and can be applied in different supply chains. However, the tool for gathering knowledge requires adaptation to the specificity of a given industry through conducting research based on disruptions measurement cards, selection of risk factors in respect of frequencies and results, and defining the zones of strengthening disruptions.

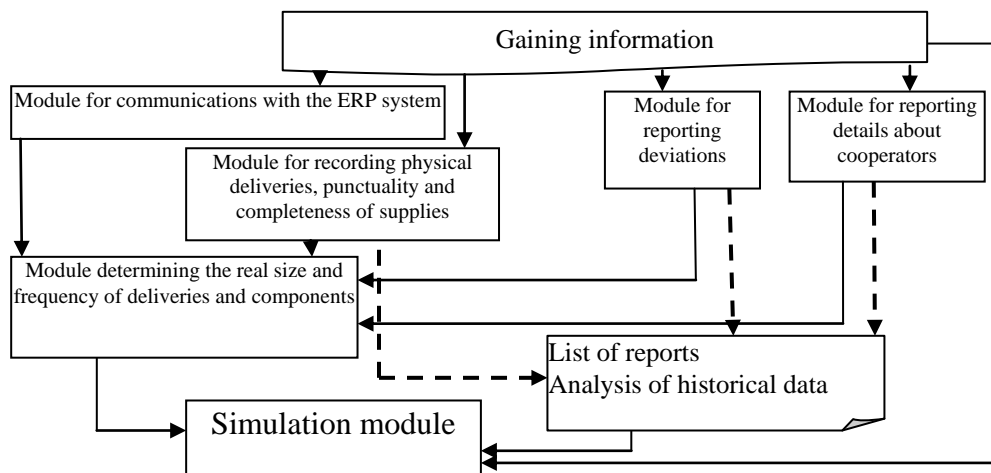


Fig. 3. Modules of the tool Planning supplies of components and controlling the level of material supplies

Source: The authors' study

The developed tool was enriched with a simulation model to support management decisions. The simulation model, in compliance with the adopted assumptions, was developed for all three variants of strengthening the resistance of a network supply chain in the technique of the management systems dynamics.

4. Risk factors and zones of strengthening disruptions in a network supply chain of metallurgic products.

The carried out literature and pilot research allowed selecting 32 factors causing disruptions in material flows in a network supply chain of metallurgic products. The initial analysis of the relevance of the relationship between selected variables, showed correlations between certain variables, therefore the authors decided to carry out the factor analysis in order to connect strongly correlated variables, and consequently reduce the number of variables. Risk factors distinguished in this way were analysed in respect of the factual justification of connecting definite variables in a given risk factor. As a result of the carried out analysis the authors selected 6 risk factors significantly diversified in respect of the frequency of occurrence of disruptions.

- Factor 1 refers to the organization of production and logistic processes,

disruptions are generated by wastage ('muda' according to Lean)

- Factor 2 refers to supplies, disruptions are generated by suppliers
- Factor 3 involves disruptions arisen at the stage of the realization of logistic processes between the base enterprise and the customer
- Factor 4 involves disruptions generated by the subcontractor
- Factor 5 involves disruptions generated by the supplier in the area of the reliability of supplies
- Factor 6 involves disruptions generated by the base enterprise in the area of order realization including monitoring and processing of orders

The distinguished risk factors not only represent significantly the variability of disruptions in respect of the frequency of their occurrence but also have their essential reason. The division of the factors is compatible with the phasic (system) perspective in logistics so it involves suppliers, the base enterprise, logistic enterprises, customers. The authors distinguished two types of risk factors within the base enterprise itself. The first risk factor expresses disruptions resulting from bad organization of work. Variables forming this factor refer to wastage factors in an organization (muda), well-known from the literature. The sixth risk factor referring to the risk generated by the base enterprise refers to events happening as a result of the maladjustment of the supply base of the organization and inspection procedures of the quality inspection to the real requirements of material flows. Similarly, disruptions generated by the supplier in respect of the frequency constituted two risk factors. The second risk factor comprises events connected with completeness, quality or lack of supply, and the fifth risk factor contains events associated with the time of delivery realization.

At the stage of identification of disruptions in material flows in s network supply chain the authors also distinguished key deviations (as a results of disruptions):

- Unpunctual order realization O1
- Incomplete order realization O2
- Unrealized order O3
- Deviations from the determined stock levels O4
- Extraordinary transport O5

The correlation analysis showed that the increase in the frequency of disruptions generated by suppliers is accompanied by an increase in the frequency of unpunctual orders and extraordinary transports. However, the growth of factors from the wastage

group (muda) is accompanied by an increase in the frequency of deviations from the determined stock levels. The growth of disruptions generated by the subcontractor causes an increase in the frequency of deviations from the determined stock levels.

The canonical analysis, where deviations in material flows were the dependent variable and risk factors were the independent variable, confirmed the influence of the frequency of disruptions on deviations (the canonical correlation coefficient $R^2=0,74$ at the relevance level $p=0,0042$). Consequently, hypothesis 1 was confirmed.

Disruption in material flows can become stronger through the influence of other factors which in the literature are defined as factors of amplification of disruptions. The assessment of factors of amplification of disruptions was carried out on a research sample of 54 enterprises of a network supply chain of metallurgic products. Particular zones were selected on the basis of the factor analysis. Taking into account the findings of the literature research (finished with the selection of factors of amplification of disruptions) and also the findings of the empirical research carried out in earlier stages (including especially separating risk factors in respect of frequency) zones of amplification of disruptions were indicated.

The factor analysis was carried out in two steps. At the first step the authors singled out 12 groups of factors which were represented by 20 factors of amplification of disruptions and 97% explained the variability of the examined phenomenon. Not all groups were characterized with a significant representation of factors of amplification of disruptions. At the second step the authors distinguished 5 zones of amplification of disruptions. The description of zones of amplification of disruptions was presented in Table 1. The distinguished 5 zones is represented altogether by 17 factors of amplification of disruptions:

Zone 1 - Zone of amplification of disruptions in the microenvironment of the base enterprise in the suppliers' environment

Zone 2 - Zone of amplification of disruptions in material flows on the line of communication between the nodes of the network supply chain

Zone 3 - Zone of amplification of disruptions in the area of the market

Zone 4 - Zone of amplification of disruptions resulting from limitations of capacity

Zone 5 - Zone of amplification of disruption in the area of the macro-environment of the network supply chain.

The factors mentioned in zones of amplification of disruptions in 93% explain the

variability of factors of amplification of disruptions. The content-related analysis of factors of amplification of disruptions representing particular zones of amplification of disruptions allows acceptance of the division received by means of the factor analysis. The authors indicated a possibility of dividing the factors of amplification of disruptions into homogeneous, in respect of the effect on the frequency of disruptions presented in risk factors, groups defined with zones of amplification of disruptions.

The analysis of the influence of factors strengthening disruptions on the frequency of disruptions expressed in risk factors was effected by means of the canonical analysis, where the components of the independent variable were zones strengthening disruptions, and the dependent variable was represented by risk factors separated in respect of frequency. The obtained configuration of components of the dependent and the independent variable (fig. 4), which significantly explains the influence of zones of amplification of the disruption on risk factors distinguished in respect of frequency, took the canonical correlation coefficient $R=0.699$ at the relevance level $p=0.0054$.

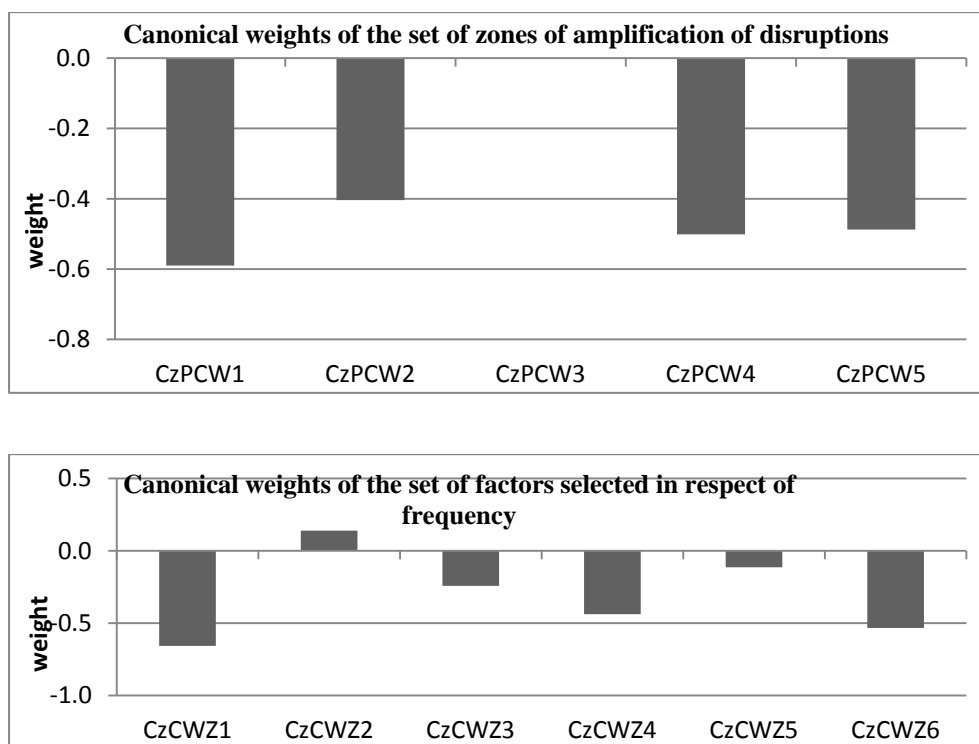


Fig. 4. Results of the canonical analysis concerning the influence of zones of amplification of disruptions on risk factors distinguished in respect of the frequency of occurrence of disruptions

Source: The authors' study

Zones 1,2,4 and 5 strongly and favourably amplify the risk factors distinguished in respect of frequency, whereas they exert the strongest influence on the growth of the frequency of disruptions connected with wastage in the base enterprise and connected with unpunctuality of deliveries generated by the supplier. In the obtained configuration only the second risk factor (disruptions generated by suppliers, including defective or incomplete delivery) has a negative and very low canonical coefficient. Consequently, it can be noticed, first of all, an essential influence of zones strengthening disruptions on the punctuality of processes realized by the supplier and on the organizations of processes in the base enterprise. The findings of this part of the research allow adopting Hypothesis 2. At the same time, the obtained findings in the area of testing both of the research hypotheses became the basis for constructing a simulation model which is a module of an IT tool

5. Variants of strengthening resistance

The stages of creating and analysing risk factors, the zones of amplification of disruptions as well as designing the IT tool and simulation models (Can, Chan, 2006; Celik, Lee, Vasudevan, Son, 2010; Harrison, Lin, Carroll, Carley, 2007), all indicated strategic variants strengthening the resistance to flagship enterprises of the network supply chain of metallurgic products.

The flagship enterprise which is a material decoupling point can strengthen the resistance of the supply chain using one of the options presented in Chapter 3:

- supplies surplus,
- flexible resources,
- network cooperation.

These are alternative strategies of amplification of the resistance of a supply chain, dependent from the level of endogenous and exogenous disruptions. The general model of amplification of the resistance of a network supply chain from the perspective of the material decoupling point consists of three models which provided the basis for simulation models. The assumptions which are common and differentiating the proposed models were shown in the table 1.

Table 1. The characterization of strategic variants of amplification of the resistance of a supply chain

	The supplies model	The flexible resources model	The cooperation model
Common assumptions	Material decoupling point realizing the postponed production tasks differentiating the base product to orders placed by recipients of the automotive industry		
	The transport cycle between MPR and the recipients		
	The supplies of the finished (diversified) products		
	The supplies of the base product (supplies on the entry to the system)		
	The unit costs of supplies		
Assessment criteria:	The unit costs of transport		
	The logistic customer service and logistic costs (it was assumed that the logistic customer service could not be smaller than 0.90 and with such an assumption the authors searched for a solution with the lowest logistic costs)		
The characteristic assumptions for the model			
The characterization of demand	A multivariant product, differentiated on a large scale with a relatively stable demand for each variant	Differentiation of the product dependent from orders for particular variants of the product, large deviations from the forecast demand	Differentiation of the product dependent from orders for particular variants of the product or resulting from the specification presented in the project of the variant of the product, very strong deviations from the forecast demand
The prevailing model of the process	BTF Build to forecast	BTO Build to order	CTO/BTO Configure to order / Build to order
Attributes of resources	Dedicated resources in MPR	Flexible supply in MPR, dedicated substitutional supply at the subcontractor's	Flexible supply in MPR, several subcontractors having at their disposal dedicated substitution and complementary resources
Cooperation	Limited, only refers to substitution resources, irregular relations (loose relations between MPR and the subcontractor)	Limited, refers to the substitution supply, cooperative agreements (strong relations between MPR and the subcontractor)	Strong, refers to substitution and complementary resources, Diversified relations between MPR and the subcontractors

Source: The authors' study

The proposed strategic variants should be investigated in respect of their sensitivity to fluctuations of demand. The proposed simulation models allow determining the thresholds of the efficiency of each variant.

In the assessment of the efficiency of the accepted strategy by the material decoupling point, both the logistic customer service and logistic costs must be taken into account . The determined deviations in material flows correspond to elements of the logistic customer service. Consequently, striving to reduce deviations in material flows, at the same time one strives to improve the level of the customer service. The costs consist of both the costs of transport, storage, non-utilization of production capacities and the costs of lost sale.

Each of the investigated strategic variants of amplification of the resistance has its consequences in the approach to material flow management. The material decoupling point, when choosing a model of flow management, should have data within concerning the frequency of disruptions, the influencing power of zones amplifying disruptions, the required level of individualisation of the product. The key stage of the making-decision process is to identify the value of the zone of amplification of disruptions in the area of the market. It is because this group includes factors characterizing the demand and the attributes of placed orders. It is fluctuations of demand, apart from the power of internal disruptions, that most strongly determine the efficiency of each variant of the strategy of amplification of the resistance of a network supply chain. The results of simulation experiments (Kramarz, 2013) showing the thresholds of the efficiency of each variant of amplification of the resistance by the materials decoupling point of the network supply chain was shown in Table 2.

Table 2. A summary of strategic variants of amplification of the resistance of a supply chain by the material decoupling point

	The supplies model	The flexible resources model	The cooperation model
Assessment criteria:	The logistic customer service and logistic costs are assessment criteria (loc is not smaller than 0.95 and with such an assumption of a solution with the lowest logistic costs)		
Stable demand, slight disruptions inside the system	strongly resistant	unprofitable	unprofitable
Stable demand Considerable disruptions inside the system	not resistant	strongly resistant	low profitability

Unstable demand Slight disruptions inside the system	not resistant	Resistant at average values of demand considerably lower than the maximum outputs of the system. The threshold resulting from the limited production capacity of the flexible and dedicated supply	Strongly resistant; The growth of cooperators is accompanied by an increases in the frequency of disruptions inside the system. The threshold results from the growth of internal disruptions of the system together with the growth of the number of cooperators, these disruptions enter into relations with the zones of amplification of disruptions and are not smoothed by advantages resulting from the large availability of production capacities
Unstable demand, considerable disruptions inside the system	not resistant	not resistant	

Source: Kramarz, 2013

In the first strategic variant the material flow management is based on forecasts of demand for variants of the product. This is the basis for shaping the combination of supplies of the base product and finished products (already diversified base products - fig. 5).

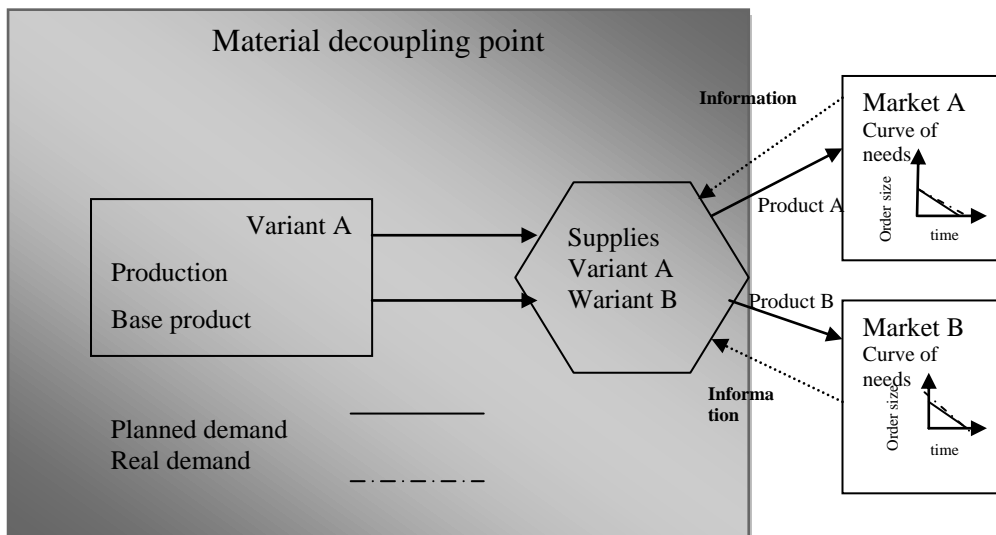


Fig 5. A flow model for the early differentiation strategy (multivariant products)

Source: The authors' study

Slight disruptions of demand and the multivariant product with a comparatively stable demand for each variants allow smoothing of the occurring disruptions with the supplies surplus in the base product stock and in the finished products stock. It is more efficient to build a surplus in the base product stock and form an alarm reserve in the finished products stock on a level close to the average demand for each variants of products. So, the level of the alarm reserve is marked on the basis of demand for variants and on the basis of the norms of supplies. The control system is programmed so as to make up supplies up to the alarm level and consequently to maximize the level of the logistic customer service through limitation of incomplete, unpunctual and unrealized deliveries. The supplies of the base product are created on the basis of a summary demand for variants of products and the norms of the reserve. This model corresponds to the model of production-to-stock, taking into account the postponed production for needs of the differentiation of the product. Variable in the control system are the level of alarm reserve in the base product stock and in the finished products stock (for each variant of the product). The variability of the level of the alarm reserve depends on changes in demand. Controlling involves tracking this variability and compensating the shortage of supplies in each stock. The system performs well in the conditions of a slight variability of demand and slight disruptions. Both the growth of fluctuations of demand and the growth of internal disruptions cause that the system to become not resistant and no configuration of supplies is in a position to ensure the required level of the logistic customer service.

In the second variant of amplification of the resistance (through flexible resources), the process of the flow management involves maintaining comparatively high production powers on the level of the materials decoupling point and supplementing them with dedicated power at the cooperator's.

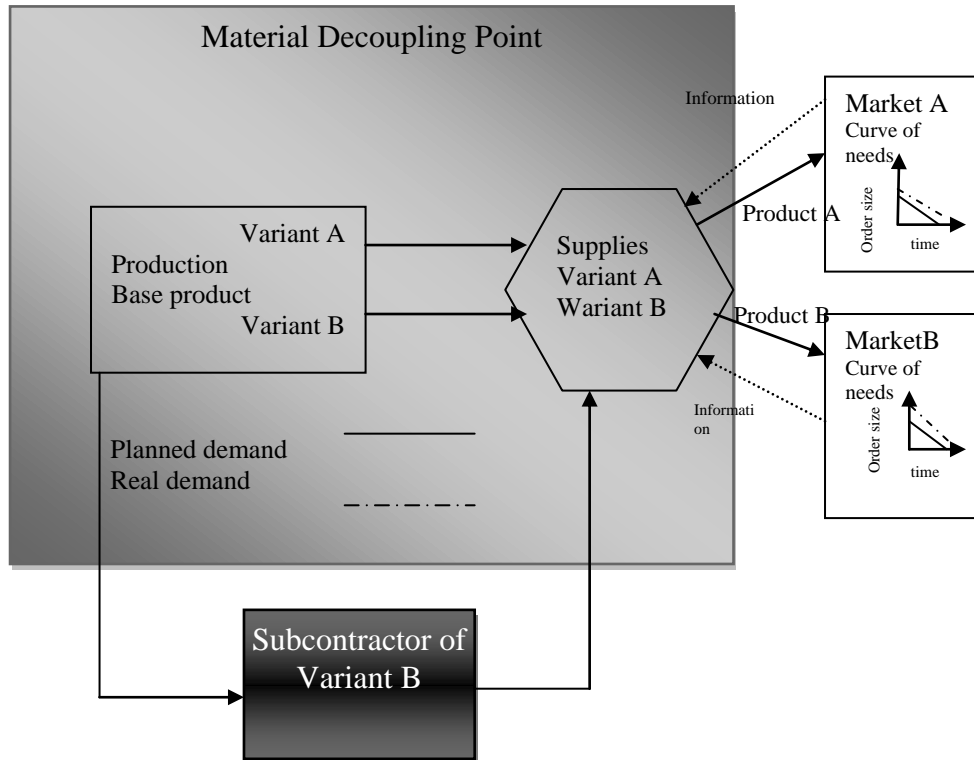


Fig 6. A strategic variant - delayed differentiation - flexible supply

Source: The authors' study

The material decoupling point has a flexible supply allowing differentiation of the base product according to the recipients' diversified needs. In the event of an increase in demand, part of operations connected with production of one variant of the product is directed to the subcontractor, and then the flexible supply realizes orders for the second variant. In this way the designed system is able to react to changes in both the summary demand and the demand for particular variants of the product as well as disruptions in material flows only slightly amplified by cooperation with the subcontractor. Disruptions in this model occur on a lower level than in model 3 because strictly limited numbers of subcontractors allow building strong and formalized relations, based on strictly designed procedures limiting the possibility of generating disruptions. Controlling involves tracking the demand for finished products, shaping the level of the reserve of base products based on summary forecasts, encompassing all variants of the product, and

starting production in the material decoupling point and at the cooperator's depending on real demand for particular variants. It is a management model based on the pull system, in which an impulse for realization of the operation of differentiation of the product (late differentiation) are the recipients' real needs. Any excess of production power and the flexibility of the system cause a possibility of a quick reaction to the variability of the demand. The system shows a high resistance to the average disruption level.

In the last variant of amplification of the resistance (creating a surplus of network relations) the system is controlled by conducting (orchestration) the subcontracting of the operations of the postponed production and building relations in the network. The production and logistic system designed in this way is both flexible and adaptive.

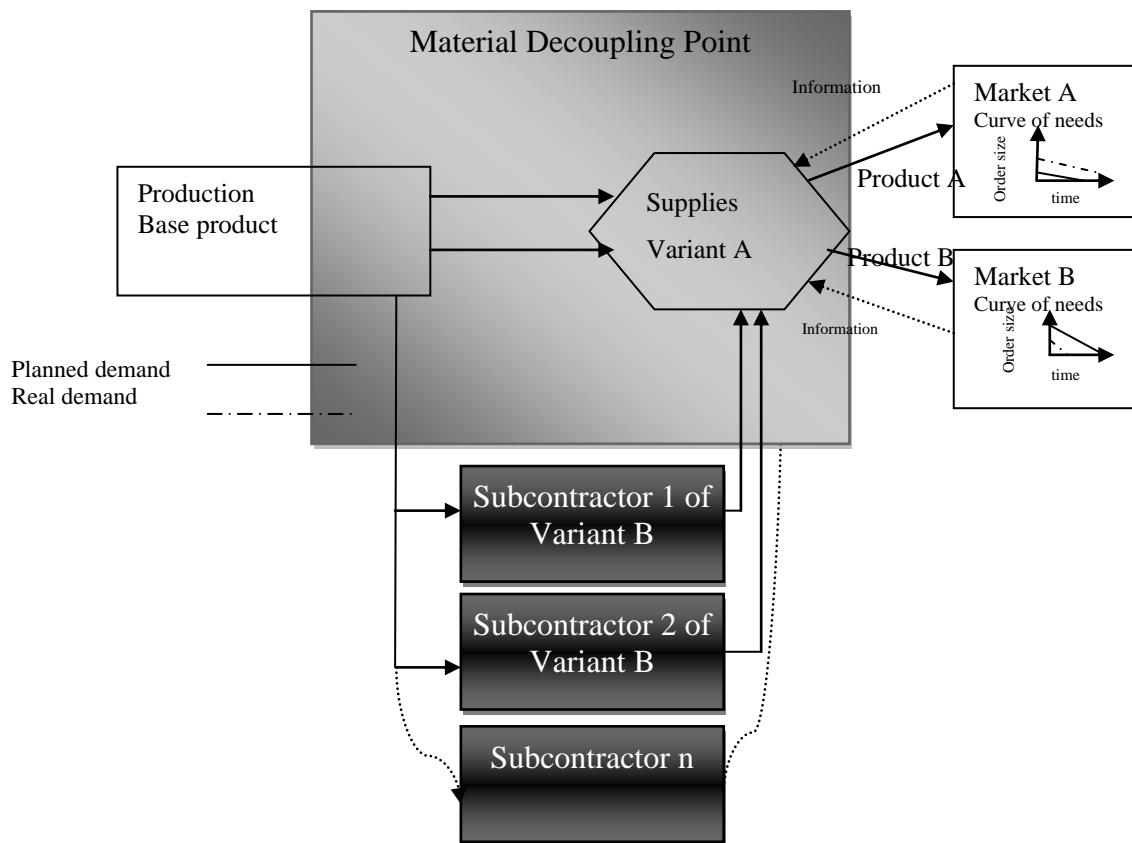


Fig. 7 A strategic variant: delayed differentiation - network relations in the area of subcontracting

Source: The authors' study

The management process involves an estimation of the summary demand for variants of the product, adjusting on this basis the stock level of the base product, receiving orders for variants of the finished product and distributing them between the production powers and partners in the network. The considerable differentiation of a product affects assumptions concerning extensions of the entire time of the production and logistic cycle but simultaneously requires high standards as regards punctuality and plenariness of deliveries. Considerable fluctuations of demand entail establishing additional relations with cooperators. These relations increase production capacities of the entire system. The system is efficient to a certain level of the variability of demand in connection with the fact that building additional relations increases internal disruptions which after exceeding the threshold value reduce the resistance of the entire system. Internal disruptions increase together with the growth of the number of cooperators. Due to the dynamic system of relations between the material decoupling point and subcontractors, relations are weaker, less formalized and more susceptible to the influence of endogenous factors.

Using the relationships between the efficiency of particular strategic variants and the fluctuations of demand as well as including the degree of the differentiation of a product into the decision-making issue, the authors developed a strategic matrix for the flagship enterprise of a distribution network fulfilling the assumption of material decoupling points (fig. 8).

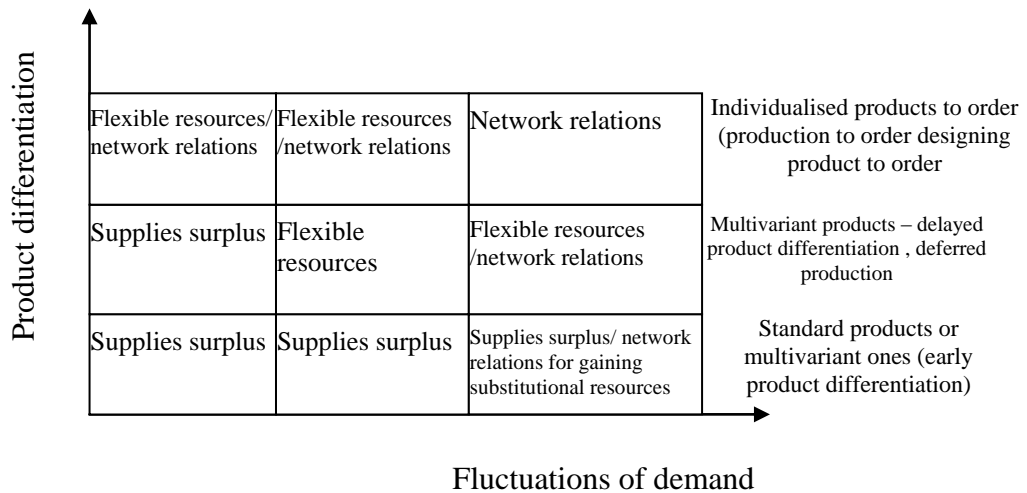


Fig 8. A strategic matrix depending on fluctuations of demand and the degree of the product differentiation

The attributes of the placed orders indicate the degree of individualisation of products. Constant demand for particular variants decides about the possibility of using the so-called mass customization, i.e. production of different variants in compliance with forecasts. Strong fluctuations within particular variants (irrespective of the fact whether the summary demand is characterized also with strong fluctuations or is relatively stable) require making a decision about realization of orders in the pull system and differentiation of base products in compliance with incoming orders. In that case, it is solely supplies of the base product that are becoming essential. The growth of fluctuations of demand causes that it is ineffective to search for amplification of the resistance through a combination of the stock level of the base product and the finished products. Then one ought to search for other ways ensuring flexibility, such as flexible resources or network relations.

Conclusions

The network structure of the supply chain enlarges the flexibility through the redundance of production and logistic resources. Flexibility, however, increases the resistance of the entire supply chain on disruptions

In such structures it is extremely essential to gather knowledge on disruptions. The proposed methodology of measuring disruptions including identification of disruptions, indication of the risk factors and zones of amplification of disruptions aims at adjustment of the designed IT tool which allows knowledge gathering under the specificity of a given industry.

The modules designed in the tool, i.e. the modules for tracking disruptions and for tracking real material flows, compatible with the ERP system, allow undertaking activities to correct the size and the frequency of deliveries and the volume of buffer reserves according to the developed real-time strategies of amplification of the resistance.

The system also allows recording deviations in the past periods and making a list of historic data. These provides the basis for estimating the trends connected with disruptions and referring them to the cooperators' attributes.

The system takes into account the stochastic aspect of cooperation. Through historic analyses it is in a position to assess the variability of demand and deliveries on the part of cooperators as well as the sizes and the reasons of deviations and use this knowledge for

material flow management.

Essential modules of the tool are simulation models which, using the data gathered in the system, permit developing and evaluating variants of amplification by the material decoupling point the resistance of the network supply chain.

The developed simulation models for the network supply chain of metallurgic products allowed carrying out experiments within the sensitivity of each of the three proposed strategies of resistance to disruptions.

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Knowledge Utilization in Knowledge Intensive Firms State-of-the-Art and Future Research Directions

Gregor Diehr*, Stefan Gueldenberg

Institute for Entrepreneurship

University of Liechtenstein

Fuerst-Franz-Josef-Strasse, 9490 Vaduz, Principality of Liechtenstein

** Corresponding author*

Structured Abstract

Purpose – This paper aims to identify the main processes and factors of „knowledge utilization“ (Zhang et al., 2009), especially the role of knowledge management initiatives (Clarke and Rollo, 2001; Wamae, 2009), as a form of generation, distribution, transmission, and usage of knowledge to create sustainable economic value. For this purpose, participating firms, employees, and other individuals are in focus of consideration, which are participating in the transfer knowledge assets of knowledge intensive firms (Abzari et al., 2011) and therefore contribute to the sustainable development of these kind of firms and their commercialization of knowledge intensive products as well as services (Lichtenthaler, 2005; Chen et al., 2010). Finally, further research directions have derived as a result of our literature analysis.

Design/Methodology/Approach – An organizational setting in which knowledge transfer, exchange or utilization should take place is difficult to establish (d'Aspremont and Bhattacharya, 2000). Therefore different main processes and factors are important to recognize. Identification of knowledge assets (Teece, 1998; von Krogh et al., 2001), knowledge governance and coordination (Hicks et al., 2002; Patrucco, 2005; Moon, 2011), relationship building (Antonelli, 2006; Lin and Wu, 2010), knowledge presentation (Desouza and Awazu, 2004; Kafentzis et al., 2004), knowledge protection (Teigland and Wasko, 2003; Mets et al., 2007), and knowledge trade (Jeong et al., 2013) are crucial for the utilization of knowledge. The authors conducted a literature review to knowledge utilization by searching for keywords, like knowledge utilization, transfer or commercialization in different scientific databases. Here the literature review should provide a framework for comparing results of the conducted scientific literature (Creswell, 2009). Therefore only double-blind reviewed articles of different scientific journals were used and the different approaches were analysed in a concept-centric method (Cooper, 1988; Webster and Watson, 2002).

Originality/Value – An overview of different knowledge utilization processes and success factors give firms in knowledge intensive environments the possibility to commercialize their outcomes. The main processes identified were the identification of knowledge assets, the knowledge governance and coordination, relationship building, the knowledge presentation, the knowledge trade, and the knowledge protection. Main

success factors of knowledge utilization, described by the literature are: absorptive capacity, solving customer problems, reputation, rewards and incentives, trust, and reciprocity.

Theoretical Implication – This research paper aims to contribute to knowledge utilization as well as knowledge management literature since the data collected in the literature review showed a focus on these concepts. Further research on knowledge utilization needs to be done to have a clear, homogeneous understanding of knowledge utilization, which is not achieved yet. The state-of-the-art evaluation has also shown a focus on the organizational perspective. The individual perspective needs to be further researched. Finally, a holistic view on knowledge utilization processes and factors could only be found in a few research articles. Therefore a holistic research model on the different knowledge utilization processes and factors, for example as an external knowledge marketing model, needs to be further designed.

Practical Implications – In terms of practical contributions, this literature review may give firms the possibility to enhance their outputs as qualitative services providers by employing the different processes and concentrate on the factors of knowledge utilization. Additionally, in the market for knowledge many uncertainties and risks may occur. Here firms and clients in knowledge intensive industries may enhance their benefits, when the value of knowledge goods is clearer, trusted relationships between the participants are present and systems of quality measurements are implemented. Furthermore, the practical importance of knowledge systems and networks to enhance the firm's knowledge capital is described. Firms should follow an open source strategy to motivate employees, clients and other firms to share their knowledge.

Keywords – Knowledge Utilization, Commercialization, Transfer and Exchange

Paper type – Academic Research Paper

1 Introduction

The globalization of markets, the convergence of previously distinct industries, and the fact that markets become even more unpredictable are challenges for firms (Day and Montgomery, 1999). In these markets consumers have more choices, and they are better informed through expanded media (Day and Montgomery, 1999). Additionally, in the 21st century, the era of communication and information technology, resources are becoming more and more important, which are responsible for the emergence of intangible assets.

One of those important competitive resources in business is knowledge and related knowledge work (Abzari et al., 2011). Entrepreneurs are convinced that knowledge work is important for the innovative power of firms and the key to long-term sustainability and

growth (Davenport et al., 2002). Teece (1998) has already seen knowledge and its application at the very roots of modern economic growth and prosperity. The increasing speed of information transmission, the increasing amount of information that can be transmitted and processed, is leading to the creation of new types or patterns of information firms (Glazer, 1991). In general, these so called knowledge intensive firms are operating in knowledge markets with aims of generating revenues, gaining knowledge access, setting industry standards, profiting from infringements, realizing learning effects, and guaranteeing freedom to operate (Lichtenthaler, 2005). The increasing technological content of products with shorter life cycles and the more intense competition (Lichtenthaler, 2005) is resulting in the need for a precise research on the firm's resource knowledge and how firms can externally commercialize it.

Here the knowledge utilization approach summarizes different ways of effectively use kinds of knowledge resources. The approach contains of a complex process involving political, organizational, socioeconomic, and attitudinal components in addition to the specific information or knowledge (Larsen, 1980). Larsen (1980) proposed that knowledge utilization can be classified as conceptual and instrumental. The conceptual use refers to knowledge that has influenced the way users think about issues. The instrumental use of knowledge refers to knowledge that has influenced action or behavior or changing policy and procedures (Larsen, 1980). Here the authors encompassed knowledge utilization from other approaches, like knowledge management by focusing on the transfer and exchange of knowledge between individuals or organizations. Nevertheless these other approaches still provide different aspects for a general overview on knowledge utilization.

The study on different areas of knowledge utilization showed many lines of research and inquiry. By analyzing scientific reviewed articles of different approaches to knowledge utilization several research questions arose which need to be answered in further research. Especially, which approaches that focus on the utilization/commercialization of knowledge do already exist in the literature? What are processes and factors for effective knowledge utilization?

2 Classification of the Literature Review

The articles which have been considered for the review are organized in a conceptually order to find differences and similarities of considered research issues. The

literature review should provide a framework for comparing results of the conducted scientific literature (Creswell, 2009).

In the first step, a literature review was conducted by keyword search in different scientific databases (EBSCOhost, Web of Science, JSTOR and Elsevier) to summarize the substance of the existing literature and drawing synthesized implications for research and practice from it (Cooper, 1988). Different synonymously terms to utilization were included in the keyword search, like marketing, disclosure, exposure, explication, trade, commercialization, exploitation, selling, commerce, and deploying. The first search was too broad and too many articles were found. Therefore these synonyms were explicitly used in combination with the term knowledge and other terms like know-how or information. The different terms were searched for in the title and abstract of the articles. Here only double-blind reviewed articles of different scientific journals were analyzed with no contextual limitations, but in a limited time period from 1990 to 2013. By doing so the authors tried to follow an evidence-based procedure of searching the literature, described by Tranfield et al. (2003). The overall number of applied literature included sixty-one articles of interest.

In a second step, the overall number of articles was read more carefully and especially references of other articles were carefully studied to find additional related scientific articles. The articles were implemented by backward and forward search in the range of appropriable scientific literature. Here the selection of interests was based on different criteria, which have developed out of the research questions. The interested topics of articles are: any form of knowledge utilization within firms and externally, definitions of knowledge commercialization, knowledge and information disclosure, and factors of knowledge transactions and exchange in general. Hereby additional twelve articles were selected. In this second step of the literature review also articles were excluded from this review, which only describe knowledge or knowledge transfer in general without relating to the specified factors of knowledge utilization, like relationships and networks, the focus on customer problem solutions, or for example the absorptive capacity of firms. In a collateral process of monitoring by the authors, the reliability of the selection process was ensured. The authors have synthesized the following contextual limitations for this research article: best practices/success factors of knowledge utilization, especially the organizational processes and the factors. Because of this specific context of the review and the described limitations, the selection of articles was limited and consequently seven

articles were excluded of the review. Finally, sixty-six articles have been selected for this review.

In the third step of the literature review all selected articles were analyzed more specific. A first general descriptive evaluation of the articles is done in the following paragraph. In **Error! Reference source not found.** the publication years of the relevant articles found by the systematic keyword search in the different databases is shown to emphasize the accelerated focus in this topic.

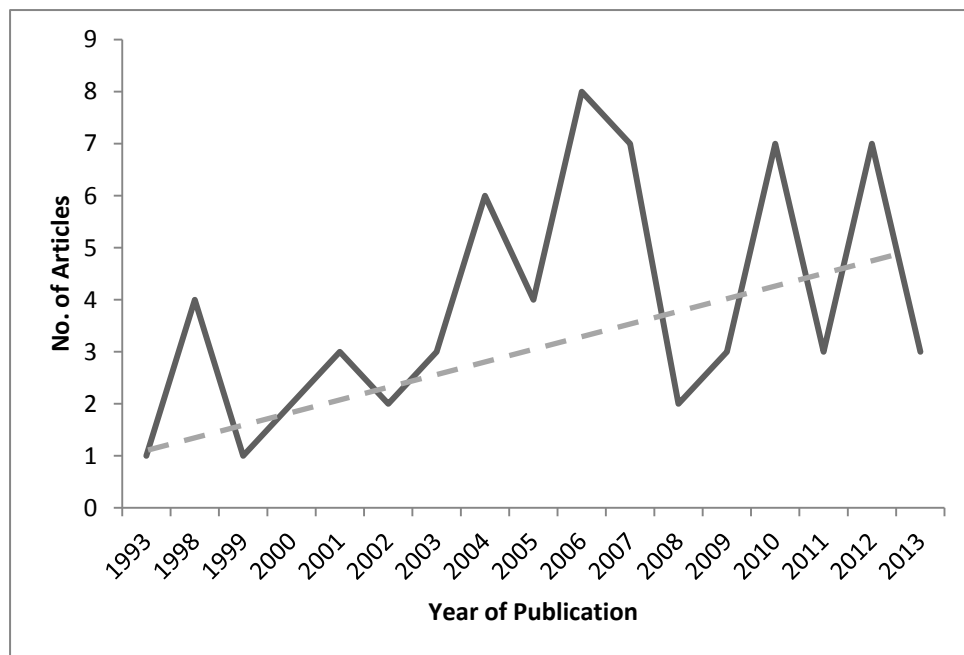


Figure 1: Overview of Article's Publication Year

In **Error! Reference source not found.** you can find an overview of research methods used in the selected articles found by the systematic keyword search in the different databases. Most of the selected articles have used a theoretical or review method. But the authors also recognized that a majority of articles in this specific topic of scientific research have employed empirical-quantitative data.

Table 1: Overview of the Research Methods in the Selected Articles

Research Methods	No. Articles
Theoretical or Review Method	41
Empirical-Qualitative Method	8
Empirical-Quantitative Method	16
Empirical-Mixed Method	1
Overall No. of Articles	66

In **Error! Reference source not found.** the different research methods used in the literature of knowledge utilization are further analyzed. It can be recognized, that different methods were used over the whole evaluated time frame. Especially theoretical or review articles were often used to handle the focused research topic. One noticing point can be acknowledged, in the first years of the articles' publication in the time frame more theoretical and qualitative research methods were used. In the last years of publication more and more empirical-quantitative research methods were used in the field of interest.

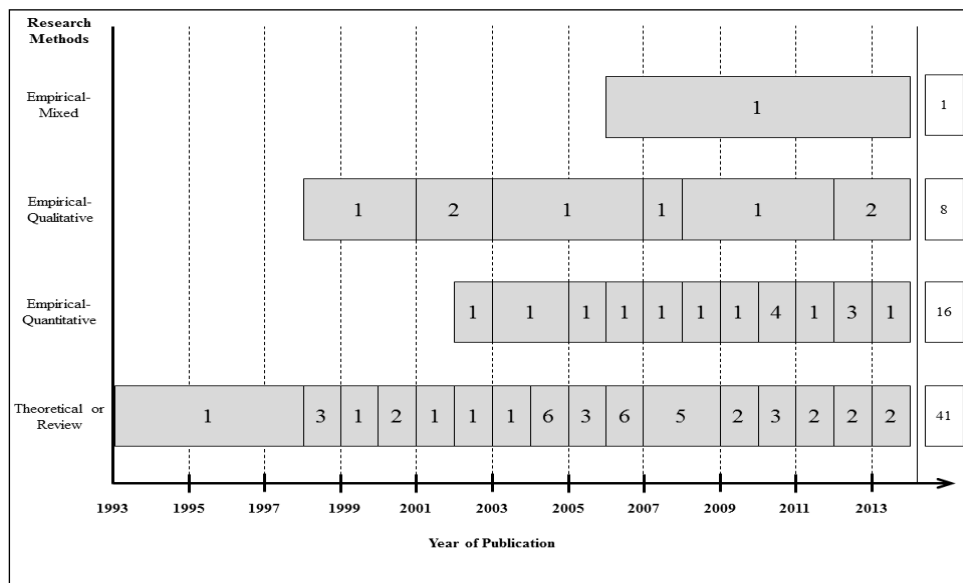


Figure 2: Trend of Research Methods

In the articles different units of analysis are analyzed, but in all articles knowledge is considered as the main resource of firms' sustainable advantage (Nonaka and Takeuchi, 1995; Davenport and Prusak, 1998) and in the considered firms most of the work is of an

intellectual nature, where well-educated, qualified workers produce qualified products or services (Swart and Kinnie, 2003). The scope of review (Cooper, 1988) is defined in processes and factors of knowledge utilization to generate commercializing outcomes for firms in knowledge intensive industries. Here the implicit values of this review are described by supporting knowledge intensive firms to perform and enhance their outputs as a qualitative services provider. In result, this overview of the different processes and success factors in knowledge utilization may contribute to existing theories (Corley and Gioia, 2011). For this reason the different processes and factors are clarified, and their interrelations are more specifically is looked at to further describe the domain of knowledge utilization (Whetten, 1989). These approaches will be analyzed in a concept-centric method (Cooper, 1988; Webster and Watson, 2002), while these concepts are categorized under the definition of different key terms of the interested topic (Creswell, 2009). Additionally, a table of all these approaches will summarize the conducted literature, so key findings and groups of patterns found in the literature will be further explained (Creswell, 2009).

The article is organized as follows: First key variables of knowledge utilization are defined followed by the state-of-the-art of knowledge utilization by presenting existing approaches and important factors of knowledge utilization. The following chapter discusses the state-of-the-art of knowledge utilization and the different success factors which are considered by the selected authors. The last chapter is describing further research and practical implications in the utilization of knowledge.

3 Definition of Key Variables in Knowledge Utilization

The authors included main literature of the firm resource knowledge to clarify different key variables in the topic of knowledge utilization. To have a clear understanding of the resource knowledge, it will be generally defined here. Probst et al. (2003) define knowledge as it refers to all the knowledge and skills individuals use for the solution of problems. In the literature the resource knowledge is summarized as intellectual capital of the firm, which generates value (Zabala et al., 2005). A firm's knowledge asset is based on experiences and expertise of their employees (Spender and Grant, 1996). Tiwana and Bush (2005) describe knowledge as actionable information, which further is an intricate and complex web of heterogeneous and endogenous activities (Antonelli, 2006). The firm provides the physical, social, and resource allocation

structure, so knowledge can be shaped into competences (Teece, 1998). Knowledge involves firm's processes, people, values, culture, intuitions and opinions (Zabala et al., 2005).

Nonaka and Takeuchi (1995) distinguish the tacit and explicit form of knowledge. Both forms are described by different attributes, like intangibility, uniqueness, concurrent usability, value uncertainty and publicity (Nonaka and Takeuchi, 1995; Chen et al., 2010). Knowledge can refer to an object or a capability and it may reside in individuals, groups, documents, processes or repositories (Alavi and Leidner, 2001). Nevertheless or exactly for this reason, Spender and Grant (1996) and Nonaka and Takeuchi (1995) point out, that tacit knowledge is the most useful form of knowledge. The expertise of individuals plays an important role here; it refers to the largely tacit facets of knowledge (Tiwana and Bush, 2005). The conscious and usually reported form of knowledge is the explicit form (Spender and Grant, 1996). Some authors, like Coff et al. (2006) mean, that tacit knowledge has great strategic value, but therefore it must be codified to exploit that value. But also the tacit form of knowledge is a major component of the utilization of knowledge without transferring it into the explicit form, like Chen et al. (2010) or Landry et al. (2012) describe it. Knowledge is characterized by unpredictability about many facets: outcomes, timing or the economic value (Antonelli, 2006). Muller and Pénin (2006) describe that producing knowledge depends on the amount of knowledge available, external or internal.

Today the processing of information in firms is seen as the critical task and the ability to do so as the critical competition requirement (Greenwood et al., 2005). Here firms are in the focus of interests, which clearly distinguish from industrial firms in the type of value creation and level of information asymmetry between the firm and its clients (Sheehan and Stabell, 2010). In general, knowledge intensive firms are defined as organizations within a knowledge economy (Drucker, 1999), that create market value through the application of knowledge to client demands (Swart and Kinnie, 2003). The knowledge intensive firms rely mainly on human and organizational resources, like experts, which are highly educated individuals and the application of expertise to deliver their services, for example banking and financial, legal, accounting, marketing, advertising, human resource management, consulting and medical consulting, architecture, research and high-tech services (Swart and Kinnie, 2003; Greenwood et al., 2005; Sheehan and Stabell, 2010; Leon, 2011; Abecassis-Moedas et al., 2012). The

human resources of knowledge intensive firms are also called knowledge workers which use predominantly cognitive skills (Leon, 2011).

Furthermore, the so called knowledge intensive services are defined as the integration of systematic knowledge and the mechanism of using the knowledge to perform a task (Zhuge and Guo, 2007). It requires the combination of organizational knowledge with skills and experiences, the output is a new process or the way of doing things, new routines, or services (Leiponen, 2006). Knowledge products and services are search, experience, and credence goods (Desouza and Awazu, 2004). These knowledge products and services are mainly subject to the same market and competitive forces that govern any product (Shapiro and Varian, 1998). Uniquely for these products and service is, that they are expensive to create, but cheap to duplicate (Desouza and Awazu, 2004). Further Teece (1998) describes that it is especially difficult, although not impossible, to trade knowledge assets and, more generally, competences. These services are users, carriers and sources of innovation (Leiponen, 2006). They can act globally as innovations in the productive system (Baviera-Puig et al., 2012) and they have a dynamic character during the distribution (Zhuge and Guo, 2007).

A further key term in this article is the knowledge markets, where intangible goods are traded (Kafentzis et al., 2004; Jeong et al., 2013). In general, the market transparency in these knowledge markets is very low and high risks or uncertainties concerning knowledge asset quality and value may occur on both sides (firms and clients) (Desouza and Awazu, 2004). Because of that uncertainty, for example, clients often hesitate to change their knowledge provider (Greenwood et al., 2005). Following activities are described within these markets: comparison of available products and services, acquisition of knowledge of knowledge providers, exchanging of tacit or explicit knowledge forms, competition and cooperation of firms for knowledge resources (Probst et al., 2003; Desouza and Awazu, 2004; Kafentzis et al., 2004; Grover et al., 2009). Two kinds of knowledge markets can be described: internal knowledge markets, where firms actually act as potential markets with buyers, sellers and brokers (Zhuge and Guo, 2007). Firms use these internal knowledge markets as a way to track and manage the flow of knowledge within them (Desouza and Awazu, 2004). On external knowledge markets, knowledge transactions are much more complex than transactions on the markets for most products and services (Lichtenthaler, 2005). These knowledge markets are active markets,

where buyers and sellers participate to trade knowledge, for example in form of intellectual property, copyrights and patents (Kafentzis et al., 2004).

Following participants and factors characterize these knowledge markets: market makers, buyers, sellers, brokers, market rules, and the market space (Desouza and Awazu, 2004). Kafentzis et al. (2004) and Chen et al. (2010) additionally describe different roles in the market for knowledge: the knowledge supplier and requester, third parties, knowledge processor, and the knowledge service provider. A knowledge service provider, which brings buyers and sellers together, provides value-added services (Kafentzis et al., 2004; Bhargava and Choudhary, 2004). They are also called knowledge brokers: brokering knowledge from where it is known to where it is not (Hargadon, 1998).

For the participants with current technologies for distributing information in knowledge markets, it is easy to explore market segments that were not reachable before (Shapiro and Varian, 1998). Here the so called imperfections of the knowledge markets (Teece, 1998) lead to different challenges for participants: the identification of knowledge clients, absorptive capacity, intellectual property rights, adequate compensation for knowledge transfers, assessing the value of intellectual assets, the nature of knowledge (Lichtenthaler, 2005).

In general, human and social factors appear in many areas of trading and exchanging knowledge (Kafentzis et al., 2004). The sharing of knowledge is a social process (Rodger, 2012). Here the “social exchange theory” plays an important role for all participants of the market, which describes that people do share information or knowledge with the expectation of reciprocity (Kankanhalli et al., 2005; Rodger, 2012). Additionally, in these markets for knowledge a high variety of knowledge intensive services and corresponding skill requirements exists (Consoli and Elche-Hortelano, 2010). In other words, the level of education of knowledge employees is quite important, to identify appropriate cooperation partners, to access and assimilate the relevant knowledge (Spithoven and Teirlinck, 2010).

4 The State-of-the-Art of Knowledge Utilization

In this section the authors want to summarize the different approaches of utilizing knowledge and find coherences, relations and similarities between them. Different authors of the analyzed articles use different terms for the utilization of knowledge. In the

following paragraphs different approaches are introduced and main processes as well as factors of knowledge utilization in the existing literature are further explained.

4.1 Existing Approaches of Knowledge Utilization

The analysis of the literature has shown that a lot of different concepts are used by authors to describe in general the utilization of knowledge. Backer (1991) already mentioned, that the knowledge utilization field is fragmented, and needs new synthesis and cross-cutting activities. In the following **Error! Reference source not found.** a summarized overview of the used concepts is illustrated. In the **Error! Reference source not found.** the concepts are listed corresponding to the number of authors applied to these concepts. Different authors also used more than only one concept, so these could several times been counted.

Table 2: Applied Concepts in the Analyzed Literature

Rank	General Concepts	Number of Authors	Rank	General Concepts	Number of Authors
1	Knowledge Management	11	7	Knowledge Intensive Services	2
2	Knowledge Utilization	9	7	Knowledge Outsourcing	2
3	Knowledge Disclosure	8	7	Knowledge Sharing	2
4	Knowledge Exchange	7	8	Knowledge Contribution	1
4	Knowledge Transfer	7	8	Knowledge Exploration	1
5	Knowledge Trading	4	8	Knowledge Governance	1
6	Knowledge Brokerage	3	8	Knowledge Innovation	1
6	Knowledge Exploitation	3	8	Knowledge Marketing	1
6	Knowledge Selling	3	8	Knowledge Methods	1
7	Knowledge Commercialization	2	8	Knowledge Mobilization	1
7	Knowledge Distribution	2	8	Knowledge Production	1

Different approaches for the utilization of knowledge are based on principles of knowledge management. Because main resources used by knowledge intensive firms exist in the form of intangibles, a specialized form of management is needed (Kjaergaard, 2003). Knowledge management is essential to the achievement of the objectives of these firms (Zabala et al., 2005). Like Clarke and Rollo (2001) describe that knowledge management initiatives supporting the generation, distribution, transmission, and usage of knowledge in ways that create economic value. These initiatives for utilization of knowledge are practiced in three main areas: intellectual capital, structural capital and

human capital (Goh, 2005). In general knowledge management is aimed at developing and properly managing an organization's knowledge (Garavelli et al., 2004). Here knowledge management is the process of creating, organizing, storing and using data, knowledge internal policies, and process manuals for organizational performance (Sedaghati, 2012; Zabala et al., 2005). The management of knowledge from the perspective of a producer means, that managing any artefact of the firm, because it embodies considerable knowledge (Cowan et al., 2000). From the perspective of the user, it is how to use these artefacts (Cowan et al., 2000). In the perspective of knowledge utilization, knowledge management is thus the process of creating value from ideas and making it available for the entire firm (Garavelli et al., 2004). The firm's ability to differentiate in the market for knowledge depends on the availability of knowledge-based assets and how these firms employ knowledge management to harness the value of these assets (Goh, 2005). In the management of knowledge, especially from the perspective of knowledge utilization, firms need to realize knowledge-centered principles, like an innovation thinking-value system, a collaborative knowledge strategy, knowledge networks, or human technology solutions (Goh, 2005).

A general basis of knowledge utilization is, that the knowledge transfer and exchange is an interactive process involving the interchange of knowledge (Mitton et al., 2007). One of the main processes of knowledge intensive firms is the transfer of knowledge from one person, or group to another (Abzari et al., 2011). A typical knowledge transfer starts with the identification of knowledge, in which potential benefits of the transfer are signaled to the receiving partner or to the sending partner (von Krogh et al., 2001). In knowledge transfers the process of identifying and transferring the knowledge resources has proven to be trickier and more time-consuming than most firms first imagine (Lucas, 2005). But the ability of firm's members to mix and exchange knowledge determines the rate at which new products and services, in general innovations are developed (Abzari et al., 2011). A next step in the knowledge transfer is packaging and dispatching of knowledge in such a way as to enhance the receiver's potential to act (von Krogh et al., 2001). The last step is the adaption, in which transferred knowledge is integrated with the local knowledge of the recipient (von Krogh et al., 2001).

Different authors, like Muller and Pénin (2006) describe the utilization of knowledge as disclosure of knowledge assets in different networks. In these networks these firms accomplish an open knowledge disclosure strategy, which may help them to generate

partnerships for research and development (Muller and Pénin, 2006). For the same reason, it can improve firms' position on the market and may facilitate to have access to external sources of knowledge more easily (Muller and Pénin, 2006). Senapathi (2011) describes four functions of knowledge dissemination, which are spreading, choosing, exchanging, and implementation of knowledge to accomplish a proper utilization of knowledge. The author describes also that firstly the firms have to determine existing valuable knowledge, experts, communities of practice, and other valuable intellectual assets, that exist within the firm (Senapathi, 2011). Once this is done, the better these assets can be leveraged, disclosed, and utilized (Senapathi, 2011).

Another approach describes knowledge utilization by strategies of knowledge brokerage (Verona et al., 2006; Nair et al., 2012). Knowledge brokerage is made possible by the effective accumulation of external resources in the firm (Nair et al., 2012). The more exposed and open the firm is to ideas generated in the environment, the more it enriches the flow of ideas into the firm (Nair et al., 2012). Verona et al. (2006) describe firms as virtual knowledge brokers, who leverage the internet to support third parties innovation activities. They connect, recombine and transfer knowledge to firms in order to facilitate innovations, hereby they often be close to their customers to provide specific innovation solutions (Verona et al., 2006). For example in markets for creative services, design consultancies have been characterized as knowledge brokers (Abecassis-Moedas et al., 2012). As a result of their access to a broad range of industries, knowledge brokers hold a broader range of ideas than firms working in only one or a few industries (Hargadon, 1998). Additionally, their flexibility in linking past knowledge with the situations of current projects support firms in knowledge utilization (Hargadon, 1998).

Another term is used by Antonelli (2006), Anton and Yao (2004) and Massey et al. (2001). They emphasize the exploitation of knowledge as form of proper utilization of the resource. It can take a variety of forms, from firms using it to produce a new product to firms selling it as a product (Antonelli, 2006). Knowledge exploitation means enhancing the intellectual capital of a firm with existing knowledge (Massey et al., 2001; Anton and Yao, 2004). Main business process, like product development or customer relationship management are highly knowledge intensive and a firm's long term success depends on this exploitation of knowledge across the business processes (Massey et al., 2001). Anton and Yao (2004) describe, that it can be risky for firms exploiting innovation, because it requires some disclosure of knowledge to the public, which makes imitation easier.

Another important approach is made by Lichtenthaler (2005), Wamae (2009) and Chen et al. (2010), which describe the process of knowledge commercialization. Firms commercialize knowledge assets by turn it into sales, licensing, joint ventures, strategic alliances, mergers, new business entities, donations, internal use, divestment of company units or even informal trades and leakages (Lichtenthaler, 2005; Chen et al., 2010). In general these firms trading information products (Chen et al., 2010) and by the ability to translate it into socio-economic solutions, they commercialize knowledge (Wamae, 2009). Thereby a firm's knowledge assets are transmitted to another independent organization involving a contractual obligation for compensation in monetary or non-monetary terms (Lichtenthaler, 2005). Chen et al. (2010) even emphasize that every firm is capable of creating business opportunities from knowledge-commercialized business models. Knowledge commercialization is influenced by the process through which innovative capabilities are produced within firm-based activities (Wamae, 2009). Here research and development specific capabilities and also non-research and development specific capabilities are involved in the commercialization of knowledge (Wamae, 2009). Major challenges in commercializing knowledge are the identification of knowledge customers, their absorptive capacity, intellectual property rights, adequate compensation for the knowledge transfer, assessing the value of intellectual assets, the nature of knowledge and the dynamic nature of demand (Lichtenthaler, 2005; Wamae, 2009).

Often knowledge utilization means to outsource specific knowledge assets. Mudambi and Tallman (2010) define it as outsourcing of firm activities that directly involve the production of knowledge and innovation, and that involve some degree of firm-specific capabilities. The authors outline this process as a make-or-ally decision, which firms have to make for the governance of the protection and leverage of their strategic knowledge assets (Mudambi and Tallman, 2010). Here licensing, franchising and joint ventures are alternatives modes for knowledge utilization (Tarn and Chien-Chih, 2012). These processes are highly tacit business activities with large investments in human capital (Mudambi and Tallman, 2010). They also demand intensive knowledge interactions and the forming of knowledge synergies within networks (Tarn and Chien-Chih, 2012). The outsourcing of knowledge requires the availability of a skilled and motivated talent pool, highly functional technology infrastructure, compatible culture and communication systems (Mudambi and Tallman, 2010). Therefore adaptations, like in corporate culture,

working procedures, and techniques have to be made to outsource knowledge to a perceiving party (Tarn and Chien-Chih, 2012).

Another form of knowledge utilization may be seen as knowledge marketing, which is a good specific form of marketing (Rode, 2001). The marketing of knowledge is clearly distinct to the marketing of industrial goods, because of the specific characteristics of knowledge goods (Rode, 2001). In result, the marketing of these knowledge products and services is a highly challenging task for knowledge intensive firms, especial because of the imperfections of knowledge markets and the disproportionately risk of opportunistic behavior of participants in these markets (Rode, 2001; Lichtenthaler, 2005). For the successful performance of knowledge marketing different resources need to be available in the participating firms: knowledge, experiences, talents, infrastructure, customer, reputation, business relations, alumni, financial capital, and sponsors (Rode, 2001). In knowledge marketing the primary asset is the firm's knowledge base for the commercialization of knowledge (Lichtenthaler, 2005).

Sedaghati (2012) describes knowledge utilization as mobilization, which comprises of specific processes by which knowledge is shared and transferred within organizations. More specific is Landry et al. (2012) describing the utilization as mobile exchange of knowledge of firms with their clients. This exchange consists of tacit and explicit knowledge, even when it is newly created knowledge (Landry et al., 2012).

One possible way of describing knowledge utilization is, that it integrates different knowledge methods, like generation, verification, transformation, reception, organizational learning, culture routines and innovation (Lado and Zhang, 1998). The firm's capability of integrating and transforming knowledge into dynamic core competencies may be an important sustainable competitive advantage (Lado and Zhang, 1998). Also Zhang et al. (2009) describe knowledge utilization in terms of the extent to which a firm uses knowledge from various sources, such as suppliers, customers, competitors, outside research organizations, and consultants, in its product development. They see even knowledge utilization in general as an important predictor of benefits of developing highly and moderately innovative products (Zhang et al., 2009). Here knowledge utilization is described by Zhang et al. (2009) as mediator between product development strategy and product innovation performance.

In general, the knowledge production is a collective process and here knowledge is understood as a collective good, transferred through complex interactions among the

members of communities or networks (Muller and Pénin, 2006). Other authors, like Backer (1993) or Consoli and Elche-Hortelano (2010) define knowledge utilization as possibility to use knowledge to solve human problems. Here Backer (1993) describes different principles for knowledge utilization which require resources for individual and organizational change. The author further mentions different strategically tasks for knowledge utilization, like interpersonal contact, planning and conceptional foresight, outside consultation, user-oriented transformation, individual and organizational championship, and potential user involvement (Backer, 1993).

4.2 *Processes and Success Factors of Knowledge Utilization*

Today in firms the utilization of knowledge and so the transfer of the knowledge often occurs in an ad hoc manner, through advice or daily exchange between collocated employees (Becker and Gassmann, 2006). An organizational setting in which such transfer, exchange or utilization should take place is difficult to establish (d'Aspremont and Bhattacharya, 2000). Therefore different processes and factors are important to recognize. In the following paragraphs these processes and factors for the success of knowledge utilization, emphasized by the literature are summarized.

One of the first processes of the utilization of knowledge is the identification of the knowledge assets a firm possesses or needs, their possible knowledge clients and the knowledge product or service these clients need (Teece, 1998; von Krogh et al., 2001). This identification is also a prerequisite for the implementation of all different other processes of knowledge utilization, like the governance process of knowledge. Furthermore the identification process plays a major role, because of the imperfections of the knowledge markets (Lichtenthaler, 2005). Firms and clients may find adequate partners more easily by the signals of these partners, which are prepared for knowledge transfer (von Krogh et al., 2001).

Some of the main processes for knowledge utilization described by authors are coordination and governance processes of knowledge assets in firms. The heterogeneity of knowledge and participants who possess knowledge require coordination in order for firms to succeed (Antonelli, 2006). Here the governance of knowledge includes coordinated transactions, quasi-hierarchies and constructed interactions (Antonelli, 2006). These governance structures are essential because they influence the disclosure of knowledge (Moon, 2011). In result, firms need to arrange a specific set of economic and

social interactions for the governance of knowledge (Patrucco, 2005). In general the coordination and governance of knowledge is dominated by different factors, like identifying the right knowledge and the intended application (Hicks et al., 2002), finding knowledge providers and recipients, evaluating knowledge assets, trading risks, trading difficulties, low reproduction costs, and determining the knowledge value (Chen et al., 2010). Chen et al. (2010) describe the knowledge value chain as helpful for coordination of different activities in knowledge utilization. Here electronic knowledge repositories are enabling employees to leverage and reuse existing knowledge, share knowledge with others and stimulate the development of new knowledge and ideas (Lin and Fan, 2011).

The approach that relationships are essential for the utilization is described by an external growth by means of takeovers, mergers and acquisitions, which is for internalizing essential knowledge (Antonelli, 2006). A firm by itself seldom has the complete set of resources required to commercialize its knowledge stocks effectively, because new knowledge usually emerges from beyond a firm's boundary (Lin and Wu, 2010). Therefore Lin and Wu (2010) describe that strategic alliances and acquisitions are providing the firms with channels to access externally created knowledge or resources. Partnering with other firms within one industry can provide these important new sources of experiences (von Krogh et al., 2001). Especially industrial firms develop strategies to build stronger networks for knowledge creation and transfer (Mudambi et al., 2009). External and internal knowledge sourcing strategies show different effects on short-term and long-term financial performance (Lin and Wu, 2010). In general, physical proximity encourages the establishment of trustworthy relationships (Mital et al., 2010). Firms need to pay attention to cultural and organizational context, in which their employees and customers are encouraged to develop and share their knowledge (Clarke and Rollo, 2001). Therefore to develop an organizational culture, that reflects the willingness of members to seek out others' disparate knowledge and to share their own is crucial (Hargadon, 1998; Thite, 2004).

An effective knowledge system involves an effective knowledge transfer (Mudambi et al., 2009) and the firm needs to be able to identify experts on recurring problems (Lee and van den Steen, 2010). Lado and Zhang (1998) describe this as experts systems, which facilitate the development and utilization of organizational knowledge. A shared vocabulary and terminology, the initiation of community of practice and the identification of knowledge gaps are crucial prerequisites of these knowledge systems (von Krogh et al.,

2001). In these networks, firms can operate as either knowledge markets or knowledge communities (Garavelli et al., 2004). Garavelli et al. (2004) argument, when firms operate as knowledge markets, the main actors are single specialists, who act as nodes of competencies organized in networks. These nodes of competencies are optimizing knowledge flow processes and avoid unnecessary knowledge flow (Zhuge and Guo, 2007). Hereby the networks can be either collaborative or competitive (Garavelli et al., 2004). Garavelli et al. (2004) additionally explain, when firms are organized as knowledge communities, knowledge emerges through the organization actions. The objective of these communities is to connect people in various forums (Mital et al., 2010). The creation of these knowledge communities support to leveraging existing intellectual capital, to share best practice, for data mining to build customer relationships, and generally to create knowledge networks (Clarke and Rollo, 2001).

The existence of social networks and social ties enhanced by group dynamics, knowledge activists, knowledge sharing culture (Ramanigopal, 2013), environment of mutual respect and trust, a shared purpose, a shared context, and managerial belief (Moitra and Kumar, 2007) are characteristics of knowledge networks. In general, the electronic connectivity today provides a new imperative to manage knowledge better (Clarke and Rollo, 2001). For example these information technologies help firms to leverage scarce expertise (Coff et al., 2006). Here electronic marketplaces as interactive business communities providing a central market space, where multiple buyers and suppliers can engage in e-commerce and commercially exploit their knowledge assets (Kafentzis et al., 2004). This interconnection of relevant knowledge producers can combine internal knowledge of a firm and external pieces of knowledge (Patrucco, 2005). The interconnections need to be socially embedded in an explicit environment, where geographical proximity favors trust, and confidence (Patrucco, 2005). The value of these networks depends on the amount of active participants in them (Clarke and Rollo, 2001). One benefit of this connectivity is the increasing efficiency of the seller, when he interacts and integrates the technological knowledge disclosure of buyers (Bönte and Wiethaus, 2007). But it also bears the risk of benefitting one's rival (Bönte and Wiethaus, 2007).

Different other synonyms are used for knowledge networks, like community of practice, discussion forums, user-populated knowledge bases, or the intranet as virtual workspace (Ramanigopal, 2013). They all have one objective to connect people to reduce capital and operating costs, increasing utilization and improving the firm's market

positioning (Ramanigopal, 2013). Teigland and Wasko (2003) explain that the implementation of intranet-based communication tools, such as electronic discussion networks promoting knowledge sharing. Firms with an interactive communication strategy (Weiss et al., 2008) can enhance their knowledge base.

Knowledge products and services should always be presented in an organized manner, user friendly, easy to navigate, easy to communicate, in a customized and personalized form (Desouza and Awazu, 2004). For the very reason, that the intangibility of knowledge and the imperfections of knowledge markets (Lichtenthaler, 2005) make it difficult for customers to find the appropriate products and services. Additionally, clear policies and rules in the market eliminating associated risks of potential customers (Kafentzis et al., 2004). Today many processes are on-line to accomplish specific tasks and support the knowledge marketplace (Kafentzis et al., 2004). In these virtual knowledge markets hardware and software is necessary to run this market (Kafentzis et al., 2004). A virtual knowledge market enables the participants or virtual roles to effectively capture, publish, share, present and manage knowledge resources (Zhuge and Guo, 2007).

The activation of knowledge providers to transfer their knowledge is based on the trade in knowledge market (Jeong et al., 2013). The trade can be former describe by a person-to-document exchange, a person-to-person exchange or both (Desouza and Awazu, 2004). In general, knowledge based assets can generate economic rents (Lado and Zhang, 1998). Furthermore, firm's willingness to pay for information may result from having information to develop innovative services and products, and to discover cost savings or other advantages in the supply chain (Lumsden and Mirzabeiki, 2008). Rewards, the knowledge sharing culture, and knowledge exchange technologies positively affect the trade in knowledge market (Jeong et al., 2013). In contrast, firms need to make a trade-off decision between realizing monetary and strategic potential of external knowledge exploitation, on one hand, and protecting a firm's knowledge base, on the other hand (Lichtenthaler, 2005). In internal knowledge markets, knowledge can be traded autonomously and the price of knowledge is flexible (Jeong et al., 2013). In external markets the value of knowledge is different for every potential customer (Shapiro and Varian, 1998) and for people providing that (Zhuge and Guo, 2007).

In contrast, knowledge may also provide increasing returns as it is used and shared (Lado and Zhang, 1998; Clarke and Rollo, 2001; Massey et al., 2001). The returns from

knowledge assets are governed by the law of economics like other goods, for example that investments in additional units of knowledge results in a much higher return (Goh, 2005). Additionally, other economic issues of trading knowledge need to be considered by firms, like transaction costs, agency costs, networking, and communication costs (Antonelli, 2006), because knowledge transactions are much more complex than transactions on the markets for most products and services (Lichtenthaler, 2005). Furthermore, extremely high production costs of either form of knowledge exists (Shapiro and Varian, 1998; Chen et al., 2010), but here information products offer vast economies of scale, the more a firm produces, the lower the average cost of production (Shapiro and Varian, 1998). In contrast low replication costs and distribution possibilities, which diminish the value quickly, and the security topics are influencing the knowledge trade (Chen et al., 2010). Especially when knowledge is tacit, transaction costs and agency costs in the knowledge market are very high (Antonelli, 2006).

Knowledge assets are often difficult to copy, but still knowledge leakage through individual's actions participating in information trading has enhanced the importance of intellectual property rights (Teigland and Wasko, 2003). The market for knowledge is distinguished by the extent to which patents and copyrights can be enforced (Antonelli, 2006). In general, the strengthening of intellectual property regimes, more active intellectual property management, has led to a growth of knowledge awareness (Lichtenthaler, 2005). The extent of disclosure and protection chosen by an innovator provides also an important indicator for the quality of their knowledge products (Anton and Yao, 2004). Codified knowledge can be protected by patents, copyrights, trademarks, trade secrets and other intellectual properties (Chen et al., 2010; Senapathi, 2011). It is depending on the value of the intellectual property and the enforceability of protection (Mets et al., 2007), which form should be accomplished. A valuable patent is shared with others by selling licenses, like exclusive, non-exclusive, or semi-exclusive licenses (Mets et al., 2007). Additionally, intellectual property rights to protect commercializable knowledge may act as incentive to produce knowledge (Moon, 2011). The interaction between property rights, disclosure and the imitation decision is the key to managing intellectual property (Anton and Yao, 2004; Kafentzis et al., 2004). Here license fee contracts result in knowledge sharing agreements across firms (d'Aspremont and Bhattacharya, 2000). The choice of an organizational form for protecting knowledge

needs to be aligned with the firm's knowledge assets, not depending on firm size or experiences (Leiponen, 2006).

In **Error! Reference source not found.** a summarized process sequence is illustrated. The different main processes of the utilization of knowledge are closely interconnected and put in an adequate order to implement.

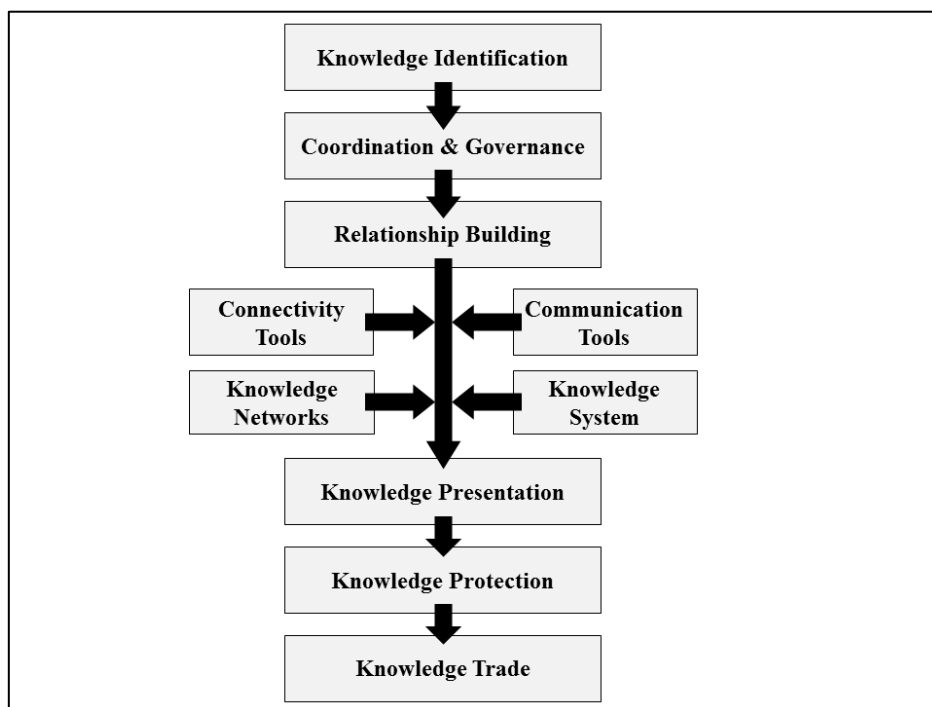


Figure 3: Processes of Knowledge Utilization

In the following paragraphs some of the main factors, highlighted in the selected articles will be described. For example, the knowledge providers' reputation increases the value of knowledge for buyers (Weiss et al., 2008). Therefore often trades in these specialized markets have the goal to change status or reputation of the provider (Zhuge and Guo, 2007). Here the high level of uncertainty regarding quality of knowledge products, allows firms with a brand name and reputation to charge a premium for their confidence (Greenstein and Markovich, 2012). Additionally, firms may increase their reputation by disclosing knowledge, which indicates to other organizations that they are competent (Muller and Pénin, 2006). A good reputation also assists in the development of trust (Rodger, 2012). As a result behaviors of open knowledge disclosure may be

motivated by reputation concerns (Muller and Pénin, 2006). Acquiring a reputation as an innovator may facilitate firms' access to financing, may make it easier to get contracts, grants and subsidies, or hire the best researchers (Muller and Pénin, 2006). Not only reputation, also trust and reciprocity play major roles in knowledge transactions (Antonelli, 2006; Rodger, 2012; Mital et al., 2010). In networks or open sources often the rating of knowledge objects are used by participants to gauge their perception on its quality (Desouza and Awazu, 2003). Additionally, a validating of knowledge providers increases the confidence and trust of buyers (Desouza and Awazu, 2003; Kafentzis et al., 2004). These trust building mechanism, like the rating system will contribute positively to the development of knowledge markets (Desouza and Awazu, 2003). The experience of customers with knowledge provider, their behavioral data, their professional status, and word of mouth determine the judgments of knowledge value by the customer (Weiss et al., 2008).

Within firms employees can be rewarded for what they know (Desouza and Awazu, 2004), the expectation of gaining appreciation, recognition, and reputation are benefits of knowledge disclosure (Zhuge and Guo, 2007). By being rewarded for sharing information and helping others, employees learn to cooperate (Hargadon, 1998). In return, incentives or rewards are important stimuli for information disclosure (Zhao et al., 2012). The organizational rewards are extrinsic motivators (Kankanhalli et al., 2005), which could be redeemed for cash (Moitra and Kumar, 2007). Additionally, knowledge providers can be motivated by intrinsic motivators, like enhancing their knowledge self-efficacy or confidence (Kankanhalli et al., 2005).

A further important factor for the utilization of knowledge is described by different authors as the focus of solving problems of customers. Here firms leveraging their intellectual capital and package it into high value-added knowledge based products and differentiated services which are capable of solving customer problems (Chen et al., 2010). Task specific information, which are collected from the firm's customers are especially relevant for problem-solving services (Verona et al., 2006; Consoli and Elche-Hortelano, 2010). The focus of the problem-solving capability is on the interactions between customers and firms. It is a knowledge based process, which consequently requires flexibly customize services and products to respond to customer feedback (Massey et al., 2001). With technological tools of customer relationship management, like customer interaction systems, integrated channel management, analytical tools (Massey et

al., 2001), the development of customized services and products is supported and the ability of firms to expand their knowledge is maintained (Verona et al., 2006). The key benefits by doing so are described by Massey et al. (2001) and Baviera-Puig et al. (2012) as leveraging organizational knowledge in customer relationship process, improvement in problem-solving processes, individualize interactions with customers, improvements of customer satisfaction through collaborative learning, and facilitation of cross-functional coordination.

One additional factor of right utilization of knowledge is the capability of firms to absorb knowledge or to innovate from their knowledge assets (Chen et al., 2010). The decisions relating to knowledge innovations are ultimately based on three main factors: who (people), what (knowledge assets) and why (business objectives) (Goh, 2005). Innovation is usually perceived as a group of activities involving interaction and knowledge exchanges between people and organizations (Muller and Pénin, 2006). Here the absorptive capacity embodied in people is the key element for the organizational integration of external knowledge (Spithoven and Teirlinck, 2010). Especially the function or skills of the firm's employees become a qualitative aspect of the absorptive capacity (Spithoven and Teirlinck, 2010). Teigland and Wasko (2003) explain the absorptive capacity as combining existing internal knowledge with novel external knowledge to develop creative solutions and improve performance.

In **Error! Reference source not found.** a summarized illustration of the important factor for the utilization of knowledge is shown. The different factors are supporting the knowledge intensive firm by successfully utilize their knowledge assets.

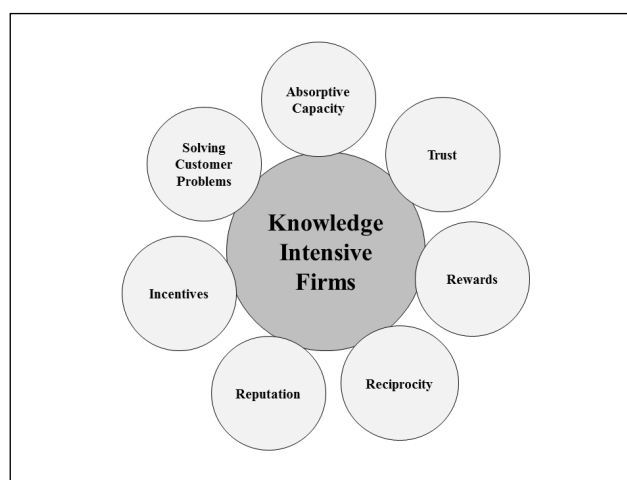


Figure 4: Factors of Knowledge Utilization in Knowledge Intensive Firms

5 Discussion of the State-of-the-Art of Knowledge Utilization

The analysis of the state-of-the-art in knowledge utilization has shown that much research in this interesting topic has been done. Therefore the authors already limited the selection of articles in the beginning by only use double-blind reviewed articles for the state-of-the-art. The number of articles used for the analysis was sixty-six. These articles have shown that a definition of knowledge utilization is difficult to make, because a lot of different concepts were used for this kind of knowledge activity. The authors have counted twenty-two different concepts for knowledge utilization (**Error! Reference source not found.**). One reason for this may have been also the acknowledged positive trend of research in this topic. Furthermore, many different processes and factors for adequate knowledge utilization could be found in the articles. Here a holistic view on these processes and factors could not be found, so the interrelations between different processes and factors and the success of all or just one factor which may be important for knowledge intensive firms could not be analyzed.

In the analysis of the processes researched in the selected literature the focus was on two dimensions, the participants and the knowledge markets. The following **Error! Reference source not found.** shows the allocation of the two different forms of participants in the knowledge utilization process, individuals and organizations. Additionally, the applied form of knowledge market, internal or external is presented in the second dimension of the **Error! Reference source not found.**. It can be recognized, that most of the scientific research is done on both external and internal knowledge markets with the focus on organizations. It can be further identified in the **Error! Reference source not found.** that the external knowledge market with the focus on either organizations or both organizations and individuals is mainly the field of interests of most of the scientists in the research topic of knowledge utilization. On the other hand, until now it is less focused on the individuals as participants in the knowledge utilization process on external, internal or both forms of knowledge.

Table 3: Participants and Place of Knowledge Utilization Processes

Participants \ Knowledge Market	Individual	Organization	Both
	Internal	0	12
External	4	22	2
Both	0	14	4

In **Error! Reference source not found.** the authors integrated a third dimension, the form of knowledge (tacit or explicit), to clarify further the focus of interests in the state-of-the-art in the literature in knowledge utilization. As the authors mentioned before, also in this illustration a focus on organizations can be recognized and the form of knowledge is less acknowledged from an individual perspective.

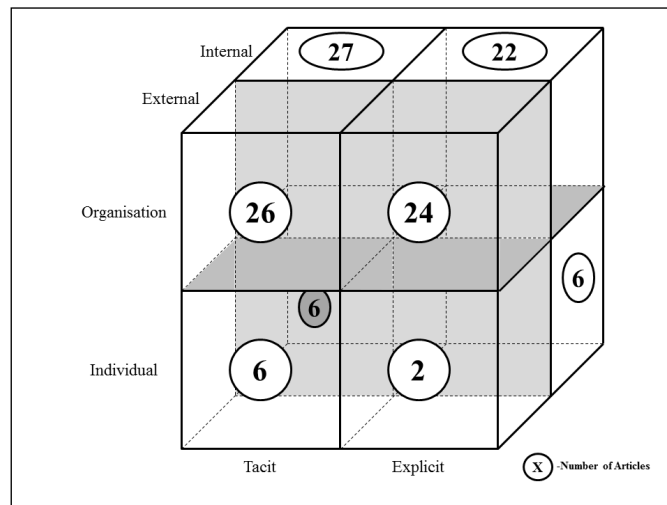


Figure 5: Number of published Articles in different Dimensions (Participants, Knowledge Market & Form of Knowledge)

By considering the success factors of knowledge utilization, Clarke and Rollo (2001) describe that organizations with large customer bases, like bank or insurance companies have possibilities to enhance the use of available knowledge assets. Because of improved data mining and exchange between different functions and managers of the firm, they may develop customer relationships and maintain further business opportunities with

existing customers (Clarke and Rollo, 2001). But furthermore the authors could not find many articles, which described exactly practical implications from the very contingent theoretical research. The analysis on the methods of research used in the articles showed a clear emphasis on theoretical articles. But a trend to more empirical research activities could be recognized in **Error! Reference source not found.**, for example the selected articles of von Krogh et al. (2001), Consoli and Elche-Hortelano (2010), Landry et al. (2012) or Nair et al. (2012).

Different methods are described in the literature of knowledge utilization to overcome the imperfections of knowledge markets. For example, Bakos and Brynjolfsson (1999) describe a method called bundling, where unrelated information goods can be surprisingly profitable (Bakos and Brynjolfsson, 1999). Very similar is another method, which is called versioning. It is described by the provision of quality-differentiated versions of services (Shapiro and Varian, 1998; Bhargava and Choudhary, 2004; Greenstein and Markovich, 2012). A further method is signaling, where firms signal their competences to academic and industrial communities (Antonelli, 2006; Muller and Pénin, 2006; Chen et al., 2010). The knowledge requesters in these communities are enabled to search for the required knowledge, when firms use signaling (Chen et al., 2010). All these methods are focused on the perspective of the clients and their identification of the adequate knowledge service or product. Methods on how organizations can identify the right client or the right knowledge provider for business activities are less mentioned in the literature by now. For example Goh (2005) describes that knowledge innovation in products can be realized by structuring and mapping knowledge, developing knowledge databases, embedding knowledge in new products and services. Here a clear process on how to identify the knowledge a firm needs is still missing.

Furthermore, the internal knowledge markets of firms provide an ideal platform to integrate technological and social aspects of knowledge management (Desouza and Awazu, 2003). The “social exchange theory” describes the motivation of participants in the knowledge market to share their knowledge, for example the expectation of reciprocity (Kankanhalli et al., 2005; Rodger, 2012). But a social dimension in knowledge utilization with the focus on the individual participants is not being researched sufficiently yet.

Only a few authors have focused on the right evaluation of the value of knowledge services and products. Prices of knowledge products across different quality conditions

and different competitive conditions are significantly different (Christen and Sarvary, 2007). The knowledge seller can use multiple methods of pricing: time taken to create it, fixed fees or retainers for their expertise, pricing of bundles, or a commission-based method (Desouza and Awazu, 2004). It is still difficult for firms and clients to evaluate the knowledge products and services, which are presented in knowledge markets. Authors have well described different forms of knowledge networks to build relationships and share knowledge. For example, Senapathi (2011) separates two different groups for dissemination of knowledge: for tacit knowledge, tools are for example communities of practice, chat rooms, online forums, knowledge networks, video conferencing. For the dissemination of explicit knowledge the intranet, knowledge repositories, best practice database, knowledge maps, blogs, or wikis are used (Senapathi, 2011). Additionally, Mudambi et al. (2009) describe three generic structures of communities, the crew, the séance and the guru structures, which give a good idea of how the firm can organize their knowledge systems.

In general, the intention to disclose information is influenced by perceived costs and perceived benefits (Zhao et al., 2012). Different authors describe many different motivational and exhibiting factors of knowledge utilization (Kankanhalli et al., 2005; Rodger, 2012; Jeong et al., 2013). Mitton et al. (2007) additionally describe different barriers of a knowledge transfer, like the lack of experience and capacity, mutual mistrust, negative attitude towards exchange, an unsupportive culture, a poor choice of messenger, information overload, or a limited time for decisions. Furthermore, barriers for knowledge leveraging are physical distances, language barriers, cultural diversity and other social-political factors (Moitra and Kumar, 2007). Here again a social dimension in knowledge management strategies, like in knowledge utilization should be included to manage socialization (Moitra and Kumar, 2007).

6 Conclusion and Future Implications

The state-of-the-art of knowledge utilization is giving a summarized overview how to act as a firm or client in knowledge intensive environments. Here the concept of knowledge management, knowledge disclosure and knowledge utilization by itself, have been widely used by the selected authors of the state-of-the-art. Additionally, the processes and factors of knowledge utilization support firms to commercialize their outcomes in knowledge intensive industries. Main success factors of knowledge

utilization, described by the literature are: absorptive capacity, solving customer problems, reputation, rewards and incentives, trust, and reciprocity. The analysis of the literature has further shown that the knowledge market and its participants are well described and knowledge goods are more and more in the focus of industries today.

For research implications, a further analysis of the knowledge market imperfections and other characteristics need to be done in the future to reduce the uncertainties of participants in these markets. Furthermore, the different concepts of knowledge utilization give the impression, that a clear, homogeneous understanding of knowledge utilization is not achieved in the topic of research yet. The state-of-the-art evaluation has also shown a focus on the organizational perspective. The individual perspective needs to be further researched. Finally, a holistic view on knowledge utilization processes and factors could only be found in a few research articles. Therefore a holistic research model on the different knowledge utilization processes and factors, for example as an external knowledge marketing model, needs to be further designed. This goes in line with Baviera-Puig et al. (2012) saying that the development of more efficient marketing strategies for technology centers is an interesting topic for future research.

For further practical implications, many different interesting contributions can be found in this literature review. For example, the possibility for firms to enhance their outputs as qualitative services providers by employing the different processes and concentrate on the factors of knowledge utilization. Additionally, in the market for knowledge many uncertainties and risks may occur. Here firms and clients in knowledge intensive industries may enhance their benefits, when the value of knowledge goods is clearer, trusted relationships between the participants are present and systems of quality measurements are implemented. Furthermore, the practical importance of knowledge systems and networks to enhance the firm's knowledge capital is described. Firms should follow an open source strategy to motivate employees, clients and other firms to share their knowledge.

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Creativity and innovation challenged in knowledge intensive organizations. When disruption is just a question of time.

Carlotta Meo Colombo *, Paola Ossola

Department of Economics and Business Sciences
University of Pavia
Via San Felice 7, 27100 Pavia, Italy

Riccardo Savariano

Business Integration Partners Italy
University of Pavia
Via San Felice 7, 27100 Pavia, Italy

**Corresponding author*

Structured Abstract

Purpose – Our study uses insights from theories of creativity and knowledge-intensive firms to conduct analysis on how creativity and innovation emerge in consultancy firms and on which organizational responses are given to the quest for organizational survival in unsettled times. We focus on the essential elements that promote the raise of new organizational areas in which new knowledge is created. A focus on these aspects is particularly interesting since consultancy firms, extreme examples of knowledge intense organization, are in danger of disruption. They are facing a fierce crisis and must focus on some sort of evolution based on creativity.

Design/methodology/approach– We adopt a qualitative research design. We interviewed 60 people inside international consultancy firms, including consultants, managers and partners based in the Italian context. The qualitative adopted approach is particularly suitable for studying socially grounded phenomena such as the one of consultancy firms as organizations made of individuals. Our approach is one of theory-elaboration. For the semi-structured interviews we used personal contacts, snowball sampling and random requests to maximize the variance in the sample. We let the interviewees describe their views about their role, tasks, relationships and approaches to work and change, following a storytelling approach.

Originality/value – There are repeated calls for empirical studies that could improve the body of theoretical work on creativity and innovation. Much prior research focused on the relation between creativity, innovation and organizational knowledge structure. Missing is a focus on the generative elements of creativity and innovation as the basis for creating new forms of knowledge.

We study creativity and innovation in management consultancy firms from an internal perspective seen as consultancy members involved in creating new management

consulting knowledge. In these unsettled times, we demonstrate that the push for creativity and innovation favors management consulting firms being models for an increasingly knowledge-based economy.

Practical implications– Our analysis is particularly needed since knowledge intensive organizations are, now more the before, rethinking their way of doing business in order to remain viable in an environment questing for sophisticated and customized consulting services. Given that “the pace of change being managed by the traditional clients of consulting firms will continue to accelerate, with devastating effects on providers that don’t keep up” (Christensen, Wang, and van Bever, 2013: 4), we focus on members involved in the creation of new knowledge structures, since external relations have already been studied.

Keywords –creativity, innovation, knowledge intensive firm, consultancy, disruption.

Paper type – Academic Research Paper

1 Introduction

Economic globalization, technological advancements, changes in customers’ needs and preferences and the progressive primacy of knowledge as a catalyst for business service industries are some of the elements pushing economy and society to be extreme examples of a Knowledge Economy and Society (Grant, 1996; Dean and Kretschmer, 2007; Martin-de Castro et al., 2011; Martin-de Castro, Lopez-Saez and Delgado-Verde, 2011).

New competitive arenas are raising characterized by new dynamics of competition (Johnson et al., 2002; Diaz-Diaz et al., 2008) where knowledge assets are acquiring increasingly importance when companies face competitors since they recognize that knowledge, new forms of knowledge and business innovation are key factors in sustaining and improving competitive advantages (Galende, 2006).

Moreover, the company’s capability to be innovative and successful depends very closely on the knowledge assets that it holds (Subramanian and Youndt, 2005) and on how it uses them.

Companies must be able to invent new ways to survive in a changing environment, viewing the innovation process as the output of a knowledge intensive business process of management (Nonaka and Takeuchi, 1995).

Our study uses insights from theories of creativity and knowledge-intensive firms to conduct analysis of how innovation and creativity emerges in consultancy firms and

which are the essential elements that promote the raise of new organizational areas (i.e., new knowledge structures or areas of expertise) in which new knowledge is created.

A focus on these aspects is particularly interesting because consultancy firms, described in recent literature as extreme examples of knowledge intense organization, are in danger of disruption.

Since they are facing a fierce crisis that needs to be dealt with, instead of disruption companies must focus on some sort of evolution based on creativity and innovation.

Our paper draws upon a qualitative study of 60 people employed in international consultancy firms based in Italy to elaborate theory on which organizational responses are given to the quest for organizational survival in unsettled times.

Literature recently called for conceptual and empirical research on studies about customized solutions for client firms as a way to maintain viability in such turbulent environment, and our qualitative analysis meets this request.

As a matter of fact our analysis is relevant for a number of reasons.

First, in the literature on creativity there can be found repeated calls for empirical studies that could improve the body of theoretical work.

Second, much prior research has been focused on the relation between creativity and organizational structure. However, missing is a focus on the generative and common elements of creativity as the basis for creating new forms of knowledge. Our analysis provides new and useful insights in the field on management consulting firms and their organizational settings.

Third, prior literature on management consultancy has mainly focused on client-consultant relations and emphasizes analysis and assessment of the external management consultancy function. In fact, as Galende and De la Fuente (2003) pointed out, many authors focused on creativity and innovation from an external perspective while leaving understudied the internal complex dynamic that characterizes the generation of new innovative areas of expertise (i.e., new knowledge structures).

Our approach is to study creativity and innovation in management consultancy firms from an internal perspective seen as consultancy members involved in creating new management consulting knowledge and developing advices to the organization they belong to. This is particularly evident in our analysis of the interviewees' decisions and behavior toward a change in the business model.

Finally, our findings have important implications for understanding the role of creativity in these unsettled times. Our research demonstrates that the “squeeze” of creativity favors management consulting firms being models for an increasingly knowledge-based economy.

2 Research Context: Management Consultancy Firms

Our research context is one where the core product is knowledge: the management consulting industry (Sarvary, 1999).

Management consultancy firms are knowledge intensive firms where “despite their increasing influence little is known about the work of management consultants” (Fincham and Clark, 2002: 1).

“We are understanding that the same forces and processes that destroyed so many businesses are definitely reshaping our consultancy world. We face competitors with new business models almost every day... and also our clients face the same situation...”

In this scenario we must start to rethink our service models and even to experiment new ones... otherwise disruption, also for us, is just a matter of time. We do not want to be too late in the game” (A senior-level manager).

The current unsettled times impose a deep reflection on creativity as a means to cope with various issues associated to the economic crisis.

In the last years consultants and managers rejected the idea of disruption in their industry claiming that their services could never be commoditized and in sourced inside the client firm (Christensen, Wang, and van Bever, 2013).

“We are trying to understand if our business models and therefore the services we provide our clients are changing at the same speed of our demanding clients...”

We must try to find a way to attract new clients...” (A manager).

Clients’ needs are becoming more sophisticated and this process leads them to reduce reliance on consultancy firms as “solution shop providers” firm (Christensen, Wang, and van Bever, 2013). This business model is at risk of being disrupted by others such as value-added process business and facilitated network firm (Christensen, Wang, and van Bever, 2013) and by the fact that the client firm, focusing on service costs and quality, is abandoning the paradigm that high price is a proxy for quality.

In the second quote an interviewed manager explains that it is necessary to find new ways to attract clients and therefore to obtain economic resources to survive. Nowadays clients are exigent and are facing a very strong economic crisis, which imposes them to carefully evaluate whether they really need consultancy services.

There is an increasing academic interest in the management consulting industry (Sarvary, 1999; Fincham and Clark, 2002) and how consulting firms are organized as part of a wider focus on professional services and knowledge intensive firms (Alvesson, 1995; Von Nordenflycht, 2010).

Consulting firms are the embodiment of knowledge-based organizations because their main assets are the expertise and competence of their employees (Engwall and Kipping, 2002).

Creativity in knowledge-based organizations is particularly challenging given the ambiguous nature of knowledge itself. Most recent research views knowledge-based creativity as emerging from ongoing work that is then embodied in organizational structure (Dougherty, 2004).

However, little is still known on creativity in knowledge-intensive firms and its generative elements' relation with organizational structure as a way to generate new forms of knowledge.

Our theoretical interest is to provide a more complete description of how new knowledge-based structures come out, enabling the consulting firm to be creative and to develop innovation.

The above state of the consultancy industry and the literature motivates this inductive study that draws upon interviews with 60 people among consultants, managers and partners in the most important international consulting firms based in Italy and seeks to elaborate theory on how organizations respond to unsettled times.

Because of their ground-breaking role in knowledge management and the widespread industry adoption of knowledge management, the analysis of international consulting industry suits particularly well as a context for our study.

The literature on creativity calls for empirical studies given the lack of verification in the field compared to the wide body of theoretical work (Woodman et al., 1993; George, 2007). Since innovation (as the result of creativity) impact on organizational structure, it is necessary to step back. Many interviewed managers recognized that to be creative an organization should hold some basic common elements in order to be able to create new

areas of knowledge (i.e., new structures or areas of expertise) that could translate in innovation. There is a complex change process governing how nowadays consulting firms try to be creative, building new knowledge-based structures (Langley, 1999; Peterson, 1998; Schulz, 2003). This must be addressed by researchers.

In the last years management consulting constantly transformed due to the fashions of management ideas and techniques. But nowadays change is also driven by other factors. The client companies are increasing their activist role in selecting and managing the resources assigned to their projects. “They have moved more and more work in-house, such as average cost analysis, an exercise that one racked up billable hours” (Christensen, Wang, and van Bever, 2013: 2).

We focus on how creativity and innovation emerge in consultancy firms in terms of internal employees involved in creating new knowledge structures. This analysis is particularly needed since these organizations are, now more the before, rethinking their way of doing business in order to remain viable in an environment questing for sophisticated and customized consulting services.

The management consultancy literature is divided between the external approach which studies the relationship between client and external consultancy functions (Alvesson, Karreman, Sturdy and Handley, 2009; Appelbaum and Steed, 2005; Fincham, 1999; Sturdy et al., 2009) and the internal perspective which studies staff members as designated to share and use new management consultancy knowledge and develop advices to the organization they belong to.

We provide useful contributions on this second approach since it is lacking empirical and theoretical attention from researchers (Sturdy, Wylie and Wright, 2012).

Given that “the pace of change being managed by the traditional clients of consulting firms will continue to accelerate, with devastating effects on providers that don’t keep up” (Christensen, Wang, and van Bever, 2013: 4), we focus on members involved in the creation of new knowledge structures, since external relations have already been studied.

2 Theoretical Background

2.1 Studying the process of new knowledge creation

Knowledge management is the key issue for consultancy companies since their product is knowledge.

“As a firm, and as individuals, we are driven to be the best, to develop unrivaled knowledge and to convey that knowledge to every client, at every time”

(www.mckinsey.com).

Therefore, how are these mission statements practically developed into reality? Is knowledge management embedded in companies? Are companies using the benefits of internal knowledge assets to be creative and innovative in order to survive in unsettled times?

Innovation is an ambiguous term, especially in the case of innovation with the consultancy industry. Different authors use different definitions of innovation.

Researchers have difficulties when defining innovation (Garcia and Callantone, 2002) and this is due to the large variety of meanings available. Following Van den Bosch et al.(2005), inspired by the work of James March, we use the definition of exploration and exploitation as a basis to define innovation.

In fact, “exploration includes activities such as search, experimentation, discovery and innovation, while exploitation involves imitation refining and adapting existing knowledge” (Van den Bosch et al., 2005, p. 26).

Our study explores how creativity and innovation emerges in consulting firms in terms of structures (i.e., areas of expertise) in which new knowledge arises. These structures are “areas”, e.g., sub-units or areas of expertise, within a firm and consultants are given to these units according to some common facets of their proficiency (Kubr, 2002).

In answering the question of how creativity emerges in knowledge intensive firms we further theorize about which are the common generative elements a sub-unit or area of expertise must have to be addressed as a new knowledge-based structure.

By evidencing the basic generative elements of these areas we study how they are combined in sequence and the overall effect of such process on the organization.

This work is embedded in two distinct theoretical traditions.

The first one has viewed organizational creativity and innovation as a multifaceted concept, studied from various perspectives and disciplines. This is due, for example, to the fact that there are many other themes (knowledge management, innovation, learning, etc.) under which similar topics have been studied (Styhre and Sundgren, 2005).

Innovation is considered as compulsory for the company’s survival in dynamic market environments (Nonaka and Kenney, 1991, Forrester, 2000, Cardinal, 2001).

In literature there can be found different definitions of innovation. For example there are some authors that stress the novelty of an idea (e.g. Barnett, 1953; Becker and Whisler, 1967; Aregger,1976). We read in Barnett (1953) that “an innovation is . . . any thought, behavior or thing that is new because it is qualitatively different from existing form” (p. 7). Other authors focus on the subjective recognition of novelty (Rogers, 1983; Zaltman et al., 1984), the first introduction of the novelty (e.g. Schmookler, 1966; Knight, 1967; Kieser, 1969; Vedin,1980), and the new combination of needs and solutions (Pfeiffer and Staudt, 1975; Moore and Tushman, 1982; Rickards, 1985).

The economic world we live in is pushing Partners (e.g., CEOs of the consultancy companies) to guide their organizations with creativity since the importance of innovations has increased dramatically.

Creativity and innovation in knowledge based firms is becoming a real challenge since managerial novelty must come from some kind of combination and integration of different knowledge components. Managers must not only adapt old business schemes (that entail some forms of knowledge) to the existing turbulent environment (Kikoski and Kikoski, 2004), but also need to be creative in defining new knowledge structures (i.e., new business practice areas).

Research on creativity has been booming, yet it is usually defined as the capacity to generate novel ideas, processes, products or solutions (Amabile, 1996).

The study of how creativity emerges is particularly challenging in knowledge-based organizations given that knowledge inheres people, processes and systems (Anand, Gardner and Morris, 2007).

Different approaches challenged these ambiguous knowledge elements. One view stressed the importance of individuals' expertise in creating policies for recruitment and retention of talented people (Starbuck, 1992). Another perspective focused on how social processes determine the degree of usefulness associated to knowledge within organizational contexts (Alvesson, 2004). A third approach studied organizational systems such as codification routines in order to embed innovative forms of expertise (Morris and Empson, 1998; Werr and Stjernberg, 2003; Anand, Gardner and Morris, 2007). Hidden in all these views is that knowledge-based creativity (and innovation) emerges from ongoing work and is then embodied in organizational structure (Dougherty, 2004).

However, far less attention has been paid to the field of creativity in consultancy firms and its relation with organizational structure in the process of generating new forms of knowledge.

In the last years there wasn't a common agreed universal definition of management consultancy, partly because of its essential contestability or its changing over time (Clark and Fincham, 2002).

More recently, Von Nordenflycht (2010) contributed to this line of enquiry attempting to provide a theory and taxonomy of consulting firms as knowledge intensive firms.

Successful innovative outputs come from the managing of internal power relations within the firm. For example, partners are owner-managers that participate in the business as key workers, helped by other employees (lower level managers and junior professionals). They are responsible for the company's overall management and for organizing groups of professionals (who have a specific form of proficiency) into recognizable areas of expertise (Greenwood et al., 1990).

Literature recognizes that partners have a desire for autonomy (Hall, 1968) and for getting control over the client firm and this could lead to dispersion of power and influence within the consultancy firm.

Knowledge based creativity and innovation, in defining new forms of knowledge, could be affected by this careful use of power and influence.

Knowledge intensive firms "commodify" knowledge since they always try to get new clients and expand their scale of activities. In order to remain viable, partners and new promoted partners must develop also reputation through which they could be able to attract new clients and set up junior professionals to perform this work (Gilson and Mnookin, 1989; Maister, 1993; Sherer, 1995). Beyond this, consultancy companies have the need to diversify, in order to prevent possible contraction in their clients' markets, and to invent new ways to exploit the firm's resources (Hitt et al., 2001).

The second theoretical tradition, that of consulting firms as epitomes of knowledge-based organizations, has mainly focused on knowledge related to the expertise and competence of the people employed (Engwall and Kipping, 2002), internal power relations (Greenwood, Hinings and Brown, 1990; Heusinkveld and Benders, 2005) and organic growth and diversification (Suddaby and Greenwood, 2001; Galanter and Palay, 1991; Hitt et al., 2001).

Widespread academic recognition has been given to knowledge as a key source of competitive advantage (Grant, 1997). The increasing importance of knowledge, as a resource to the firm possessing valuable, rare, inimitable and non-substitutable characteristics (Polanyi, 1966; Hall and Sapsed, 2005), in our contemporary society imposes a shift in how consultancy companies think about innovation.

In this context, it is, therefore, imperative to study how consultancy firms create new knowledge and, more importantly, how they transfer new knowledge.

Innovation can be the answer to such a research question in terms of processes in which the organization creates and defines new knowledge structures addressing emerging problems.

Now more than before, and especially in the consulting industry, firms compete on knowledge resources rather than the ownership of lands and capitals (Dunford, 2000).

A large amount of literature, taking the knowledge-based view of the firm (Grant, 1996; Teece et al., 1997; Van den Bosch et al., 2005; Leiponen, 2006), develops the idea that a firm must be capable to learn and to adapt to its changing environment and this is conceived of as an essential condition for its survival.

Kim and Lee (2006) stressed the importance of knowledge in the process of development of a collective knowledge management system that, while generating learning, develops creativity and innovation.

A main difficulty in researching knowledge innovation within the consultancy industry resides in the fact that this kind of innovation is not related to something tangible. New knowledge could come, for example, from a co-production or co-creation process with the client (Van de Aa and Elfring, 2002).

Far more attention is needed to understand how consultancy firms continually create new knowledge-based structures in order to be creative and survive in changing environments.

Therefore the question of how creativity and innovation arise and which are the generative elements of a new knowledge structure is very important in the run for survival.

This dearth of literature on the process of new knowledge creation in consulting firms offers us with a unique opportunity to elaborate theory on how knowledge intensive organizations squeeze creativity in unsettled times.

3 Methodology

3.1 Sample and data collection

This research is explorative because there is limited research on informal knowledge sharing and creation within the consultancy sector.

We adopt a qualitative research design and mainly base our work on semi-structured interviews. In total there were 60 interviews with 60 people inside international consultancy firms, including consultants, managers and partners based in the Italian context.

We define a consultancy firm as a firm that calls itself a consultancy firm, and also a firm which delivers consultancy on the market.

Our initial focus was on studying partners and managers as the leading individuals that drive creativity. Our initial set of interviews, however, revealed that creativity challenges everyone inside the firm.

Following an inductive approach and drawing upon emerging insights from our initial interviews, we refined our questions and started focusing on the concepts of creativity and innovation more narrowly on all the main levels existing in consultancy firms, e.g. partners, managers and junior level consultants.

This narrow focus was also prompted by the dearth of literature on the topic that was raised by the research team during their process of going back and forth between theory and the data (Strauss and Corbin, 1998).

A qualitative research approach was adopted since it is particularly suitable for studying socially grounded phenomena such as the one of consultancy firms as organizations made of individuals, as it allows researchers to elaborate meanings from the actors' perspective.

The approach adopted in this study is one of theory-elaboration. In contrast to a purely deductive approach that tests theory or a purely inductive approach that builds a new theory, a theory-elaboration approach “contrasts pre-existing understandings with observed events in order to understand extant theory” (Greenwood and Suddaby, 2006: 31).

For the semi-structured interviews we used personal contacts, snowball sampling and random requests to maximize the variance in the sample. In all interviews we followed the same semi-structured outline.

People interviewed worked in strategy consultancy, operational consultancy, tax and legal consultancy and financial services consultancy. The information was analyzed and the main quotes regarding knowledge creation and innovation were collected and compared.

Our idea was to let the interviewees describe their views about their role, tasks, relationships and approaches to work and change, following a storytelling approach. Our main concern was to allow them to interpret the questions freely and to deepen the themes they regarded as particularly important.

The interviews were conducted at the interviewees' workplaces and generally lasted between one hour up to three hours and were tape recorded with the approval of the interviewees and transcribed verbatim so as to have 'real time' data, avoiding the recall bias that may occur when participants are asked to comment upon issues retrospectively (Van de Ven and Poole, 1995).

In addition to the interviews that took place with the people inside the companies, meetings have been planned with specialists in the field of consultancy and innovation. Our aim is to get their point of view and practical suggestions.

4 Findings and Discussion. The elements of a new knowledge structure.

In our exploratory analysis we iterated between insights from the existing literature on Knowledge-based innovation and those emerging from our in-depth analysis of interview data.

We found that *four generative elements* are distinctive for a knowledge structure.

4.1 Individual Commitment

"We are a company that develops if people develop and believe in the company"
(A Partner).

Everyone inside consultancy companies tends to align his or her career's progression with the firm's growth. Consultancy companies are organizations in which people develop competencies and knowledge while trying to progress in their career.

During this journey, as long as people's career progresses together with the company's growth and success, people are more driven to develop entrepreneurial skills on behalf of the firm and want to improve their professional socialization, as a way to express initiative towards the company's success.

The individual-personal element leads to the desire to reach the top level of management (for lower level managers and consultants) thanks to professional socialization and entrepreneurial skills' development as a fundamental element constituting a knowledge structure.

The *first dimension* of this individual commitment element relates to people's need to create their *status* as an essential element for gaining access to the better client-projects assignments and for getting more autonomy. People believe it is important to build and show a leadership style in order to be directly related to what they are known for.

The *second dimension* is the person's *determination* to fulfill what is requested by top managers in order to be promoted.

The *third dimension* refers to the partner's role in *supporting and enabling* the building of an area of expertise.

4.2 Differentiation

As long as consultants want to progress in their career, they need to support the building of new organizational knowledge areas. Therefore, it is fundamental that they define their particular expertise and differentiate it in order to define new professional knowledge that can lead the firm into an innovative domain of activity.

The *first dimension* related to this second element is related to the *improvisation* sometime consultants perform when they are asked to solve novel or divergent client's demands. Consultants use existing knowledge but try to improve it modifying processes, methodologies during their work.

The *second dimension* concerns *how the new knowledge is applied* to the client's assignments. One respondent said that "when you are forced to invent something new, than it can happen that also your way of reasoning, thinking and solving problems can change and be re-shaped".

The *third dimension* relates to *uniqueness of knowledge* embedded in the new area of expertise newly created. People that work inside that new knowledge structure should develop their own professional identity different from the one of other areas. It is necessary to point out that they are strongly influenced by the hallmark practice of the company.

4.3 Setting of the boundary

People that created and developed the new knowledge structure must be able to induce others to believe in the relevance of the new area of expertise as a sort of knowledge territory with its own boundaries with the main aim to exploit this new territory to address the client market.

The *first dimension* of this third element is related to the need to *avoid others' "resistance to things which challenge their view of the world"* (A Partner).

The *second dimension* is related to the *power of clients* in helping founders (of the new area) to justify the recognition of the new knowledge structure created. As long as the new area of expertise is successful in terms of client's assignment the founders will be justified in continuing on this knowledge territory.

The *third dimension* is related to the *internal support of client gatekeepers* since it helps the new practice to expand beyond the founders' narrow client base.

4.4 Organizational culture

A new area of knowledge is generate when there is a supportive organizational culture, i.e. everyone inside the company share the idea that creativity and innovation are the basis for long lasting success.

A *first dimension* of the fourth element refers to the *training of people*. In fact is has been noted that is important to work with a variety of partners in the course of a person's career since they face different modes of problem solving.

A *second dimension* is related to the degree of "*sponsorship*" that partners of other areas do in order to introduce and support the new area of knowledge with possible clients.

5 Conclusion and Future Research

"We must be aware that we need to reshape our way of doing business consultancy.

The world is changed. I will never face disruption, as someone may call it, because I will push myself, and the ones that work with me, to have 'the idea' that will boost our portfolio of projects" (A senior-level manager).

Our objective was to define how new knowledge structures rise in consultancy companies (i.e., generative basic elements of a new knowledge area).

A knowledge structure can be defined as an area of expertise (with its own borders - i.e., a separated business area) formed by communities of professionals that contribute to the firm's organizational structure. Project teams, instead, are temporary assemblies of consultants whose main aim is to complete a single assessment for a client and after that the team dissolves.

Our findings on new knowledge structure creation want to shed light on the poorly understood process of knowledge-based creativity and innovation that is very critical to today's firms.

Management consulting firms are extreme examples of knowledge-intensive firms (Alvesson, 2004) in which innovation must be addressed in order to survive in turbulent times.

We have built our work on these literatures to understand the process of knowledge-based creativity and innovation.

We have studied creativity and innovation in management consultancy firms from an internal perspective seen as consultancy members involved in creating new management consulting knowledge and developing advices to the organization they belong to, toward a change in the business model (Engwall and Kipping, 2002).

Our findings have important implications for understanding the role of creativity in these unsettled times (Sturdy et al., 2012).

Our research demonstrates that the "squeeze" of creativity favors management consulting firms being models for an increasingly knowledge-based economy.

We are aware that the insights we draw came from a study set in the context of management consulting firms, but we suggest considering that these findings are interesting opportunities for future research on innovation in the knowledge economy.

We have described which are the four generative elements every firm must possess in order to be able to create a new knowledge structure (new area of expertise). These elements and their dimensions can be seen as means to build opportunities for reacting to turbulent times.

We have focused on individuals as the starting point for innovation within knowledge-based organizations. This could allow us to locate individuals' innovation initiative at the level at which it occurs.

We concentrated on the internal elements that determine creativity and innovation, without discounting exogenous forces entirely, but we believe that at our level of analysis

external forces tend to get filtered through the lens of those who are directly impacted by such forces.

Our work addressed the complexity of creativity and innovation within consultancy firms. We found that complexity resides in the fact that companies, in order to survive to changing environments, need to develop new forms of knowledge thanks to which they could be able to serve new or old clients and to remain viable overtime.

For the full development of innovative knowledge within the consultancy industry, management support is needed. This could be conceived of as the main the reason for the low attention given to innovation by consultancy firms.

Our work, also, addresses the importance of cultural elements as means that could stimulate and encourage creation of new knowledge.

Further research on knowledge-intensive firms could theorize about how such structures emerge (i.e., the dynamic underlying the new knowledge generation) and then get embedded in organizations.

A comparison across industry sectors could be interesting since it could confirm the existence of a typology of knowledge structures that rise in order to react to external negative triggers.

Future research should try to address how cultural aspects could be affected and driven by processes of knowledge sharing. A focus on other business cultures could be interesting as it allows researchers to compare and ultimately generalize the main findings.

More research is also needed regarding the role of the knowledge department in consultancy firms. A creative and innovative culture must be fostered in consultancy companies where people are allowed to get involved and to think about continuous organizational improvement.

Researchers could address leaders and their role in recruiting the appropriate people who will focus on innovation and new knowledge creation is needed. The focal point could be on the leader as a facilitator and as a person that can learn as well from others.

6 Practical Implications

People working inside consultancy companies should have the chance to work out new ideas. Management should support a culture in which creativity and innovation is

fostered. For example, in order to stimulate such process, companies could try to improve informal networking (e.g., lounge rooms or whiteboards in common rooms).

Also, firms should allow more time for people to elaborate new ideas that can generate new knowledge (regardless of the applicability in the field and regardless of the fact that a project might fail). This aspect could stimulate creativity in people working for this kind of companies since they will be paid for their time spent on thinking about how to create new solutions and new knowledge.

The above cited ways to improve new knowledge creation could strengthen the innovative culture of the company and could ensure a long-term competitive advantage.

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The impacts of inter-organizational knowledge transfer on performance of a collaborative network

Harri Laihonen

Department of Information Management and Logistics
Tampere University of Technology
PO Box 527, 33101 Tampere

Sanna Pekkola*

Lappeenranta University of Technology
Lahti School of Innovation
Saimaankatu 11, 15140 Lahti

** Corresponding author*

Structured Abstract

Purpose – The paper studies the impacts of inter-organizational knowledge transfer on performance of a collaborative network. The study focuses on performance information and aims to reveal what motivates organizations to open and share their performance figures to network partners, what impacts they expect to attain and what have they reached with this in practice?

Design/methodology/approach – For the purpose of this study, a total of 16 managers of the partner companies were interviewed. Interviews were carried out in two phases. The first set of interviews was held in autumn 2010. The second interview study was carried out in 2012. The latter interviews focused on the long-term impacts of the provided performance information.

Originality/value – Contribution of the paper relates to two aspects. First, it provides empirical evidence about the impacts of inter-organizational knowledge transfer on network performance. Second, it brings more depth to the analysis of these impacts by combining the research fields of performance management and knowledge management.

Practical implications – The empirical examination revealed that inter-organizational knowledge transfer within the studied network has improved managers' awareness of shared targets and status of networked operations. Thus, the results encourage organizations to engage in network-level performance measurement and sharing of performance information to network partners.

Keywords – knowledge management, inter-organizational knowledge transfer, performance information

Paper type – Academic Research Paper

1 Introduction

The paper studies the impacts of inter-organizational knowledge transfer on performance of a collaborative network. Focus on inter-organizational knowledge transfer is a timely management issue because companies increasingly collaborate and share knowledge with an objective to meet customers' needs more efficiently and effectively (Bititci et al., 2012; van Wijk et al., 2008; Easterby-Smith et al., 2008; Phelps et al., 2012). The study focuses on performance information and aims to reveal what motivates organizations to open and share their performance figures to network partners, what impacts they expect to attain and what have they reached with this in practice?

In addition to inter-organizational knowledge transfer the paper relates closely to a timely issue of networked performance management, which has attained increasing attention especially in the area of service management (Ostrom et al., 2010; Bititci et al., 2012). In order to evaluate performance of service systems (Vargo et al., 2008; Spohrer et al., 2007), information is needed not only on performance of individual organizations but also about the ability of the system members to collaborate and provide value for customers (Grönroos and Helle, 2010; Tucker and Pitt, 2009; Spohrer et al., 2007; Lönnqvist and Laihonen, 2012; Laihonen et al., 2014). Here, empirical examination is conducted in a collaborative network, which is defined as advanced and demanding form of collaboration (Camarinha-Matos et al. 2009). It involves a joint process where the entities share information, resources, and responsibilities to plan, implement, and evaluate activities to achieve a common goal (Camarinha-Matos et al. 2009).

The literature on knowledge transfer has focused on factors impeding and stimulating transfer (e.g. Albino et al., 1999; Kumar and Ganesh, 2009; Laihonen, 2014; Riege, 2007) and the quantitative impacts of transfer (e.g. Boumarafi and Jabnoun, 2008; Tsai, 2001). The paper focuses on the performance impacts and aims to increase understanding also about the qualitative consequences of inter-organizational knowledge transfer (Figure 1). Despite the importance of qualitative understanding about the impacts of inter-organizational knowledge transfer, for example, when pondering whether or not to engage in inter-organizational knowledge sharing, this is a less studied area. The impacts are approached from three perspectives (Franco-Santos et al., 2012): 1) the impacts on people's behavior (e.g. participation and commitment of network partners), 2) the impacts on organizational capabilities (e.g. processes and activities that enable network to perform

better and gain competitive advantage), and 3) the impacts on performance (e.g. effects on financial and non-financial results at all levels of the network).

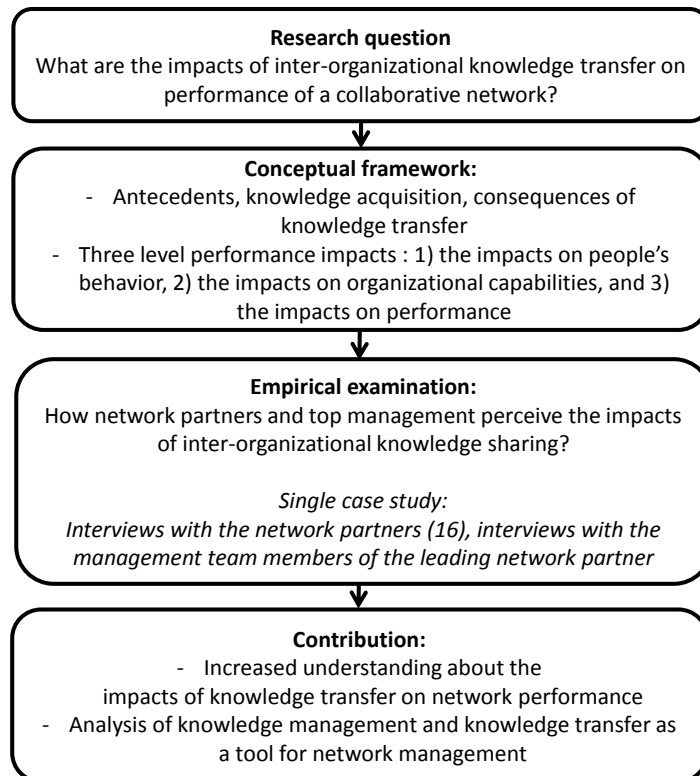


Figure 1. Research design.

The following sections of the paper are organized as follows. The next section reviews the literature on inter-organizational knowledge transfer and performance management. Based on the literature, the critical components of inter-organizational knowledge transfer and the resulting performance impacts are combined into a conceptual framework that forms basis for the empirical analysis. Section 3 describes the empirical research context and methods used. The results section maps the impacts of inter-organizational knowledge transfer at the various levels of the studied network. Analysis follows the empirical section. Finally, the concluding section summarizes the key findings of the paper and suggests directions for further research.

2 Theoretical framework

2.1 Inter-organizational knowledge transfer

Knowledge transfer has been one central research field of knowledge management ever since the early 1990's (e.g. Cohen and Levinthal, 1990; Grant, 1996; Szulanski; 1996). The increased complexity of modern business environments has further increased the importance of and interest in the phenomenon, not only within organizations but also between network partners (e.g. Easterby-Smith, 2008; Hutzschenreuter and Horstkotte, 2010; Inkpen and Tsang, 2005; Khamseh and Jolly, 2008; Martinkenaite, 2011; Phelps et al., 2012; van Wijk, 2008).

Knowledge transfer is defined as the transfer of knowledge from one unit to another (e.g. Cutler, 1989; Albino et al., 1999; Argote and Ingram, 2000; Bender and Fish, 2000; Kalling, 2003; Kumar and Ganesh, 2009). When analyzing knowledge transfer, it is important to understand: 1) who transfers knowledge to whom (actors), 2) what is transferred (content) and 3) in which context (context), and 4) which medium is the most suitable in a given context (media) (Albino et al., 1999; Laihonon, 2014). Inter-organizational knowledge transfer refers to a transmission process where knowledge is transferred across firm boundaries (Collins and Hitt, 2006; Meier, 2011).

Martinkenaite (2011) provides an integrative framework for analysing inter-organizational knowledge transfer. This framework is built on three dimensions: antecedents of transfer, knowledge acquisition and consequences of transfer (Figure 2).

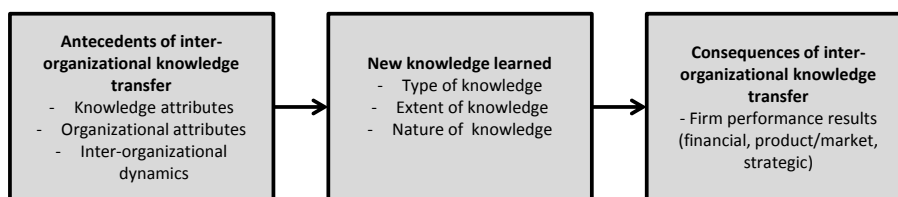


Figure 2. Framework of inter-organizational knowledge transfer (Martinkenaite, 2011).

Martinkenaite (2011) defines antecedents of inter-organizational knowledge transfer as knowledge attributes, organizational attributes and inter-organizational dynamics. The literature has quite extensively studied the attributes of knowledge and considers tacitness, complexity, specificity and institutional embeddedness as key antecedents of

knowledge transfer in inter-organizational setting (Martinkenaite, 2011). It is well-known that tacit knowledge is more challenging to transfer than explicit knowledge (e.g., von Hippel, 1994; Simonin, 1999; Argote and Ingram, 2000). The ambiguousness of knowledge also hampers the transfer (e.g. Zander and Kogut, 1995; Szulanski, 1996, 2000; Simonin, 2004; Coff et al., 2006; van Wijk, 2008). In addition, the value of transferred information matters – the more valuable the information, the more interested the receiver is (Gupta and Govindarajan, 2000).

By organizational attributes Martinkenaite (2011) refers to categories recognized by Easterby-Smith et al. (2008): absorptive capacity, motivation to teach and learn, and intra-organizational transfer capability. Absorptive capacity (Cohen and Levinthal, 1990) of the recipient is defined by its prior knowledge, trust and cultural compatibility among partners, adaptability of the recipient and the amount and quality of communication (Lane et al., 2001). The roles of openness or willingness to share knowledge, trust and previous knowledge correlate positively with knowledge transfer (e.g. Cohen and Levinthal, 1990; Dodgson, 1993; Wathne et al., 1996). Steensma et al. (2005) show that the more willing the donor firm, the greater the opportunity of the receiver to internalize knowledge. A shared context (i.e. similarities in organizational culture, values, and technical skills) expedites the transfer by reducing the ambiguity (Albino et al., 1999). Inter-organizational dynamics concerns also power issues, trust and risk, social ties and structures of inter-organizational relationships (Easterby-Smith et al., 2008).

As the consequences, or performance implications, Martinkenaite (2011) recognizes financial performance, product/market performance, and strategic performance. In this approach learning is seen as a mediator of performance. Author sees knowledge transfer as a two-stage process that involves acquisition of new knowledge and exploitation of that knowledge. Logic behind this is that transfer does not create performance. Instead, knowledge acquisition, that is, “the extent, type and nature of the new knowledge learned” (Martinkenaite, 2011, p. 55), mediates the performance results. Finally, it is important to acknowledge that performance is defined against the strategic objectives of an organization and that any knowledge management initiative, like knowledge transfer, needs to support organization’s business strategy (Hansen et al., 1999; Zack, 1999).

2.2 Three perspectives to performance impacts

From a knowledge-based viewpoint, performance information forms a basis for performance management (cf. Bititci et al., 2007). Management needs up-to-date and accurate information in order to guide organization towards its targets and proactively respond to challenges posed by the environment (Nudurupati et al., 2011). This information enables monitoring performance, identifying weak areas, enhancing employee motivation, improving communications and strengthening accountability (Waggoner et al., 1999; Simons, 2000). Furthermore, an ideal performance management system provides information about strategic uncertainties (Simons, 1994) and external phenomena, such as changes in market situation and customer behavior. It has been noted by several authors that performance measurement combines the views of internal efficiency and external effectiveness (Keegan et al., 1989; Kaydos, 1999; Neely et al., 1995).

Performance measurement system is “a set of indicators used to quantify the efficiency or effectiveness of purposeful actions” (Neely et al., 1995, p. 80). Franco-Santos et al. (2012) emphasize that performance measurement system plays a key role in strategy, communication and management processes and generating organizational capabilities that enable organization to succeed. An important aspect has been noted by de Waal (2004) who stresses the integration of performance measurement information to daily managerial activities. Here, performance information facilitates development, implementation, and review of business strategies by focusing people’s decisions and actions on strategic goals and by encouraging a continuous dialogue about strategy endeavors (Franco-Santos et al., 2012).

Nudurupati et al. (2011) discuss on performance information behavior, which they define as “people’s behavior with performance information”. The literature underlines that in order to foster performance-driven thinking and behavior, management needs to be trained to interpret and analyze measurement results, define action plans and monitor the results of actions (Neely et al., 1995; de Waal, 2004). Specific and clear performance measures and targets are associated with reduced confusion about strategic direction leading to better goal commitment, behavior and performance (Webb, 2004). Franco-Santos et al. (2012) have categorized consequences of performance measurement into three categories: 1) consequences on people’s behaviour, 2) consequences on organisational capabilities, and 3) consequences on performance (Figure 3).

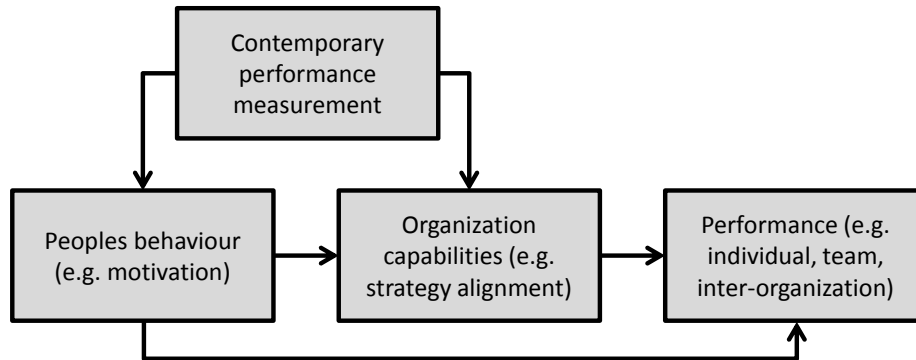


Figure 3. Consequences of performance measurement (modified from Franco-Santos et al., 2012).

According to Franco-Santos et al. (2012) consequences on *people's behaviour* refer to the actions or reactions of employees to measurement (e.g. motivation, participation) and their underlying cognitive mechanism (e.g. perceptions). Authors' results show that performance measurement facilitates development, implementation, and review of business strategies by focusing peoples' decisions and actions on strategic goals and by encouraging a continuous dialogue about strategic endeavours.

Impacts on *organisational capabilities* refer to consequences associated with specific processes, activities, or competences that enable the organisation to perform and gain competitive advantage (e.g. strategic alignment or organisational learning) (Franco-Santos et al., 2012). Franco-Santos et al. (2012) found a strong agreement on the impact of performance information on organizational communication processes, organizational routines and management practices. This is supported by the results of Papalexandris et al. (2004) who highlight the beneficial effects of measurement systems on communication processes at all levels of the organization.

Impacts on *performance* comprise the effects that performance measurement systems have on financial and non-financial results at various levels of the organisation (e.g. firm performance, managerial performance, or team performance). Franco-Santos et al. (2012) classified these performance impacts into two groups: reported performance and perceived performance. Reported performance includes both financial (e.g., accounting performance, market performance) and non-financial performance (e.g., customer satisfaction).

2.2 Conceptual framework

Knowledge management literature considers fairly extensively antecedents of knowledge transfer and issues related to knowledge acquisition. On the other hand, performance management puts a lot emphasis on design, implementation and use of performance measures (Bourne et al., 2000) and gathering performance information (Waggoner et al., 1999) but has left the underlying knowledge processes with fairly modest attention (Nudurupati et al., 2011). By combining the viewpoints of these disciplines it is possible to better understand how performance measurement systems, performance information, learning, and performance relate to each other's.

By combining the frameworks of Martinkenaite (2011) and Franco-Santos et al., (2012) we end up to a conceptual framework presented in Figure 4. In the framework, the performance measurement system is considered as the antecedent of inter-organizational knowledge transfer. The framework recognizes three aspects where performance impacts of inter-organizational knowledge transfer can be detected: peoples' behavior, organizational capabilities, and reported or perceived performance. It also pinpoints that measurement system and provision of performance information do not tell directly what to do and how to improve performance. Instead, those enable learning, which enables performance improvement. If performance improves, it implicitly indicates that the organization has learned and applied the information acquired. Hence, knowledge acquisition and learning are seen as mediators of network performance (cf. Martinkenaite, 2011).

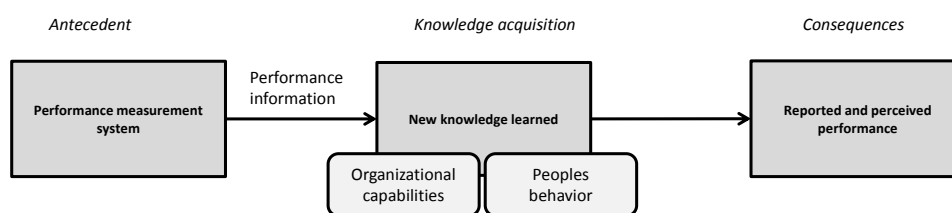


Figure 4. Conceptual framework - impacts of inter-organizational transfer of performance information.

By following the framework presented in Figure 4, the empirical part of the paper studies how network partners and top management perceive the impacts of inter-organizational knowledge sharing in one particular network.

3 Methodology

The aim of the study is to examine what are the impacts of inter-organisational knowledge transfer on performance. The phenomenon was studied in a longitudinal research setting where the data was gathered from a single case network by interviewing network partners. The studied collaborative network (cf. Camarinha-Matos et al., 2009) consists of the main company manufacturing kitchen fitments and reselling firms selling these kitchens to consumers. The resellers are independent firms with a full responsibility for their own businesses. The case network has shared goals and strategies. Firms collaborate in advertising and training as well as provide some support services together. This collaboration is intense and systematic.

The starting point for this research was laid already in 2008, when one of the network partners surprisingly confronted financial problems. Losing a partner would be reflected to the whole network, because finding and educating a new partner would take time and money and is a long-term process. A special aspect of this particular partner related to its role as a trusted partner for its long ranging expertise and experience in the business. This raised a question: why this happened and how the situation could have been detected earlier?

Situation was carefully analyzed and network partners identified that there were two ground reasons for what happened: 1) they had problems in information flow between partners, and 2) they did not have any network-level performance information available, which could have helped in anticipating the situation. In this phase, the second author of this paper stepped in to the process of developing measurement practices. As the result of the analysis, it was considered that the existing measurement information provided only a fragmented picture about the performance of the whole network (e.g. incomes, profit marking and orders). It also focused primarily on the leading network partner and only some fragmented information was available about the other partners. Each partner evaluated their own performance in varying tools and methods.

As a response to the recognized problems, a network-level performance measurement system was designed and implemented in 2009. Purpose was to develop a system that would both provide new information about network-level performance and improve information flow between partners. The new network-level measurement system provides information on financial state of network (e.g. costs, incomes and profit margins), customers (e.g. number of customers and customer satisfaction) and network partners'

satisfaction (e.g. satisfaction with network operations, processes, marketing and products, and welfare and wellbeing). In addition, it offers estimations of future incomes. These key performance indicators (KPI) were derived from the network strategy and partners' competitive strengths. The measurement system was built on a basic idea that all network partners have access to the measurement data and can compare their own results to other partners and the network-level information. During the performance measurement system design process, IT system was developed to support information provision and transfer.

Within the above-described contextual setting, this particular paper studies what impacts have been attained by sharing network-level performance information among network partners. For the purpose of this study, a total of 16 managers of the partner companies were interviewed. Interviews were carried out in two phases. The first set of interviews was held in autumn 2010. At this phase the new measurement system was being used for one year. The interviews were semi-structured and focused on interviewees' perceptions on the measurement system and its utilization. They were also asked about the ability of the system to support network- and partner-level management and to describe both the negative and positive impacts of the use.

The second interview study was carried out in 2012. This time interviews focused on the long-term impacts of the provided performance information. The top management team (CEO, sales director, production directors and financial director), two sales managers and four representatives of reselling network were interviewed. All the interviews were conducted face-to-face except for second interview study four respondents from reselling network were interviewed by telephone. Each interview was audiotaped and transcribed verbatim.

The interview transcripts were carefully analyzed and the recognized impacts were categorized according to the framework of Franco-Santos et al. (2012). Thus, impacts were divided to the following categories: 1) the impacts on people's behavior (e.g. participation and commitment of network partners), 2) the impacts on organizational capabilities (e.g. processes and activities that enable network to perform better and gain competitive advantage), and 3) the impacts on performance (e.g. effects on financial and non-financial results at all levels of the network).

4 Results

4.1. *The impacts on people's behavior*

The findings reveal that the transfer of network-level performance information has increased interviewees' understanding about their own business and its success factors. An important feature of the measurement system is the possibility to compare one's own performance to network-level averages. This provides a baseline for analysing own information and helps to interpret, understand and learn from the results. This also encourages communication between partners and facilitates learning from the experiences of other network partners. The interviewees described the importance of a shared understanding and learning as follows:

“After comparing own company's performance to network performance I understood that my company is performing at the average level.” (Reseller, 2010)

“It is easier for them (network partners) to support and help others, when they have an understanding of the current state of operations in their own reselling unit and network averages.” (Sales manager, 2012)

The top-management interviewees considered in 2012 that network-level information transfer has promoted performance-driven culture and knowledge-based management in general. Performance information has had an important role both in the management of partner organisations as well as decision making at the network-level. The interviewed network partners found performance information useful for self-monitoring, learning and decision support and aligning their operations with the network strategy. Learning from the new performance information had increased their goal commitment. The network partners were more aware and involved with the shared objectives and were better able to evaluate their own performance in relation to network strategy.

The interviewees' perceptions were in 2012 that network-level performance information has increased the openness and transparency between the network partners. Moreover, this has led to an increase in cooperation and participation. In consequence, the

interviewed participants described that trust between the network partners has increased and hence affected positively to a network culture.

4.2. The impacts on organizational capabilities

To ensure the efficient utilization of performance information, some structures and processes are needed, because the new inter-organizational knowledge have to integrated into network routine. Based on the interview results, two enabling structures can be identified that have significantly promoted information use and network-level communication.

First, interviewees emphasized in both interview studies the usefulness of the new meeting practices. In a monthly meeting, managers of network partners gather together to discuss about the new performance information and try to interpret and learn from this information. With the network-level performance information it is possible to make decisions concerning the whole network and define development targets to improve overall performance. Another regular meeting, which has gained added value from the network-level performance information, is a meeting between the main company's sales manager and resellers. In these meetings, the focus is on a single network partner but with the new performance information it is now possible to compare performance of resellers and better evaluate reasons behind certain results as well as recognize the needed development activities. Meeting practices are tools for increasing trust, promoting commitment to network objectives and advancing inter-organizational knowledge transfer. The sales managers described benefits as follows:

“The new meeting practice and especially more in-depth and comparable information has increased trust and openness between the sales manager and resellers. This makes discussion and decision making more structured and open between the network partners.”(Sales manager, 2010)

New measures, more open discussion atmosphere and comparable information have also supported decision making, which is more straightforward when it is based on reliable information. This was emphasized in both interview studies:

“Before the decision making was based on the few informal measures and tacit knowledge, but now we have facts that we can use for managing the network. It is also easier to explain and justify why certain decisions are made.”(Reseller, 2012)

New performance measurement system has also supported and clarified the definition of network roles and responsibilities. The role of the main company has become more consultative. It is increasingly helping network partners with their open questions and challenges. This relates also to a changed role of the measurement system. It is now considered more as a learning and management tool than control mechanism. Management structures have enhanced the spread of knowledge and interaction among the network partners.

4.3. Performance

The empirical evidence shows that reported network-level financial performance (e.g. profit margin, incomes) has not significantly improved after systematical use of new performance measurement system and performance information. According to interviewees, the detected financial improvements were more as a consequence of changes in market environment.

However, network partners reported a notable improvement in financial figures. At the network-level, partners were able to reduce reclamation costs (30%) and marketing costs (15%). These improvements affected directly and positively to network's profit. The interviewees described causes for these changes as follows:

“I compared the reclamation costs to the network-level average and realized that my company suffers from high reclamation costs. After that I started to ask others (network partners) for advice and tips to reduce these costs.” (Reseller, 2010)

“When we (resellers) started actively to follow the reclamation cost, our understanding about the underlying problems increased. Shared discussion and new measurement information enabled a more focused development actions. We learned a lot and were able to reduce them.” (Reseller, 2010)

“I noticed that my firm uses quite a lot of extra for marketing (in addition to chain marketing) compared to other partners and the gained impacts on customer volume were unsubstantial.”(Reseller, 2010)

Furthermore, the results of network’s satisfaction survey in 2011 witnessed that network partners were more satisfied with communication and information transfer between partners than previously. This was further supported by the results of the interview study in 2012, which showed that the new measurement system and shared performance information have increased transparency of operations and enabled more focused development of network processes, like the development of joint service processes and shared marketing campaigns.

5 Analysis

Contribution of the paper relates to two aspects. First, it provides empirical evidence about the impacts of inter-organizational knowledge transfer on network performance. Second, it brings more depth to the analysis of these impacts by combining the research fields of performance management and knowledge management. Whereas the literature on knowledge management has focused predominantly on factors impeding and stimulating transfer (e.g. Kuman and Ganesh, 2009; Laihonon, 2014; Martinkenaite, 2011; Riege, 2007) and the quantitative impacts of transfer (e.g. Yang, 2007; Boumarafi and Jabnoun, 2008; Tsai, 2001) literature of performance measurement and management has mostly ignored the knowledge processes that are needed to transfer performance information between network partners.

The empirical examination revealed that inter-organizational knowledge transfer within the studied network has improved managers’ awareness of shared targets and status of networked operations. This has also led to improvements in both reported and perceived performance. Thus, the results encourage organizations to share their performance information to network partners. This finding cannot be generalized to all knowledge transfer situations but offers support to previous studies arguing that performance needs to be studied as a shared phenomenon, which necessitates and is enabled by inter-organizational knowledge transfer (cf. Bititci et al., 2012; Busi and

Bititci, 2006; Parung and Bititci, 2008; Kulmala and Lönnqvist, 2006; Laihonen et al., 2014; Pekkola and Rantanen, 2014).

The findings contribute to the literatures on inter-organizational knowledge transfer (van Wijk et al., 2008; Easterby-Smith et al., 2008; Phelps et al., 2012) as well as on network-level performance management (Kaplan et al., 2010; Yin et al., 2011; Bititci et al., 2012). The literature indicates that inter-organizational knowledge transfer and learning have firm-level performance impacts in case of strategic alliances (Jiang and Li, 2008; 2009; Meier, 2011). This study provides evidence on the impacts of knowledge transfer in a collaborative network and adds to the literature on strategic alliances (cf. Brouthers et al., 1995; Camarinha-Matos et al., 2009). The results support findings of Cousins et al. (2008) and Mahama (2006), who have found evidence that performance measurement enhances both financial and non-financial performance indirectly by improving cooperation and socialization (i.e., trust and commitment) within the network.

The paper also brings further the idea of systemic performance measurement (cf. Laihonen et al., 2014), which has argued that in a networked business environment, performance is determined by performance of individual organizations, ability of the network partners to co-operate and customer-perceived value or performance (cf. Lönnqvist and Laihonen, 2012). The empirical evidence suggests that transfer of performance information between network partners leads to shared learning and performance improvements at all levels of the system. Thereby, the results indicate that performance measurement system can act as a valuable antecedent for inter-organizational knowledge transfer as the conceptual framework hypothesized. Measurement system defines in a concrete form the joint purpose, objectives and a common language for network partners. Simultaneously, the provided performance information acts as a driver for inter-organizational learning and network performance (Easterby-Smith et al., 2008).

Based on the empirical findings it seems that performance measurement and derived performance information can have valuable roles as knowledge integrators and promoters of learning and thereby, together with users compose a social system that could significantly improve performance (cf. Bititci et al., 2012). This kind of joint learning and inter-organizational knowledge transfer also endorses the maturity of a network. It supports the development of network-level processes, practices and structures by

encouraging partners to share information, resources, and responsibilities to plan, implement, and evaluate activities to achieve a common goal (cf. Pekkola et al., 2013).

A managerial implication of the results seems to encourage organizations to pay more attention on individuals' mental models and attitudes towards performance measurement. Through them it is possible to build a performance driven and knowledge-based management culture, which would yield performance improvements not only on the short run but also in the long-term. It all comes back to a question: what do people do with the performance information? (cf. Nurudupati, 2011). Collaboration is a one way to create and sustain competitive advantage but it necessitates that all partners understand that the focus of network management needs be on the service provided, not on the individual organizations, otherwise the system will not optimize the customer's benefit. Yet, it is important to recognize the factors that will drive success of the network, and finally the network needs to be managed, otherwise, the intended objectives will not be achieved (cf. Yin et al., 2011; Bititci et al., 2012).

6 Conclusions

The paper studied the impacts of inter-organizational knowledge transfer on a performance of a collaborative network. The paper combined ideas from the knowledge management and performance management literatures and composed a conceptual framework that considered performance measurement system as an antecedent of inter-organizational knowledge transfer. The provided performance information was seen as an enabler of knowledge acquisition and learning between network partners. Knowledge acquisition and learning were considered as mediators of network performance.

In the empirical part of the paper, based on the conceptual framework, impacts of inter-organizational knowledge transfer were studied from three perspectives in a collaborative network. The results were encouraging. The empirical examination revealed that inter-organizational knowledge transfer within the studied network has improved managers' awareness of shared targets and status of networked operations. Thus, the results encourage organizations to engage in network-level performance measurement and sharing of performance information to network partners. These drive learning and performance improvement.

The paper provided new insights on the inter-organizational knowledge sharing and increased understanding about the phenomenon of network performance. Interesting themes for the future research would be to examine how the turbulent operating environment or maturity of the network affects inter-organizational knowledge transfer. The main limitation of the paper relates to having only one case network. On the other hand, it is also a key strength of the paper: a deep understanding about the studied network and access to previously untouched information provided a much-needed possibility to examine the research question in a unique case environment (cf. Yin, 2009).

Despite of its weaknesses, the paper lays a foundation for developing a knowledge-based and performance-oriented management culture in networks. Simultaneously it puts in evidence the central role of knowledge management in fostering the vitality of the network. Without proper information and understanding about the effectiveness of operations, efficiency of various partners and ways of organizing it is not possible to make informed decisions.

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New knowledge and management models for sustainable growth of business: the case of the Italian banking sector

Antonio Lerro *

Department of Engineering, University of Roma 3
Via della Vasca Navale 79, 00176 Roma (Italy)
Department of Mathematics, Computer Sciences and Economics
University of Basilicata, Viale dell'Ateneo Lucano
85100 Potenza (Italy)

Francesca A. Jacobone

Department of Engineering, University of Roma 3
Via della Vasca Navale 79, 00176 Roma (Italy)

** Corresponding author*

Structured Abstract

Purpose – Global economic integration, technological change, the rise of digital opportunities and a new and sophisticated demand for products and services are creating a multitude of new opportunities and business options for firms and organizations. Accordingly, they are increasingly challenged to develop more and more renewed strategic, management and knowledge models, approaches, tools and techniques to satisfy effectively customers and to improve performance and sustainability. Although these scenarios characterize all the economic activities, this is particularly true for some industries more involved to face these transformations: it is the case of the banking sector. In fact, in the last decade, in a regulatory framework changing and under an high competitive pressure, banking organizations are revisiting and expanding their traditional borders and modalities to do business, trying to re-think their internal structures and to integrate more effectively places and channels, new services, new technologies, customers' wants and cost-reduction needs.

The aim of the paper is then to examine the new strategic, management and knowledge models elaborated and adopted in the banking sector in the Italian context. The relationships among these models and the business performance of the main banking organizations are identified and analyzed. Five successful experiences related to the adoption of new strategic, management and knowledge models are introduced and discussed.

Design/methodology/approach - To support our arguments we adopt a multiple-case studies methodologies. We provide the case examples of Banca Fineco, Azimut, Banca Fideuram, Banca Mediolanum and Banca Generali which recently have effectively planned and implemented innovative strategies and models aimed to activate and support a sustainable growth of their business.

Originality/value - This paper contributes to further develop our comprehension about the importance to elaborate and implement new strategic, management and knowledge models in a very relevant business sector such as the banking one. The analysis of the case-examples shows in particular how some Italian banking organizations – often considered too small to compete in the capitals global competition – have been able to elaborate and successfully implement new mechanisms to guarantee performance and sustainable growth.

Practical implications – The paper provides implications for future research and useful insights for management. However, further and detailed case studies are called to improve understanding of the phenomena and the capacity to generalize insights and best practices.

Keywords – Strategic, management and knowledge models; Banking; Services; Italy

Paper type – Academic Research Paper

1. Introduction

Global economic integration, technological change, the rise of digital opportunities and a new and sophisticated demand for products and services are creating a multitude of new opportunities and business options for firms and organizations. Accordingly, they are increasingly challenged to develop more and more renewed strategic, management and knowledge models, approaches, tools and techniques to satisfy effectively customers and to improve performance and sustainability. Although these scenarios characterize all the economic activities, this is particularly true for some industries more involved to face these transformations: it is the case of the banking sector.

In the last decade, in a regulatory framework changing and under an high competitive pressure, banking organizations are revisiting and expanding their traditional borders and modalities to do business, trying to re-think their internal structures and to integrate more effectively places and channels, new services, new technologies, customers' wants and cost-reduction needs. In particular, great relevance is playing the technological innovation, and specifically the evolution and the adoption of the ICT as basic pre-condition for the banking operations. In fact, ICT do not involve only the administrative and control activities, but all the productive processes characterizing the banking players. In fact, ICT deeply changed from a passive tool aimed to reduce costs and deliver internal procedures to key innovative factor able to improve practices, generate new financial products and services till to create new markets.

The aim of the paper is then to examine the new strategic, management and knowledge models elaborated and adopted in the banking sector in the Italian context. The relationships among these models and the business performance of the main banking organizations are identified and analyzed. Finally, five successful experiences related to the adoption of new strategic, management and knowledge models are introduced and deeply discussed. Specifically, we provide the case examples of Banca Fineco, Azimut, Banca Fideuram, Banca Mediolanum and Banca Generali which recently have effectively planned and implemented innovative strategies and models aimed to activate and support a sustainable growth of their business. The analysis of the case-examples show in particular how some Italian banking organizations – often considered too small to compete in the capitals global competition – have been able to elaborate and successfully implement new mechanisms to guarantee performance and sustainable growth.

2. The banking sector in Italy: state-of-the-art and evolution

2.1 From traditional banks to innovative banking

In the last decades, in Italy, the traditional banks have been often unable to defend their market shares, remaining linked, also in a period of crisis, to passive and reactive attitudes and to strategic and operative behaviors not customer-centric. Accordingly, in the last years, a great debate at political and industrial level is emerging about the closing of banks' agencies and the cutting to the employees (Bracchi and Masciandaro, 2013; Forestieri and Mottura, 2009).

However, it is possible to state that the ways to answers to the new challenges and the level of performance and growth of the players of the banking sector have not been common (Bracchi and Masciandaro, 2013): in fact, different banks have understood on time the need to change radically their strategic value propositions and consequently their business models according to new knowledge and management practices. In particular, great relevance plays the capacity not only to read the market dynamics but mainly to understand the life, the wants and needs of the final customers and then to provide them solutions more and more tailor-made and thought and proposed according to a consultancy-driven approach, from wealth management to wealth planning and wealth advisory; from consultancy platforms and customer financial processes analysis to portfolio management, and so on.

In order to better analyze these macro-dynamics, an empirical research aimed to test the assumption that the achievement of good business performance is related to the elaboration and the adoption of new strategic, management and knowledge models has been designed and developed. In the next section, data and methods and the main insights are introduced and discussed.

2.2 The empirical research: data and methods

A detailed research on the economic and financial performance of the most important Italian banks has been designed. However, for sake of simplicity, the details of the empirical research are not reported in this paper. A research protocol has been elaborated and balance sheet data from 2008 to 2012 have been collected and elaborated. In particular, the collection and the analysis of synthetic but relevant indicators such as the Core Tier as proxy of the solidity of the bank, and the Return on Equity (ROE) and Net Incomes as proxies of the revenues capacity of the bank have been developed and used. The indicators referred to year 2012 are reported in Table 1. The insights of this empirical research determined the chance to identify clearly the banking players that better could face the challenges of the new competitive scenarios and were able to run successfully change management programs. In the following sections of the papers, on the base of a desk analysis, a detailed presentation of the best real cases, their value propositions and their new knowledge and management models adopted to guarantee sustainable growth of their business is introduced and analyzed.

Table 1. Performance indicators of the selected Italian banks

Companies	Performance Indicators (2012)		
	CORE TIER 1 %	UTILE NETTO (mln euro)	ROE %
Unicredit	10,84	865,0	1,84
Banca Intesa	11,2	1.654,0	3,29
Banca Popolare di Vicenza	8,23	64,0	1,9
UBI Banca	10,29	83,0	0,87
Banca Popolare di Milano	8,38	-430,0	-10,48
MPS	8,5	-2.000,0	-33,56
BNL	7,7	51,0	13,8
Credem	9,4	121,4	6,11
BCC di Roma	13,31	20,1	3,1
Unipol Banca	8,4	13,4	1,46
Banca Profilo	22,7	2,1	1,49
Banca Intermobiliare	9,04	-64,9	-18,11
Banca Finnat	33,6	6,2	3,49
Banca Mediolanum	19,25	351,0	24,71
Banca Generali	12,5	133,1	33,68
Banca Fideuram	18,9	205,3	27
Banca Finco	9,23	125,0	38,72
Azimut	10,29	160,3	27,25

3. Cases of excellence in the banking sector in Italy

3.1 Banca Fineco: technologies and operational excellence as levers of innovation and value creation

Banca Fineco is the direct bank belonging to the Unicredit Group in which plays the importance role of central point of the asset gathering. Since 1999, it is synonymous of innovation in the financial services. It is focalized almost exclusively on segments of the retail customers. Its core value is the trading online, i.e. the creation of a lot of banking, investment and trading tools accessible via web, phone and smartphone or through the consultancy of over 2.000 personal financial advisers organized in a network of over 250 financial shops, called Fineco Centers.

On 2008, from the integration of Unicredit Xelion Banca and Banca Fineco, a new banking organization able to combine the professionalism and the capillarity of the network of the financial consultants with the strength of an outstanding technological platform of financial services was created.

In fact, it is widely recognized that the success of Banca Fineco is grounded on the technological advantage of its platforms about the online banking and trading: it has been able to exploit effectively the potential of the technological tools to increase revenues, to reduce costs and to improve the quality of its product and services: for example, through the easiness of the trading-on-line Power Desk platform, the efficiency of Logos platform to follow the financial markets in real time directly through the smart phone, the utility of the mobile applications on iOS, Android e Windows Phone, letting a complete management of the financial services of the bank in distance way.

Moreover, in order to maximize these investments in structural intellectual capital, Banca Fineco has paid attention also to the human resources dimensions of intellectual capital, organizing specific training activities on technology and engineering fields as well as assessment activities and competences plans for all the Group Managers and recruitment plans for talents.

The innovation strategy of Banca Fineco has been systematically integrated by the regular activities about the identification and the analysis of the customers' needs and questions as well as by monitoring the international best practices and by the attention paid to the input and information provided by the commercial network and the customer care.

More recently, great attention has been dedicated to improve the easiness to use Fineco platforms, managing technological aspects, contents and graphical interfaces; for example, on 2011, the releases of Fineco App for iPhone, the new Fineco App for the operative system Android, the Chart Trading, and other innovative services have been launched and the results achieved till now confirm the goodness of a business model strongly oriented to provide innovative services, easy-to-use and with competitive costs, able to involve and satisfy all the investors and traders that gradually use the finance online.

Also within the banking area, in order to create segmentation of the customers' base and to premium the best customers, a set of 113 services and exclusive conditions – called Apex – has been created and launched. Finally, relevant investments in marketing and communication to promote and support customer attraction and to create brand recognition have been developed continuously till now.

Summarizing these evidences, it is possible to state that Banca Fineco is applying a strategic model based on the differentiation, elaborating value propositions (Tracy and Wiersema, 1997) mainly referred to operational excellence and price leadership. Operational excellence is achieved through the use of the virtual platforms that let to offer products and services minimizing costs and reducing wastes, without traditional agencies on the territories, i.e. not employing front-office collaborators. All this determines the attempt to become also a price leader. Being an online bank, Banca Fineco can exploit successfully the chance to provide homogeneous and standard products and services without time and place constraints.

3.2 Banca FIDEURAM and Azimut: customer intimacy as lever of innovation and value creation

Banca Fideuram is a company of the Intesa Sanpaolo Group traditionally specialized in producing, managing and selling financial products and services addressed to high-profile and upper affluent customers. It is one of the leaders of the private banking in Italy; in fact, through its private bankers, it offers a complete specialized financial consultancy and a wide portfolio of solutions able to satisfy the asset management and the financial and insurance needs of very asking customers.

The financial consultancy provided by Banca Fideuram is based on dialogue, trust and personal relationships between customer and private banker as well as on structured approaches supporting the identification and the definition of the profile and states of the

customer. Accordingly, the attention about all the specificities and details of the customer' profile as well as about strictly confidential aspects is a core value of the consultancy provided by Banca Fideuram.

Also *Azimut* can be considered one of the leaders of the private banking in Italy. *Azimut* is a relevant financial consultancy company not belonging to any banking Group. It is structured in five networks - Apogeo, Az, *Azimut* consultancy *Azimut* Global Advisory and *Azimut* Wealth Management – aimed to provide outstanding services of consultancy on asset management directed to high-profile and upper affluent customers. Its core values are efficiency, rapidity and strong customer-orientation and its business model is based on an open architecture in which is possible to find products and services both developed within the *Azimut* networks and developed by other relevant international players of the financial world. All this in order to effectively capture the better opportunities on the markets, coherently with the *desiderata* of each customer.

Moreover, in order to maximize operational systems and to reach integration with the territorial systems in which operates or wishes to operate, *Azimut* often defines agreements and partnership with the local banks

Summarizing these evidences, it is possible to state that both Banca Fideuram and *Azimut* are applying a strategic model based on the differentiation, elaborating value propositions (Tracy and Wiersema, 1997) mainly referred to customer intimacy and niche.

3.3 Banca Mediolanum and Banca Generali: integration as lever of innovation and value creation

The strategic and business model of Banca Mediolanum - since its foundation on 1982 - is based on the model of integration, i.e. to emerge as provider of a wide portfolio of products and services, from banking services to savings management to insurance.

It is a winning model in which the main customer is not the single investor but often the family with its diversified wants and needs. It exploits a multichannel approach to the market and a smart use of the technologies as tool of customer relationships management, in particular referred to the back-office activities.

Also Banca Generali adopts with success the strategic and business model based on the integration of various product and services at financial, banking and insurance level directed to affluent and private customers, mainly through a network of financial

consultants. The adoption and the success of this strategic model are also linked to the internationalization processes that have traditionally characterized Banca Generali.

4. Conclusions

This paper has examined the new strategic, management and knowledge models elaborated and adopted in the banking sector in the Italian context. The relationships among these models and the business performance of the main banking organizations have been identified and analyzed and five successful experiences have been introduced and discussed. In particular, the case examples of Banca Fineco, Azimut, Banca Fideuram, Banca Mediolanum and Banca Generali which recently have effectively planned and implemented innovative strategies and models aimed to activate and support a sustainable growth of their business have been presented. This paper contributes to further develop our comprehension about the importance to elaborate and implement new strategic, management and knowledge models in a very relevant business sector such as the banking one. The analysis of the case-examples shows in particular how some Italian banking organizations – often considered too small to compete in the capitals global competition – have been able to elaborate and successfully implement new mechanisms to guarantee performance and sustainable growth. The paper provides implications for future research and useful insights for management. However, further and detailed case studies are called to improve understanding of the phenomena and the capacity to generalize insights and best practices.

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Measuring managerial ability using a two stage SFA DEA approach

Graziella Bonanno *, Giovanni D'Orio

Department of Economics, Statistics and Finance,
University of Calabria, Cubo 0 C, Ponte P. Bucci, 87040 Arcavacata di
Rende (CS)

Stefania Veltri

Department of Business Administration and Law
University of Calabria, Cubo 3C, Ponte P. Bucci, 87040 Arcavacata di
Rende (CS)

* *Corresponding author*

Structured Abstract

Purpose – Quantifying managerial ability is central to management literature. Prior research indicates that manager specific features (ability, talent, reputation, or style) affect economic outcomes and are therefore important to economics, finance, accounting, management and IC research as well as to practice. Most of the measures used in archival research, also reflect significant aspects of the firm that are outside of management's control. The paper, coherently with Demerijan et al. (2012), is directed to exploit the possibility to measure the managerial ability assessing managers based on the efficiency with which they generate revenues.

Design/methodology/approach – The paper addresses his aims applying a more sophisticated approach to the three stage estimation (Fried *et al.*, 2002), in which both Data Envelopment Analysis (DEA) and Stochastic Frontier Approach (SFA) are used to estimate the efficiency scores firms to derive a measure of manager ability (MA). The method used could be named “two-stage SFA DEA” approach. Our idea is to obtain a measure of MA as residue of the inefficiency equation of SFA and to use it as a new input to insert in the “second/third” DEA stage. The Italian banks have been chosen as the sample to investigate and implement our model.

Originality/value – The originality of the paper consists in the proposition of a new model to measure managerial ability, able to outperform the alternative measures of managerial ability, simple to use as it is based on easily obtainable financial data and available for a broad cross section of firms. Moreover, our paper is original also from a technical point of view, by employing not just the SFA or DEA methodology, but a “two stage DEA SFA” approach, in which the frontier and the inefficiency equation are estimated simultaneously.

Practical implications – We believe that our managerial ability score exhibits an economically significant manager-specific component and contains less noise than

existing proxies of managerial ability. This more precise measure of ability opens the door to a wide array of studies that previously were difficult to conduct.

Keywords – Managerial ability, Data Envelopment analysis (DEA), Stochastic Frontier Approach (SFA), “two-stage SFA DEA” approach

Paper type –Practical Paper

Acknowledgments - Though this work is the fruit of joint reflection and collaboration, for academic reasons sections 1 and 2 are to be attributed to Stefania Veltri, sections 3 and 4 are to be attributed to Graziella Bonanno, who also contributed to section 5, which together with section 6 are to be attributed to Giovanni D’Orio

1 Introduction

Quantifying managerial ability is a central theme for management literature. Prior research indicates that manager specific features (ability, talent, reputation, or style) affect economic outcomes and are therefore important to economics, finance, accounting, management and intellectual capital (IC) research as well as to practice.

Prior research is limited to measures such as media coverage and historical returns, which are difficult to attribute solely to the manager versus the firm (Rajgopal 2006), or manager fixed effects, where there is evidence of a manager-specific effect, but the quantifiable effect is limited to managers who switch firms (e.g., Bertrand and Schoar 2003; Bamber et al. 2010; Ge et al. 2011).

The main aim of the paper instead, coherently with Demerijan et al. (2012), is to provide a measure the managerial ability more precise of the existing measures (i.e. more able to exhibits an economically significant manager-specific component) but at the same time containing less noise than existing proxies of managerial ability, a measure that allows to better distinguish the effect of the manager from the effect of the firm.

The paper addresses his aims applying an approach stemming from the three stage estimation (Fried et al., 2002) but more sophisticated than this, hereafter “two-stage DEA SFA” approach. Applying “two-stage DEA SFA” approach, both Data Envelopment Analysis (DEA) and Stochastic Frontier Approach (SFA) are used to estimate the efficiency scores firms first, then to derive a measure of the manager ability. This method consists of estimating the frontier and the inefficiency equation simultaneously. In this way the first and the second stages are incorporated in a single one and the efficiency

scores are estimated through a parametric method which takes into account also a random error and not only the inefficiency taking away from the frontier.

The idea behind the paper is to obtain a manager ability measure as residue of the inefficiency equation and to use it as a new input to insert in the “second/third” DEA stage. The Italian listed banks have been chosen as the sample to investigate and implement the model, as banking industry has been object of several studies employing DEA methodology (Battese et al., 2000; Casu et al., 2004; Seiford and Zhu, 1999).

The originality of the paper consists in the proposition of a new model to measure managerial ability, able to outperform the alternative measures of managerial ability, simple to use as it is based on easily obtainable financial data and available for a broad cross section of firms. Moreover, our paper is original also from a technical point of view, as it employs not just the SFA or DEA methodology, but a “two stage SFA DEA” approach, in which the frontier and the inefficiency equation are estimated simultaneously.

We believe that our managerial ability score exhibits an economically significant manager-specific component and contains less noise than existing proxies of managerial ability. This more precise measure of ability opens the door to a wide array of studies that previously were difficult to conduct.

2 Literature Review

The impact of management on firm performance is a topic of everlasting interest in the managerial literature. Several are the proxy used in literature to measure managerial ability. Some studies refer to broader measures to proxy the managerial ability, such as the prior industry-adjusted stock returns (Fee and Handlock, 2003), the CEO’s financial press visibility and the firm’s prior industry-adjusted return (Rajgopal et al., 2006) and a combination of CEO tenure, prior media mentions, appointment from outside of the firm, and prior industry-adjusted stock returns (Milbourne, 2003). Other studies (Tervio 2008, Carter et al. 2010) used executive pay to infer managerial ability. A number of studies proxy managerial ability looking at the market reactions, such as Hayes and Schaefer (199), that identify able managers as those who were hired away by another firm, and Bennedsen et al. (2010), that examine firm profitability following deaths affecting the CEO. Several studies, finally, rely on manager fixed effects as measure of CEO’s ability,

such as Bertand and Schoar (2003), Bamber et al. (2010), Ge et al. (2011). Anyway, all of the measures above examined lack of precision and often rely on infrequent events.

Studies using DEA characterize themselves to provide a more precise measure of managerial ability. Among these, Murthi et al. (1996, 1997) measure managerial ability in the industry sector, Barr and Siems (1997) and Leverty and Grace (2012) within the bank and insurance sectors. In each of these studies, the inputs and outputs to the DEA vectors are industry specific. For example, in Murthi et al. (1996) the inputs include product quality and product price, and the outputs include market share. In the Leverty and Grace (2012) insurance study, the inputs include administrative and agent labor, and the outputs include the present value of real losses incurred for personal and commercial short-tail lines. The study of Demerjian et al. (2012), instead, measure efficiency for a large cross section of firms, spanning most industries. In detail they use as DEA input five stock variables (net purchased fixed assets, net operating leases, net Research & Development, purchased goodwill and other intangible assets and two flow variables (cost of inventory and selling & administrative expenses) to capture the choices managers make in generating revenues (output). Demerjian et al.'s (2012) study also differ from the others because the authors modify the DEA generated firm efficiency measure by excluding from it key firm-specific characteristics that the authors expect to aid (firm size, market share, positive free cash flow, and firm age) or hinder management's efforts (complex multi-segment and international operations), attributing the unexplained portion of firm efficiency to management.

The paper propose a measure of managerial ability that, coherently with Demerjian et al. (2012) allow to better distinguish the effect of the manager from the effect of the firm and to obtain an ordinal ranking of quality for the sampled firms using a "two-stage SFA DEA" approach described in the following section. The model will be applied to the Italian banking sector, on which focused several studies employing DEA methodology (Battese et al., 2000; Casu et al., 2004; Seiford and Zhu, 1999).

3 The "Two-stage SFA-DEA" approach

The methodology used in this work is an alternative of the tree stage DEA SFA approach proposed by Fried *et al.* (2002) and perhaps it would be appropriate to call it "two-stage SFA DEA" approach. The traditional version of this approach consists of three steps. In the first one the authors use DEA in order to estimate the initial measure of

firm performance. In the second stage, the first stage performance measures are regressed against a set of variables. In this way, a decomposition of the variation in the performance is obtained, which is formed by a part attributable to environmental effects, a part due to managerial inefficiency and a part attributable to random errors. Finally, in the third step, DEA is used in order to re-evaluate the firm performance with adjusted inputs (or outputs, depending on the orientation of first stage DEA).

We introduce an alternative approach to the just described one using SFA at the first stage in order to implement the specification proposed by Battese and Coelli (1995). This method consists of estimating the frontier and the inefficiency equation simultaneously. In this way the first and the second stages are incorporated in a single one and we estimate the efficiency scores through a parametric method which among other things takes into account also a random error and not only the inefficiency taking away from the frontier. Our idea is to obtain a manager ability measure as residue of the inefficiency equation and to use it as a new input to insert in the “second/third” DEA stage.

SFA is a parametric method which allows to make inference on the estimated parameters by assigning a distribution error. Further classification distinguishes the stochastic methods from the deterministic ones. The first take into account that a bank may stray from the efficient frontier also for reasons of random nature and not only for the inefficiency. The wide application of SFA is due to the possibility to decompose the error in two parts, the inefficiency and the random errors. Under this profile, SFA is preferable to the DEA (Data Envelopment Analysis), that is a non-parametric methods. The DEA supposes that the distance from the frontier is explained entirely by the inefficiency and it does not consider random errors as may be, for example, the errors of measurement of the variables or those due to unexpected events. A further advantage of the method SFA is the ability to insert in the model a set of variables that explain the inefficient component. In particular, the specification proposed by Battese and Coelli (1995) estimated the frontier model and the inefficiency equation in a simultaneous way. This method therefore offers a guarantee to consider in the estimation of the frontier an exogenous component of inefficiency.

In particular, the methodology used in this work can be described as follows:

1. The first stage involves estimating simultaneously the cost frontier and the inefficiency equation defined in the system (1):

$$\left\{ \begin{array}{l} \log Cost_{it} = \sum_{j=1}^J \beta_j \log y_{ij} + \sum_{n=1}^N \gamma_n \log w_{in} + u_{it} + v_{it} \\ u_{it} = \sum_{k=1}^K \eta_k z_{itk} + e_{it} \end{array} \right. \quad (1)$$

where $Cost_{it}$ is the total cost incurred by the i -th bank at time t ; y_{ij} represents the value of the j -th output obtained from the bank i in year t ; w_{in} is the cost of the n th input used by the bank i in the year t ; β_j and γ_n are the respective parameters to be estimated; u_{it} is an erratic component that measures the inefficiency. This is a no-negative variable; v_{it} is, instead, the random error; with $j = 1, \dots, J$ and $n = 1, \dots, N$. And, moreover, z_{itk} represents the k -th variable at time t that influence the i -th bank; with $k = 1, \dots, K$. Our interest is to obtain manager ability measure as residues of the inefficiency equation and to introduce it in the DEA second stage estimation.

2. The second stage consists in implementing DEA approach with another input, the manager ability estimated in the previous step. DEA is the most used method in the literature of manager ability (Demerjian et al., 2012; Hajiha and Ghilavi, 2012; Leverty and Grace, 2012).

Let x_i and q_i be, respectively, the column vectors of inputs and outputs, X and Q the input matrix and the output matrix, the variable returns to scale (VRS) linear programming problem can be written as follows (Afriat, 1972; Banker, Charnes and Cooper, 1984; Battese *et al.*, 2005):

$$\begin{array}{ll} \min_{\theta, \lambda} & \theta, \\ \text{st} & -q_i + Q\bar{\lambda} \geq 0, \\ & \theta x_i - X\bar{\lambda} \geq 0, \\ & I'\bar{\lambda} = 1 \\ & \bar{\lambda} \geq 0 \end{array} \quad (2)$$

where θ is a scalar, $\bar{\lambda}$ is a $I \times 1$ vector of constants and the third expression of (2) is the convexity constraint.

4 The sample: data and variables

Data are from the ABI Banking Data, which provides the balance sheets of Italian banks from 1993 to the present. Moreover, some variables (for example, bad loans calculated by geographical location of customers) are taken from the BIP (“Base Informativa Pubblica” online) released by the Bank of Italy. The period covered by this analysis is 2006-2011. There were 686 banks in 2006, 692 in 2007, 689 in 2008, 686 in 2009, 648 in 2010 and 631 in the last year. The sample consists of CCBs (on average 63%), Ltd (on average 32%) and Popolari banks (on average 6%). As can be seen, most of the banks are small and minor (92% of the sample in 2006 and 94% in 2011). In addition, the proportion of banks that have their main office in the North is 60% of the sample. This is a much higher value than that for banks that have their main office in the South (20%). In order to highlight some information about the Italian Banking System, Table 1 reports the distribution of Total Assets for geographical areas and legal categories. As can be seen, this industry is characterized by a breakdown and, for each macro-area or legal class, banks have specific and different characteristics.

Table 1. Average values of Total Assets by geographic area and legal category (constant values in mln of euros - NIC Index Istat, base year = 1995)

	2006		2007		2008		2009		2010		2011	
	Banks	Total Assets	Banks	Total Assets	Banks	Total Assets	Banks	Total Assets	Banks	Total Assets	Banks	Total Assets
Geographical Area												
North-West	151	6,011	149	6,955	144	8,210	152	7,464	138	5,762	129	6,370
North-East	241	1,636	242	1,884	242	1,877	239	2,045	231	2,883	230	3,020
Centre	151	3,250	150	3,106	154	3,238	150	3,381	144	3,182	139	3,418
South	143	725	151	701	149	712	145	768	135	742	133	736
Legal Category												
LTD	218	7,327	218	7,845	222	8,593	233	8,082	207	8,001	193	8,879
CCB	431	241	436	257	428	278	414	301	406	318	404	328
POP	37	5,276	39	6,368	39	5,506	39	6,001	35	6,689	34	7,154
Total	686	2,764	692	2,983	689	3,253	686	3,268	648	3,177	631	3,312

Source: Own elaboration on ABI data.

With regard to the variables used in the econometric analysis, in the extensive review proposed by Berger and Humphrey (1997), it is argued that the intermediation approach

proposed by Sealey and Lindley (1977) is the most appropriate to evaluate financial institutions. For these reasons, the variables we include in the model are selected according to this approach.

Although there is a heated debate about which specifications of inputs and outputs to choose in the study of bank performance, there is a certain consensus in considering loans to customers (y_1) as the main banking output. We introduce another output into the model, namely the non-interest income (y_2). This choice is justified by the fact that today's banks offer a range of non-traditional "collateral" services for which they obtain positive gains. The third output used in this work is that of securities (y_3), composed of loans to other banks, equities and bonds (Barra et al., 2011). With regards to inputs, we use labour, capital and deposits. In the SFA stage we use the input prices in order to estimate the cost frontier, while in the DEA stage, we apply a production frontier introducing a fourth input given by the Manager Ability' measure calculated in the first stage. The traditional inputs are three. Labour (x_1) is measured as the number of employees of individual banks. The cost of labour (w_1) is calculated as the ratio of personnel expenses to the number of employees. The cost of capital (w_2) is measured in this work as the ratio of expenses that are not considered in the other input variables in the frontier model and the banking product (x_2). Therefore, the numerator includes administrative expenses (excluding personnel expenses), operating expenses, the interest expense net of interest on amounts due to customers, depreciation of fixed assets and commission expenses. The administrative expenses include cost items, such as those relating to electricity, rent and maintenance of various types. Finally, the third input considered is given by the deposits from customers (x_3) whose cost (w_3) is given by the ratio of interest paid to customers and the total amount of deposits. The dependent variable in the cost function, $\text{Cost}(y,w)$, is the total cost of individual banks and this is calculated as the sum of administrative expenses, interest expense, operating expenses, commission expenses and depreciation of fixed assets.

As already mentioned, the specification made by Battese and Coelli (1995), which allows the simultaneous estimation of equations of system (1), implies a need to define the determinants of inefficiency. One environmental variable that explains bank performance is credit quality (z_1), which we calculate as the ratio of non-performing loans to total loans to customers. Both these variables are defined by customers' geographical location and are taken from the BIP of the Bank of Italy. The values of the loans quality

(z_1) are linked to each observation through the definition of four geographical macro-areas. In order to take into account the bank's risk position and the effect that this may have on efficiency scores, an indicator of bank solvency (z_2) is introduced. This is calculated as the ratio between regulatory capital and risk weighted assets and is a measure of banks' capital adequacy in relation to the credit risk. Furthermore, this is calculated on a territorial level by considering the same four macro-areas used for z_1 . It is also useful to consider the weight of each bank within the industry and, in this sense, the Herfindahl index (z_3), has been adopted. It is calculated for each geographical macro-area as the sum of the squared market share of each bank in the sample. This is an issue which has been addressed in many works (Casu and Girardone, 2009; Dongili et al., 2008; Fontani and Vitali, 2007) which have aimed at verifying whether a higher concentration in the industry, such as has occurred in the Italian banking sector since the '90s, may influence bank efficiency. In general, the outcome is uncertain, since the operations of consolidation have resulted in an increase in size with an eye to probable and expected increases in efficiency levels. On the other hand, this may cause an increase in banks market power. Turati (2008) proposes a model that captures the relationship between profitability and efficiency. The results support the idea of a competitive banking sector and, according to the author, the consolidation operations lead to an increase in banks' bargaining power, which is bad for customers. The *ftse* index (z_4) is introduced into the model in order to capture the relationship between the effects of the current crisis, reflected in Stock Exchange transactions, and bank efficiency. Moreover, a dummy for each year of the analysed period is introduced in order to consider a time effect on the efficiency scores. This dummy is meant to capture what happened in the years before and after the crisis, which reflects phenomena which are different from those gauged by the other z -variables. Finally, we have included some dummy variables in order to take into account the fact that any difference in the levels of cost efficiency may be determined by legal category, geographical location and/or size of banks.

5 Main findings

We report the results of both the stages.

5.1 First stage: results from SFA

The translog cost function for the banking sector is estimated as a system of equations. The aspects of the firm's behavior that we observe are total cost, the allocation of total cost across the various inputs (i.e., input expenditure shares), the firm's output level, and the input prices that the firm faces. The translog function allows for both positive and negative scale effects, that is, average cost can both decrease and increase across the range of the cost function. In this sense, the translog function can represent a production function that is not homogeneous. The elasticity of cost with respect to output is the ratio of marginal to average cost.

Essentially, this allows the observable information about the behaviour of the firm such as total resources expenditures, the distribution of these expenditures across inputs, the output yielded by these expenditures and the resources prices faced by the firm all to be used in the estimation of the parameters of the model. In addition to the restrictions on the estimated parameters, there is the restriction that the error terms in the share equations sum to zero.

Table 2. Estimates for the cost frontier of Italian banks (2006-2011)

	Coefficients	SE	z-value	P-value		Coefficients	SE	z-value	P-value
β_0	-5.44***	0.580	-9.38	0	γ_{11}	-0.05***	0.015	-5.94	0
β_1	0.73***	0.005	14.96	0	γ_{12}	-0.004	0.024	-0.35	0.72
β_2	-0.20***	0.059	-3.32	0	γ_{22}	0.05***	0.012	8.06	0
β_3	0.38***	0.056	6.92	0	α_{11}	-0.06***	0.006	-9.20	0
γ_1	1.60***	0.124	12.91	0	α_{12}	0.07***	0.008	8.58	0
γ_2	0.03	0.099	0.35	0.72	α_{13}	-0.02*	0.008	-2.39	0.02
β_{11}	0.04***	0.002	42.74	0	α_{21}	0.07***	0.004	14.02	0
β_{12}	-0.06***	0.006	-21.08	0	α_{22}	-0.05***	0.008	-6.67	0
β_{13}	-0.03***	0.006	-10.84	0	α_{23}	-0.002***	0.007	-0.37	0

β_{22}	0.03***	0.004	12.40	0					
β_{23}	0.02***	0.007	4.68	0	sigma ²¹	119.43*	49.68	2.40	0.02
β_{33}	0.01***	0.004	3.82	0	gamma ²	0.9997***	0.0001	7805.44	0
					Log-likelihood	363.15			

Significance levels: '***' = 0.01; '**' = 0.001; '*' = 0.05; '.' = 0.1; ' ' = 1.
Source: Own elaboration on ABI data.

In Table 2 there is the estimation of the cost frontier for the Italian banking system for the period 2006-2011. All the coefficients of our model for the translog cost function are significant.

Table 3 shows the cost inefficiency equation for the Italian Banking system (2006-2011). All the coefficients are significant. The coefficient for "Bad Loans" has a positive sign. This means that the higher is the incidence of suffering (or, in other words the lower is the credit quality of the territorial area where the bank has its main office), the higher is the values for estimated inefficiency.

The coefficient of the "Solvency Ratio" has a negative sign. If banks have high solvency ratio, the lower is the risk to which they are subject, than the lower is the level of inefficiency that they register.

Table 3. Inefficiency equation estimates for Italian banks (2006-2011)

	Coefficients	SE	z-value	p-value
$z_1 = \text{bad loans}$	615.77*	255.99	2.41	0.02
$z_2 = \text{solvency index}$	-868.05*	358.46	-2.42	0.02
$z_3 = \text{Herfindahl index}$	-2875.70*	1188.70	-2.42	0.02
$z_4 = \text{ftse}$	-0.03*	0.01	-2.40	0.02
$d2006$	-105.64*	43.59	-2.42	0.02
$d2007$	-73.35*	30.50	-2.40	0.02
$d2008$	-859.18*	358.84	-2.39	0.02

¹ $\sigma^2 = \sigma_u^2 + \sigma_v^2$; this is composed of the error variance, given by the sum of the variances of the two components.

² $\gamma = \sigma_u^2 / \sigma^2$; the zero value of this parameter indicates that deviations from the frontier are only due to random error; while values close to one of the range entail that the distance from the border is due to inefficiency. This parameter, in the technique of Jondrow et al. (1982) is used to separate the component of inefficiency (JLMS technique).

<i>d2009</i>	163.84*	68.19	2.40	0.02
<i>d2010</i>	121.89*	50.35	2.42	0.02
<i>d_ltd</i>	684.34*	284.65	2.40	0.02
<i>d_pop</i>	892.63*	371.70	2.40	0.02
<i>d_minor</i>	-65.13*	27.14	-2.40	0.02
<i>d_med</i>	-402.49*	167.74	-2.40	0.02
<i>d_large</i>	-170.87*	70.71	-2.42	0.02
<i>d_major</i>	152.38*	64.37	2.37	0.02
<i>d_nw</i>	607.00*	252.54	2.40	0.02
<i>d_centre</i>	262.75*	109.70	2.40	0.02
<i>d_south</i>	144.99*	61.00	2.38	0.02

Significance levels: '****' = 0.01; '***' = 0.001; '**' = 0.05; '*' = 0.1; ' ' = 1.

Source: Own elaboration on ABI data.

The coefficient of Herfindhal's index has a negative sign. This means that Banks in which the concentration of Total Assets (relatively to their main office) is higher reached the highest levels of efficiency.

The coefficient of FTSE index has a negative sign. This signals a pro-cyclical trend in efficiency.

The highest cost efficiency values are achieved by CCBs and by Banks with the main office in North-Est. The efficiency levels are higher in small Banks than in major ones, but minor, medium and large Banks achieve cost efficiency levels higher than the small ones.³

These results are quite interesting and sometimes surprising (such the one that smaller banks are more efficient than bigger banks) but for our aim, the most important issue is the following one. We obtain that the erratic component u_{it} , the share of the composite error that measures inefficiency, has been "clean up" from some sources of inefficiency (bad loans, solvency, etc.), then we can use the residual of the inefficiency equation as an acceptable proxy to signal managerial ability.

5.2 Second stage: results from DEA

In the second stage, we apply DEA under the hypotheses of both Constant Return to Scale (CRS) and Variable Return to Scale (VRS). The assumption of VRS seems to explain

³ In this estimation, BCCs are the group of control for the legal category, Banks that have the main office in North-Eastern Italy are the group of control for the geographical side.

better some features of the organisation studied but it is useful to conduct a CRS and a VRS DEA upon the same data since that doing this way it allows us to decompose the technical efficiency (TE) scores obtained into two components, one due to scale inefficiency and one due to “pure” technical inefficiency (i.e. wrong input mix or managerial inefficiency). If we have a difference between the two TE scores for a specific observation (or Decision Making Unit) this indicates that the Decision Making Unit has scale inefficiency. When this happens we can calculate this inefficiency using the difference between the VRS TE score and the CRS TE score.

In Table 4 there are the efficiency scores estimated with DEA without and with Manager Ability’s measure as new input of the production function. The standard errors are in italics. We performed a test on the differences between means and we widely reject the null hypotheses of equality.⁴ This result allows us to consider the Manager Ability as a significant variable to be introduced in the estimate of a production function with the DEA approach.

Table 4. Estimated DEA for the Full Sample with and without Manager Ability’s measure as new input of the production function.

	2006		2007		2008	
	CRS	VRS	CRS	VRS	CRS	VRS
Full Sample - No Manager Ability as input	0.9004	0.9090	0.8980	0.9076	0.9000	0.9087
	<i>0.0400</i>	<i>0.0434</i>	<i>0.0387</i>	<i>0.0436</i>	<i>0.0393</i>	<i>0.0431</i>
Full Sample - Manager Ability as input	0.9064	0.9133	0.9096	0.9161	0.9174	0.9230
	<i>0.0411</i>	<i>0.0443</i>	<i>0.0417</i>	<i>0.0456</i>	<i>0.0430</i>	<i>0.0457</i>
<i>Nr. of observations</i>	475		495		525	
	2009		2010		2011	
	CRS	VRS	CRS	VRS	CRS	VRS
Full Sample - No Manager Ability as input	0.8980	0.9070	0.8887	0.8974	0.8943	0.9048
	<i>0.0357</i>	<i>0.0401</i>	<i>0.0366</i>	<i>0.0410</i>	<i>0.0368</i>	<i>0.0406</i>
Full Sample - Manager Ability as input	0.9093	0.9157	0.8994	0.9062	0.8997	0.9082
	<i>0.0383</i>	<i>0.0418</i>	<i>0.0394</i>	<i>0.0421</i>	<i>0.0367</i>	<i>0.0403</i>
<i>Nr. of observations</i>	500		472		481	

Source: Own elaboration on ABI data.

⁴ The result of the two tests (one for CRS, one for VRS) is available on request (in the case of CRS, the t-statistic is equal to 29.10, while in the case of VRS, it is equal to 25.58).

The average efficiency scores of Table 4 show that when we consider the additional input of Managerial Ability the results of efficiency improve. This happens for all the years and for all the observations. The magnitude of improvement is different in different years. Figure 1 shows the trend in the estimated average Efficiency Score. It is clear from the Figure that including Managerial ability as a input gives us better scores. It means that Managerial ability has a positive impact on the efficiency of the sample. The trend is increasing from 2006 until 2008, it decreases 2009 and 2010 and slightly improves for 2011.

In Figure 2 we can observe the magnitude of improvement given by Managerial Ability. This value is calculated as the differences between the efficiency score obtained without this input and the efficiency score obtained including in the estimation the proxy of Managerial ability.

The highest value is observed in 2008; years 2007, 2009 and 2010 show a similar value of the impact of Managerial ability on efficiency while the minimum is observed in year 2011.

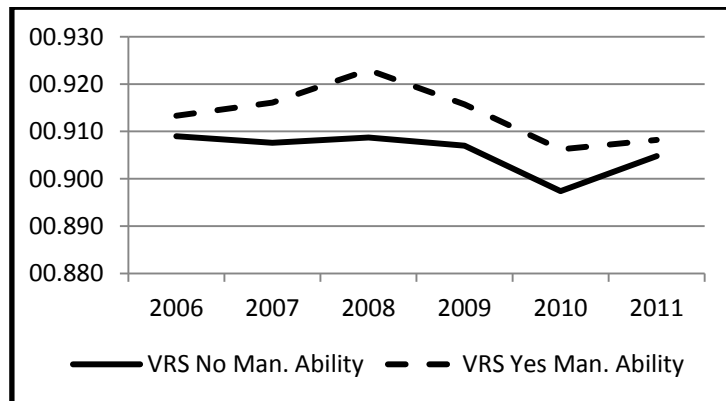


Figure 1 Trend in the average Estimated DEA - Full sample with and without Managerial Ability's measure.

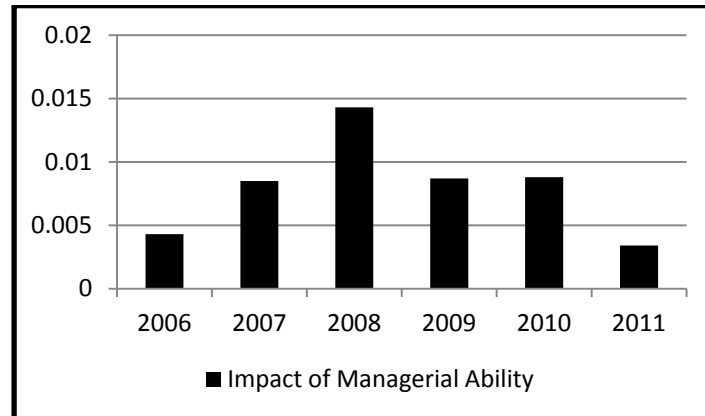


Figure 2 Impact of Manager Ability. Full Sample.

Table 5 reports the estimated efficiency when we introduce MA's measure as input. We show the results disaggregated for legal category and size. Also in this table, the standard errors are in italics.⁵

As can be seen, in the case of VRS we obtain an increase of estimated efficiencies, but trends remain substantially unchanged. When we disaggregate for legal category, we find that Popolari Banks perform better than Ltds and CCBs and that the latter register the worst results. As regard the size, it easy to realise that the largest Banks achieve the higher levels and that with decreasing size also the estimated values decrease. These results confirm the existence of a strong heterogeneity in Italian Banking System.

Table 5. Estimated DEA efficiency scores of with Manager Ability's measure as input - Full sample - Legal Category - Size

	2006		2007		2008		2009		2010		2011	
	CRS	VRS	CRS	VRS	CRS	VRS	CRS	VRS	CRS	VRS	CRS	VRS
	All sample											
	0.9064	0.9133	0.9096	0.9161	0.9174	0.9230	0.9093	0.9157	0.8994	0.9062	0.8997	0.9082
	<i>0.0411</i>	<i>0.0443</i>	<i>0.0417</i>	<i>0.0456</i>	<i>0.0430</i>	<i>0.0457</i>	<i>0.0383</i>	<i>0.0418</i>	<i>0.0394</i>	<i>0.0421</i>	<i>0.0367</i>	<i>0.0403</i>
Obs	475		495		525		500		472		481	
	Legal category											
Ltd	0.9249	0.9415	0.9374	0.9530	0.9516	0.9630	0.9313	0.9480	0.9197	0.9362	0.9099	0.9321
	<i>0.0342</i>	<i>0.0363</i>	<i>0.0275</i>	<i>0.0301</i>	<i>0.0313</i>	<i>0.0303</i>	<i>0.0298</i>	<i>0.0325</i>	<i>0.0377</i>	<i>0.0366</i>	<i>0.0375</i>	<i>0.0397</i>

⁵ In this stage, we exclude banks that register SFA-efficiency scores with a standard deviation greater than 0.10 between 2006 and 2011 (27 observations). Moreover, DEA requests a full matrix of values, therefore the final number of observations, for this step, is 2948.

Obs	112	118	131	120	111	120						
Pop	0.9287	0.9415	0.9492	0.9627	0.9613	0.9727	0.9453	0.9518	0.9348	0.9488	0.9228	0.9351
	0.0288	0.0344	0.0244	0.0261	0.0345	0.0331	0.0373	0.0385	0.0413	0.0398	0.0402	0.0445
Obs	26	27	33	29	25	24						
CCB	0.8985	0.9017	0.8971	0.9000	0.9011	0.9039	0.8987	0.9017	0.8900	0.8931	0.8944	0.8977
	0.0414	0.0422	0.0403	0.0412	0.0370	0.0379	0.0359	0.0367	0.0357	0.0365	0.0347	0.0355
Obs	337	350	361	351	336	337						
	<i>Size</i>											
Minor	0.9021	0.9056	0.9019	0.9056	0.9086	0.9123	0.9021	0.9056	0.8934	0.8967	0.8968	0.9006
	0.0428	0.0436	0.0411	0.0428	0.0413	0.0428	0.0372	0.0384	0.0383	0.0392	0.0368	0.0378
Obs	366	379	408	383	365	378						
Small	0.9141	0.9273	0.9299	0.9412	0.9446	0.9525	0.9295	0.9403	0.9145	0.9267	0.9046	0.9237
	0.0314	0.0351	0.0346	0.0374	0.0360	0.0360	0.0338	0.0356	0.0377	0.0334	0.0358	0.0346
Obs	82	80	83	74	74	76						
Medium	0.9256	0.9595	0.9341	0.9656	0.9450	0.9704	0.9310	0.9636	0.9201	0.9570	0.9147	0.9618
	0.0144	0.0194	0.0155	0.0214	0.0244	0.0218	0.0202	0.0210	0.0215	0.0212	0.0225	0.0210
Obs	23	24	26	24	23	22						
Large	0.9574	0.9784	0.9631	0.9824	0.9772	0.9907	0.9559	0.9784	0.9509	0.9794	0.9478	0.9783
	0.0217	0.0138	0.0162	0.0135	0.0191	0.0123	0.0200	0.0158	0.0206	0.0153	0.0182	0.0137
Obs	8	6	7	7	8	5						
Major	0.9703	0.9968	0.9906	0.999986	0.9900	1	0.9868	0.9966	0.9948	1	0.9637	1
	0.0029	0.0045	0.0064	0.00003	0.0150	0	0.0104	0.0029	0.0073	0	0.0062	0
Obs	2	4	4	3	2	2						

Source: Own elaboration on ABI data.

We are able to reproduce the table 5 when estimating a stochastic cost frontier in the first stage. We chose not to include it because does not the focus of the paper. However, from the SF cost side, CCBs perform better than the others one, while Ltds are placed in the same intermediate position with respect to what happens when estimating the production function through DEA. For what concerns the size, we find a conflicting result because in this case we obtain that the minor banks are positioned in first place with the highest levels of cost efficiency, while the major banks are in last place. The ranking remains unchanged with respect to the other banks (small, medium and large).

6 Conclusions and future research directions

Quantifying managerial ability is central to management literature. Most of the measures used in literature reflect significant aspects of the firm that are outside of management's control. The originality of the paper consists in the proposition of a new model to measure managerial ability, able to outperform the alternative measures of managerial ability, simple to use and based on easily obtainable financial data and available for a broad cross section of firms. The paper aims to exploit the possibility to measure the impact of managerial ability on technical efficiency.

To do this we use a sophisticated approach to the classical three stage estimation, in which both Data Envelopment Analysis and Stochastic Frontier Approach are used to estimate the efficiency scores firms. This allows us to derive a measure of Managerial Ability. The method used is a "two-stage SFA DEA" approach. Our measure of Managerial Ability is the "clean" part of the residue of the inefficiency equation of Stochastic Frontier Approach and we use it as a new input in the "second/third" Data Envelopment Analysis stage. We observed an improvement in efficiency scores calculated with this new input for all years and for all the average samples. This can be seen as a proxy of positive impact of Managerial Ability on technical efficiency. We believe that our proxy of managerial ability score exhibits an economically significant manager-specific component and contains less noise than existing proxies of managerial ability. This more precise measure of ability allows a wide array of studies that previously were difficult to conduct.

An interesting topic for further research can be to develop a "behaviour" model for inefficient firms. Since we estimate a technical efficiency frontier, the Observations (Decision Making Units - DMU) on the Frontier can be seen as "fashionable" DMU for all the DMU that are not fully efficient (not on the Frontier). In this way, all the frontier DMU can be treated as "peer". "Peers" define the relevant part of the production frontier for a DMU. If a DMU is not fully efficient, given the previous and following estimation we can calculate which is the target (i.e. produced output given the used inputs) that the DMU could aim at if efficient. An example will make it clear. (see Figure 3). Output Z can be produced using two inputs y and x. The points on the iso-product curve (A,C,E and F – let us not consider D yet) are DMUs producing the quantity Z of output in an efficient way, using different technologies (the vectors departing from the origin indicates the input combinations). DMU B produces the quantity Z using a sub-optimal technology.

If DMUs on the frontier have a Technical Efficiency score of 1, B will have a smaller Technical Efficiency score, i.e. 0.8. This means that for that DMU could be possible to reduce the consumption of all inputs by 20% without reducing output. If we draw a vector between the origin of the axis and B, the vector will cross the production frontier at the point D. D can be seen as an ideal firm that uses the same technology of B but efficiently (it uses less inputs for the same quantity of output). D could be firm B using its technology efficiently. Point D can be obtained as a linear combination of point A and C. A and C will be the “peers” firms of B.

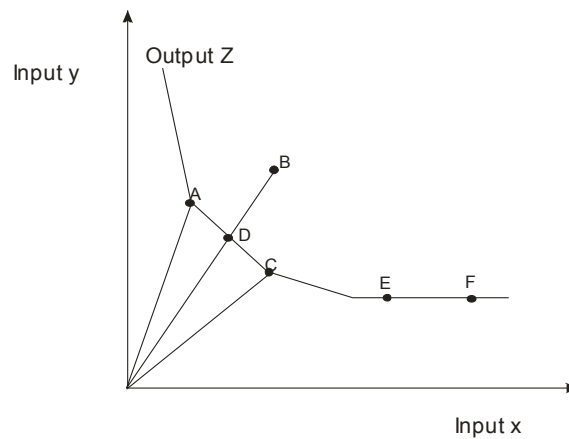


Figure 3 Frontier and Peers

Since we can have a proxy of Managerial Ability as an input (and for all inputs), we can calculate a "weight" for each peer and for each input, including Managerial Ability. The weight obtained for each input, in each estimate and for each “peer” is “the importance” of that firm as a peer in the linear combination (i.e. in the example D is at the same distance between A and C so the weight of these two peers will be i.e. 0.5 and 0.5. If D was very close to A, the weight would be 0.90 for A and 0.10 for C).

This approach can give some useful direction to non-efficient DMU in the changes needed in each input (including Managerial Ability) to achieve full efficiency, and this can be an interesting starting point for a new work.

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Management settings enabling Sustainable Value Creation. The case study of a Social Enterprise

Roberto Linzalone *, Laviero Saganeiti

Dipartimento di Matematica, Informatica ed Economia, DIMIE
Università degli Studi della Basilicata
Via dell'Ateneo Lucano, 10 – 85100 Potenza, Italia
Institute of Knowledge Asset Management
IKAM Centro Studi&Ricerche
Via D. Schiavone, 1 – 75100 Matera, Italia

** Corresponding author*

Structured Abstract

Purpose – Today's socio-economic crisis ongoing in many countries, is strongly challenging the value creation approaches and the sustainability of traditional for-profit enterprises' model, mainly focused, if not exclusively, on the satisfaction of the shareholders or the owners. In this context, that sees even more companies reducing or shutting down, the Social Enterprise (SE) is increasing the production and the opening of new units, distinguishing for its competitive capability and sustainability. The paper investigates the reasons at the basis of such SE's performance, identifying in the management model setting the peculiar reason: multistakeholder structure, balanced value creation among stakeholders, integrated management of three key dimensions: compliance, process performance, knowledge and learning.

Design/methodology/approach – The research has been designed on the basis of case study methodology. In particular an Italian Social Enterprise theoretically significant and relevant for the investigation of the research topic has been sampled. The qualitative data collected have been carried out from interviews to the Director, observation of day to day management practices, participation to enterprise's internal meetings, access to organization's repositories.

Originality/value – The paper analyses one of the oldest Italian social enterprises, and discloses key elements of its management model, providing useful insights for a sustainable value creation model setting.

Practical implications – Identifying social enterprise management model's settings, enable to compare traditional for-profit enterprises' model with SE's ones. For-profits may benchmark useful settings in order to create value and be sustainable in today's turbulent competitive context.

Keywords – Social Enterprise, Value creation, Management settings, Integrated governance.

Paper type – Research Paper

1 Introduction

Today's socio-economic crisis ongoing in many countries, is strongly challenging the value creation approaches and the sustainability of traditional for-profit enterprises' model, mainly focused, if not exclusively, to the satisfaction of the shareholders or the owners.

In this context, that sees even more companies reducing or shutting down, the Social Enterprise (SE) is rising, distinguishing for its competitive capability and sustainability. The paper investigates the reasons at the basis of such successful SE's model, identifying in the management model dimensions and settings the peculiar features.

As a counter altar of the for-profit company, the SE is a type of enterprise characterized by the absence of profits, the moderate role of shareholders, and the aim of providing services or products of a collective and common interest. These characteristics of the SE's model distinguishes it in terms of value creation and sustainability.

SEs adopt a peculiar management model that identifies some basic drivers and combines them effectively, in order to fulfil requests and expectations of a wide range of stakeholders.

The management model of a SE is then a model in which the management dimensions and their settings are effective in terms of sustainable value creation, the distribution of value creation involves various internal and external stakeholders, as well as the contribution to enterprise's achievements comes from a variety of complementary stakeholders. The SE's value creation model appears to be more sustainable, and more fitted against specific stakeholder's interests.

The paper analyses the case of an Italian SE, of about 2 centuries of life. It highlights how the management model is multi-stakeholder, support and distributes value among equally important stakeholders, is set on three main interacting dimensions: compliance, performance, knowledge.

The paper explores the management foundations (dimensions and settings) underlying the SE, identifying its peculiar characteristics. The paper address, besides, implications to for-profit companies in order to enhance value creation and sustainability dynamics.

Although the growing economic importance of SE, few attention is paid by management literature in order to disclose its management foundations, to reveal its value creation dynamics. An higher attention should be paid by the management research community in order to analyze this emerging model of doing business, more robust and sustainable in today's turbulent environment.

The paper is organized as follows. Section 2 provides the background of the research, section 3 presents the research project, the case study's data and methods, section 4 reports the results, and section 5 outlines conclusions and implications.

2 Background

2.1 Social Enterprise and value creation

In the last years the deep changes of the economic, political and socio-cultural contexts are stressing the foundations of business and enterprises, mainly or exclusively based on the goal of profits.

This have determined new reflections about companies management, entrepreneurship and models of development in advanced countries. In fact, the emerging dynamics have accelerated the search of new models of doing business able to reconsider the paradigm of the free market and to re-think the roles assigned to the different forms of enterprises (Linzalone and Lerro, 2014).

In order to build a sustainable economic system, it is crucial to ground the enterprise on more-extended key actors and to find a new balance among them. Particularly effective is the non-profit, social services providers' 'business' model (Stiglitz, 2009), and the role they have. It can provide a new company's management setting, able to balance financial capital, workforce and collective interests to support the emerging deep changes in the economic and social structures of the advanced countries (Dasgupta P., 1998; Sen A., 1998).

Social enterprise has no universally agreed definition (Leadbeater, 1997; Prabhu, 1999) since it is mainly characterized by its diversity and heterogeneity. Accordingly there is no universally accepted definition of social entrepreneurs (Shaw and Carter, 2007). Social entrepreneurs have been variously described as "those people who bring to social problems the same entrepreneurship and imagination that business entrepreneurs bring to wealth creation (Blair, 1997). They initiate social innovation and change

(Drucker, 1999; Leadbeater, 1997), motivated by the opportunity to adopt an innovative approach and creative use of resources and relations to satisfy needs which the state welfare system cannot or will not meet (Thompson et al., 2000). Other scholars have sought to identify common characteristics to social entrepreneurs (Leadbeater, 1997; Leadbeater and Goss, 1998; Prabhu, 1999; Thake and Zadek, 1997; Thompson et al., 2000).

What really matters about SEs is how the profit earned is reinvested and who benefits from it.

Indeed, what distinguishes social enterprises from traditional businesses is the fact that the social impact is considered more important than profit maximization. In particular, it is important to understand the impact that a social enterprise has on society and who benefits from its business.

The definition of SE can vary according to different countries and contexts (Spear et al., 2009). In the UK, the SE is “a business with primarily social objectives whose surpluses are principally reinvested for that purpose or the community, rather than being driven by the need to maximize profit for shareholders and owners” (UK Cabinet Office, 2006).

In Italy the Social Enterprise is a “a qualification, not a form of company; it can be acquired by all those private organizations, no-profit, that operate in a stable and principal way, an economic and organized activity, in order to produce and/or deliver goods and/or services of a social utility, aimed to serve a general interest (D.Lgs. 155/2006).

According to OECD (1999) SE is a “private activity conducted in the public interest, organized with an entrepreneurial strategy but whose main purpose is not the maximization of profit but the attainment of certain economic and social goals”.

Yunus argues that “SE is a cause-driven business and the social business investors/owners can gradually recoup the money in-vested, but cannot take any dividend beyond that point [...]. The purpose of the investment must be merely to achieve one or more social objectives through the operation of the company, no personal gain is desired by the investors. The company must cover all costs and make profit, at the same time achieve the social objective, such as, healthcare for the poor, housing for the poor, financial services for the poor, nutrition for malnourished children, providing safe drinking water, introducing renewable energy, etc. in a business way” (Yunus M. , 2007).

Social enterprise has a peculiarity in comparison with other subjects operating in the third sector: the continuous search of a synthesis between the social service/assistance to deprived persons, and the capability to produce revenues with respect to explicit and implicit rules of the Third sector's market frame (Fiorentini, 2006).

From the different definitions the literature provide, it is possible to point out some agreed features of the SE's business model:

- the aim of creating and delivering social values, opposed to the business aim of profit maximization for the owners;
- the need to adopt a multi-stakeholder approach, and consider a wide range of target stakeholders, both internal and external;
- the basic importance of monitoring and evaluating impacts on the society, not just the results on the user;
- the need of a synergic and integrated management approach, able to balance different value creation target needs;
- the need of generate sales - as of a for-profit enterprise - and manage to cover costs, in particular the cost of work;
- the strategic importance of generating a surplus, over the cost covering, in order to reinvest in innovation of: technologies, knowledge, physical infrastructures;
- the explicit and recognised importance of stakeholders' contribution to the SE's performance; they influences each other according to a reinforcing loop: the more the SE increases performances, the more the stakeholders contribute and facilitate it.

2.2 The Business nature of the Social Enterprise and its Management model

The SE's management model can be defined as hybrid. This definition is well represented by Dawans et al. (2012), that define a social enterprise as “a business venture created for a social purpose, mitigating or reducing a social problem or a market failure, and to generate social value while operating with financial discipline, innovation and determination of a private sector business”.

SE differs from traditional for profit oriented, because, even in the variety of legal formats determined by the different national laws, they keep in common the principles of pursuing business strategies and solutions in order to achieve social aims, and to reinvest the surplus for community benefit (Haugh, 2006).

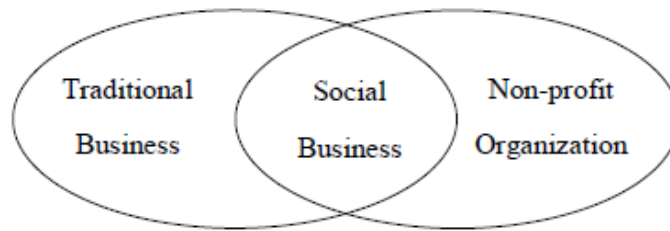


Fig. 1 - The hybrid nature of Social Enterprise (ISE, 2011)

Social entrepreneur has been defined as who “builds strong and sustainable organizations, which are either set up as not-for-profits or companies” (Schwab Foundation, 2009).

The debate about different SEs typologies is even large, but can be effectively summarized according to Stalder's '*SE's Business models typologies*'.

Source	SE Business models
Alter, 2006	Mission centric, Mission related, Unrelated to mission
Elkington and Hartigan, 2008	Leveraged non-profit business model, Hybrid non-profit business model, Social business model
Dees et al., 2001	Purely philanthropic, Mixed, Purely commercial
Global Entrepreneurship Monitor, 2009	Traditional NGO, Not-for-profit, Hybrid, For-profit

Tab.1 - SE's Business models typologies (Stalder, 2010)

According to Dees an important prospectus comes from Alter (2006) that synthesizes in the 'Hybrid Spectrum of enterprises' the differences among enterprises and their management model structure an settings, distinguishing: pure non-profit with social value creation commitment, non-profit with income generating activities, Social enterprises, socially responsible business, corporation practicing social responsibility, for profit with no commitment to social value creation.

Dees et al. 2001, propose an interesting comparison of SE's business models identifying dimensions and settings.

	Purely Philanthropic	Hybrids	Purely Commercial
Organization	Nonprofit organization (e.g. foundation, NGO)	Social Business (e.g. social venture)	For-profit Corporation (e.g. corporate philanthropy)
Methods, Goals and General Motives	Mission-driven	Balance of mission and market	Market-driven
	Appeal to goodwill	Mixed motive	Appeal to self-interest
	Social value creation	Social and economic value	Economic value creation
Destination of income/profit	Directed toward mission activities of nonprofit organization	Reinvested in mission activities or operational expenses and/or business growth	Distributed to shareholders and owners
Key Stakeholders			
Beneficiaries	Pay nothing	Subsidized rates and/or mix of full payers and those who pay nothing	Pay full market rates
Capital	Donations and grants	Below-market capital and/or mix of full payers and those who pay nothing	Market rate capital
Workforce	Volunteers	Below-market wages and/or mix of full payers and fully paid staff	Market rate compensation
Suppliers	Make in-kind donations	Special discounts and/or mix of in-kind and full price	Charge market prices

Tab. 2 - SEs' Business models: a comparison (Dees et al., 2001)

As first important dimension of SE's business model it is important to highlight the multi-stakeholder nature. It is very important to consider the role and the stakeholder target, since it is a group or an individual that can influence, or be influenced from, the achievement of enterprise's goals (Freeman 1963). The tight and circular interaction between stakeholder's interests and enterprise's business performance becomes even more clear in a turbulent and global environment, where stakeholders can joint in groups and increase their power, can use the information technologies and its communication pervasiveness to support or obstacle enterprises' goal achievement. Enterprises should then consider stakeholders as strategic factors of companies competitiveness, and operate a stakeholder based management model.

Stakeholders, indeed, driven by their personal goals participate to the enterprise, so they depend from it, and the enterprise's health depends from them (Ahlstedt e Jahnukainen, 1971; Freeman, 1984; Cornell e Shapiro, 1987; Hill e Jones, 1992, Brenner, 1993).

Different classifications of stakeholders can be found in the literature. Freeman and Reed (1983) grouped the stakeholders into primary and secondary. Primary stakeholders are those necessary for the survival of the enterprise: shareholders and investors, employees, customers, suppliers. Secondary stakeholders are instead those not involved in transactions and not necessary for the survival enterprise, but anyway able to move the public opinion in support or against enterprise's performance: media, communities, administrations.

Another shared classification proposed by the literature is the one that recognizes internal and external stakeholder, depending on the involvement in the enterprise's activities.

Preston supports the thesis that "the four key stakeholders of any enterprise sorted by importance are: customers, employees, community, shareholders" (Preston, 1990), that is arguing that if the right needs and interests of the first three groups are satisfied with efficacy, the shareholders take a great advantage. Profit is a byproduct of the ability in satisfying with responsibility the right needs and expectations of primary stakeholders.

A multi-stakeholder approach to the management of any enterprise is a key element in order to plan and control enterprise's goal achievement; it allows to manage the enterprise taking the higher contributions from stakeholders, or reducing their opposition, to a company's goal. It is then important the role they have in the management model and the set of dimensions, in order to consider even more stakeholders as "participants to a process of sustainable and shared value creation" (Freeman, 1984).

3 The Case study

An enterprise's management model needs to consider different stakeholders, needs to render explicit the cause-effect dynamics of value creation indicators, and finally needs to stress the setting enabling value creation sustainability. A group of scholars argue that enterprises embodying those principles in the management model are more performing in conventional performance (profits, sustainability, growth) than others.

3.1 Methodology and research design

In order to explore how the management model structure and setting can enable a sustainable value creation a case study research has been designed.

The SE has been identified as a holder of the business and management characteristics more stressful for the study. SE competes like a business company on the market but needs to comply with non-profit economic constraints and the collective interest. Given the multi-stakeholder nature, and its dependency with SE's operative performances and sustainability, the research population has been pointed to the SEs.

On the basis of the identified population, a list of potential SEs has been defined according to theoretical motivations (Glaser e Strauss, 1967). The SEs we listed represented a polar type, that is an extreme situations in which the phenomenon of interest is transparently observable (Pettigrew, 1988).

A letter of invitation to contribute to the research has been sent to listed SEs, and then the most significant one 'Istituto dei Ciechi di Milano', among three respondents, has been chosen. A plan of open and semi-structured interviews with the Director took place, and the results organized in tables.

3.2 L'Istituto dei Ciechi di Milano

The Istituto dei Ciechi di Milano (hereinafter reported as 'Istituto') provides training, supporting services, work opportunities for blinds and visually impaired people.

The Istituto was founded in Milan by Michele Barozzi in 1840. Along almost 2 centuries the Istituto renovated physical structures, services, technologies and knowledge, making of sustainable value creation for users and communities its distinguishing factor.

Significant milestones of the Istituto's life are:

- 1868 - Istituto gains the title of Moral Authority with Italian Royal Decree as 3rd oldest italian institute for the blinds;
- 1869 - A kindergarten is built for the accommodation of blind students and a laboratory were established.
- 1925 - A 'Home for blind women' was set up with the purpose of facilitating job opportunities;
- 1926 -Istituto is recognized as a collective-society service provider, and a Royal Decree subsidies it, over the charity donations.
- 1950s - Public subsidies are cancelled; the Istituto's board starts up entrepreneurial initiatives to collect financial returns. A consulting service and a “Tiflopedagogica”

(pedagogy for visual impairment) research centre are set; in few years the Istituto becomes a European leader in consultancy and research.

- 1993 - A radical innovations plan involving information technologies, research in pedagogy for visually impaired, location and spaces logistics, teachers training, start;
- 2006 - Istituto starts developing and organizing social events, exhibits and shows, related to the 'world of blindness', making the event organization and the fundraising fundamental source of incomes. An Historical Museum "Luis Braille" is set, and the cultural and artistic heritage belonging to the Istituto (paintings, sculptures, musical instruments) is installed as a permanent exhibit; a library, an historical archive, and a photographic one are also set and available for the community;
- 2007 - The Istituto's building, located in the Milan city centre, is renovated and provided with areas dedicated to concerts. A new stream of business services starts up: location for events. Besides, a grant for journalists and the magazines that better promote the cause of blinds and visually impaired is launched.

4. Management dimensions and settings enabling sustainable value creation.

The Istituto's model.

The data collection has been organized in a double round interview. The first round, according to the administration of an open interview to the Istituto's Director, has addressed the structural dimensions and the purposes of the management model.

The second round of interviews, still administered to the Director, has addressed the settings of the management dimensions, according to Istituto's value creation targets.

The Istituto's management model. The management model is not explicit. It is encrypted in the director's management routines; it also doesn't conform to explicit models known in the management literature, like Balanced Scorecard, or Performance Prism. The purpose of the model is to support a multi-stakeholder management approach, and secure planning and control of activities addressing value creation. A rationalization of the Istituto's management model allowed to identify the following structural dimensions:

- value creation targets,
- value creation drivers,
- management dimensions.

The Istituto's management settings. After having defined the structural dimensions of Istituto's management model, a second round of interviews took place. According to the management structure the list of key stakeholders representing targets for the Istituto has been set under Value creation targets. A value driver depending on the target stakeholders is the dimension to be set in order to plan proper management targets.

Finally three management variables have been set out by the Istituto's Director in order to plan and control process/activities: compliance to social and ethical values, service and process performance, knowledge and growth of persons. A qualitative assessment of impact correlation between management dimensions and value creation has been drawn through a qualitative scale grading: strongly, moderately, weakly. Istituto's Director evaluated how impacting have been, on the basis of recent decades enterprise's observations, the management dimensions on the value creation; in this way it is captured and exploited the setting of management model dimensions, enabling Istituto's value creation dynamics.

Value creation		Management dimensions		
Targets	Drivers	Compliance	Performance	Knowledge
Blinds and visually impaired (users)	Service effectiveness	●	●	○
User's families	Support	○	●	○
Employees	Salary and satisfaction	●	○	●
Community	Reputation	●	○	○
Suppliers	Quality/Price	○	●	○
Milan's Public Admin. (City house, etc.)	Service efficiency	●	●	○
Media	Public awareness	○	○	●

● strongly ○ moderately ○ weakly

Tab.3 - Istituto's Management model: structure and settings.

4. Final remarks and Conclusions.

Sustainable value creation becomes even more important for enterprises, as the competitiveness becomes turbulent and higher.

The SE represents a model of enterprise characterized by the absence of profits and the aim of providing services or products of a collective and common interest. These

characteristics of the SE's model distinguishes it in terms of value creation and sustainability. Its management model structure and settings appear to be particularly enabling the value creation, due to a cyclical support between stakeholders' value and stakeholders' contribution; the last results in a support to the enterprise's performances. The case study reveals useful insight to for-profit companies management, addressing some issue about the management model: reconsider the value creation targets and the stakeholders, review the impact they have on the value creation and on its sustainability, set the management dimensions and proper indicators.

Particularly important is also the cross dimensional interaction among management model's dimensions, and the advantage coming from an integrated management across them. According to Monks and Minow (1995) "the relationship among various participants in determining the direction and the performances of corporations" is crucial in the management of an enterprise. This highlights that the factors impacting on enterprise's performances are not based in the company but even more outside. The Management model needs then to be enlarged and approached to a governance model.

Governance has, intact, elements of stakeholder management (Kooiman, 1993) because it involves multiple stakeholders that are interested in specific tasks (Kooiman, 1993; Beritelli et al., 2007; Kjaer, 2004).

Governance does not involve a given hierarchy and a self-evident leadership so it involves less predictability and government control (Breda, Costa and Costa, 2006) compared to the government that often may oversee tasks that have to be completed (Mhone and Edigheji, 2003; Newman, 2001; Kjaer, 2004).

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Open innovation for sustainable city transport: organizational structure and skills

Attias-Delattre Véronique *

Department of Management
University of Paris Est Marne la Vallée (UPEM)
University Address : Bât. BDE – Rue Gallilée – 77420 Champs-sur-
Marne - France

Mitkova Liliana

Labolatory IRG – University paris Est
University of Paris Est Marne la Vallée (UPEM)
University Address : Bât. BDE – Rue Gallilée
77420 Champs-sur-Marne - France

** Corresponding author*

Abstract

The proposed article aims to show which aspects of organizational skills contribute to successfully maintaining an open innovation model. Open innovation is a global approach to innovation management analysed from different angles, such as the strategic, technological, human, and market aspects. Although various research trends have contributed to understanding open innovation, a key element is missing from the debate: the role-played by organizational arrangements and skills in implementing open innovation. The purpose of this paper is therefore to fill this blank area in research on open innovation by addressing the following research question: What organizational framework should be put in place to develop organizational skills for open innovation? Our approach is based on a case of inbound open innovation concerning the improvement of an urban transport system, led by a French high-tech group with an active open innovation policy.

Key words: open innovation, organizational arrangements, organizational skills

Paper type: Academic research paper

1 Introduction

In an environment of global competition based on new ideas, shorter product life cycles and market uncertainty, a company's capacity to innovate is viewed as a source of sustainable competitive advantage. In this context, the innovation model is evolving so as to adapt to the rapid diffusion of knowledge. Rothwell (1994) identifies five generations of innovation since Schumpeter's linear process, from the chains that link markets and inventions (Kline and Rosenberg, 1986) to extensive networking. In 2003, Chesbrough (2003) introduced the concept of open innovation – which offers an alternative to the closed innovation model centred on in-house research results that are very expensive and long to obtain – in the form of an open model based on both internal and external knowledge sources. Unlike the closed model, which assumes in-house Research and Development (R&D) and targets traditional markets, open innovation puts the emphasis on outside relationships to acquire and/or develop inventions. Academic work done on open innovation denotes on the one hand, the use of external and internal knowledge sources to accelerate internal innovation, and on the other hand, the use of external paths to markets for internal knowledge (Chesbrough, 2003, 2006a). In other words, this open model puts forward two complementary aspects (Chiaroni *et al.*, 2010). The first of these is inbound open innovation, which is based on establishing relationships with external organizations or individuals with the purpose of accessing their technical and scientific skills for improving internal innovation performance. Specifically, inbound open innovation involves inward technological transfer, including the practice of leveraging other people's ideas and actively collaborating in research activity organizations with the purpose of commercially exploiting technological knowledge. The second aspect is outbound open innovation, which is the practice of establishing relationships with external organizations because firms rely on other sources in addition to their internal R&D (Chesbrough and Crowther, 2006).

Opening up the innovation process towards the outside involves intensive collaboration between people with skills and experience in different institutions, departments and technological domains. Numerous interactions provide an opportunity to acquire new technologies, establish rewarding partnerships and react faster to the market. To adapt to this opening up, firms focus on their core skills and on attaining complementary capabilities (Hagel and Brown, 2005). Recent work by Wallin and von

Krogh (2010) puts the accent on integrating knowledge into the organization of open innovation. This approach also involves analyzing the individual skills and knowledge of open team members (Leiponen, 2005). The issue of how to organize knowledge and skills as a driving force in open innovation management has rarely been tackled in published research. Yet the identification of these skills, their integration into organizational structures and their development are key to implementing an open innovation model. We therefore analyze the organizational skills shaped by long-term organizational structures necessary for integrating external sources into open innovation processes.

For companies, the transition towards an open model involves identifying its organizational skills supported by specific organizational structures (Charoni *et al.*, 2010; Chesbrough, 2003; Deck, 2008). Christensen (2006) points out that, “open innovation can be considered an organizational innovation”. Recent studies have shown the importance of organizational support in creating new partnerships, routines and skills matrices to move towards a process of open innovation (Marshak, 1993; Chesbrough, 2006b). They offer a general overview of the organizational structures for open innovation without a deeper understanding of organizational mechanisms for implementing open innovation. Despite the attention it has attracted, there are still unanswered questions regarding the ideal organizational set-ups for an open process, in particular in the case of inbound activities. This article takes up this recognition of the role of organizational methods in structuring new organizational skills for successfully managing inbound open innovation. Concretely, this involves illustrating to what extent the development of organizational skills is based on establishing a specific organizational framework in order to make inward collaborations and transfers. This research focuses on the case of a major French group with intense R&D activity *in the sustainable urban transport* based on an inbound open innovation model.

The first part presents the framework of our analysis on organizational arrangements and the issues of organizational skills in an open innovation model. The second part focuses respectively on the methodology and the results of this research.

2 Open innovation: analysis of organizational arrangements and skills

The objectives of this part are to analyze studies of organizational arrangements specifically aimed at open innovation (2.1) and then define the characteristics of

organizational skills for this model (2.2). This will enable us to highlight the connections between these notions and build up our theoretical framework for analysis.

2.1 Organizational arrangements to manage open innovation

The relationship between organizational arrangements and innovation has been the focus of numerous studies. The outcome of an innovation process is defined by the characteristics of the organizational set-ups, which have been recognized as crucial (Drucker, 2007). According to Menguc and Auh (2009) the organizational arrangements adopted by firms influence the development and carrying out of innovation. Christensen (2006, p. 35) remarks that, “open innovation can be considered an organizational innovation”. However, apart from the work done by Chesbrough (2003), little research has been undertaken to understand organizational structures for open innovation. Nevertheless, changes in organizational arrangements are crucial to opening up the innovation process (Naqshbandi and Kaur 2011). In particular, the organizational structure lever is considered as the starting point for the process of implementing open innovation (Chiaroni *et al.* 2010). Establishing new organizational set-ups also makes it easier to collaborate on research and integrate external knowledge and technologies, which are more complex than for products and services (Lichtenthaler and Ernst 2006). In the same vein, Hansen and Nohria (2004), emphasize that effectively managing externally acquired knowledge requires the development of complementary internal organizational systems focused on accessing knowledge and integrating it into the firm’s innovation processes. In this section, we describe the reference framework that was used as a guide to gather and interpret the empirical data collected through the case study. This framework was developed by looking into organizational set-ups, in particular those that combine exploration and exploitation in the innovation process (Ferrary, 2011; Verona and Ravasi, 2003), and into the rare research dedicated to the organizational characteristics of the open innovation model.

Ambidextrousness and open innovation

Studies on innovation look at the structures that make it possible to combine two complementary approaches: exploitation innovation, which mobilizes existing knowledge in the company to rapidly respond to the market, and exploration innovation, which involves significant renewal of knowledge (Raisch and Birkinshaw, 2008; March, 1991).

In practice, the firm is supposed to gain a sustainable competitive advantage through striking an efficient balance between exploration and exploitation (Andriopoulos and Lewis, 2009) and efficiently exploiting the disruptive innovations generated by exploration (Benner and Tushman, 2003; McNamara and Baden-Fuller, 1999; O'Reilly and Tushman, 2004). Published studies propose different configurations for ambidextrous organization, which is defined as an organization's ability to reconcile explorative and exploitative activities simultaneously (Tushman et al. 2002). While Benner and Tushman (2003) promote ambidextrous organizations with separate structures (usually a central research laboratory for exploration innovation and operational departments working on exploitation innovation), other studies propose more complex organizational forms that favour the transfer and reconfiguration of skills (Verona and Ravasi, 2003; Foss, 2003). These outfits have been qualified as "hybrid" (Foss, 2003), "flexible forms" (Volderba, 1996), "semi-structures" (Brown and Eisenhardt, 1997) and "dynamic communities" (Galunic and Eisenhardt, 2001). Research done by Ferrary (2011) shows that in open innovation, companies combine exploitation and exploration in ambidextrous structures with highly specific characteristics (Chanal and Mothe, 2005):

- Organizational flexibility, which is the capacity to modify structures, decision-making circuits and communication in the face of change;
- Extensive communication, which offers stakeholders a great deal of freedom to improvise within innovating projects;
- Creation of a scientific expertise network within the research centre targeting external cooperation to acquire and commercialize knowledge.

However, these ambidextrous structures do not explicitly correspond to an open model, which puts the accent on interactions with the external environment and collaboration between external and internal stakeholders. Recent management studies have thus looked at the specific features of organizational set-ups that make these connections feasible.

Organizational characteristics of open innovation

Beyond the issue of organizational ambidexterity, studies done by Chesbrough (2003) underline how modifications in organizational support allow the process to be opened towards the outside. In fact, in open innovation processes, organizational boundaries become porous as a result of the firm's close interaction with different actors

in their environment (universities, research labs, customers, exhibitions, venture capital firms, etc.) (Chesbrough, 2003, van de Vrande, 2010). This opening out of the innovation process thus requires setting up organizational arrangements that encourage external collaboration and the construction of new internal skills. Specific organizational characteristics for this model can be identified in academic work:

- Top management plays a significant role in setting up organizational changes (Chiaroni *et al.*, 2010); in the same vein, the cohesion and strategic alignment of the firm's various functions play a key role in establishing successful open innovation (Naqshbandi and Kaur, 2011);
- Specific structures and measures are created to promote the opening-up of the innovation model (Chesbrough and Crowther, 2006);
- Independent "open innovation" business units are set up (Kirschbaum, 2005) with dedicated cross-functional teams (Huston and Sakkab, 2006) or independent R&D units devoted to open projects (Chiaroni *et al.* 2010). The cross-functional interface is important with "non-routine and reciprocal information processing systems";
- Organizational roles are defined, e.g. gatekeepers who manage the interface between the firm and its external environment (Tushman, 1997);
- A network of partners is put in place during the initial phases of the innovation process, encouraging the acquisition of external knowledge (Perkmann and Walsh, 2007);
- A firm-level inter-organizational network is established by leveraging R&D managers' personal social networks. These networks are mainly explorative to probe new areas of knowledge that are different from those that they traditionally master (Chiaroni *et al.* 2010);
- Formalized processes for evaluating external knowledge are put in place to complement the existing explorative network. In this evaluation process, an important role is played by the IP Office, which defines mechanisms for facilitating knowledge transfer and protecting companies from opportunistic behaviour (Chesbrough 2006b).

Coordinating and centralizing activities are also crucial to operating an open model. Mortara and Minshall (2011) point out that multiple options exist to coordinate the two extreme approaches, centralized and decentralized. According to Tripak *et al.* (2006)

the major strong point of centralized R&D is that it encourages risk-taking and long-term thinking, while decentralized R&D primarily encourages aligning projects, business needs and shortening the time to market. An alternative is a hybrid structure, which gives business units the capacity to handle incremental innovation for current products and may exceed the resources of a central R&D department, but with less efficiency than other structures. Research does not clearly show whether an autonomous structure or a centralized structure is best suited to open innovation (Linton, 2002).

Along the same lines, Charoni *et al.* (2010) highlight the importance of routines and procedures in the adoption and success of open innovation. This involves the formalization of structures, defined as a form of control employed by bureaucratic organizations, or in other words, the degree to which a codified body of rules, procedures or behaviour prescriptions is developed to handle decisions and work processing (Naqshbandi and Kaur, 2011). Formally structured organizations are characterized by institutionalized rules, policies and routines, difficult cross-function integration, and reduced spontaneity and flexibility in operations, leading to behaviour programming and strict rule enforcement (Chen and Huang, 2007). In contrast, an informal organizational structure is characterized by openness in the system, which is a necessary precondition for initiating ideas in the innovation process (Naqshbandi and Kaur, 2011). According to Damanpour (1987), high formalization makes administrative innovation easier, while low formalization facilitates the adoption of technical innovations. Firms employ both formal and informal coordination. Nevertheless, Naqshbandi and Kaur (2011) show that published studies imply that open innovation tends to be favoured by informal, rather than formal, organizational structures.

These characteristics relate to the strategic and operational levels of open model management. Our research aims to identify the organizational arrangements that promote dynamic connections between these two levels and help the construction of organizational skills.

2.2 Open innovation: identifying organizational skills

The previous section highlighted the characteristics of organizational arrangements that foster the operation of an open model. To open up the black box of open innovation, in this section we analyze the issues of organizational skills that enable this model to take shape in the long term. In this sense, open innovation is not a one-off

event between closed innovations, but rather a continuous, complex process in the organization. We therefore consider a continuous trajectory of innovation, whereby strategy and structure exist before individuals commence an innovation activity, so that they can take on the firm's strategic orientations as their operational activities progress (Drucker, 1993, Reich, 1991). This leads us to consider that an analysis of the open innovation process is based on strategic orientations supported by a specific structure and operational activities taken on by stakeholders who may or may not be from the organization. Structure, strategy and organizational activities thus contribute to building up organizational skills. Therefore, in order to understand organizational skills in the case of open innovation, we analyze them taking three approaches. Firstly, this involves looking at the issues of management through skills (in human resources management) in which the analysis of organizational skills is based on individual and collective skills borne by individuals or teams possessing knowledge. Secondly, the strategic approach shows us how the structure encourages the creation and integration of knowledge, formalized into organizational and collective skills. Lastly, we take a third approach to show how we can use the analysis of organizational arrangements and knowledge to shed light on another facet of organizational skills, i.e. the connections between on the one hand strategy and organizational structure, and on the other hand between the different levels of skills, including collective, individual and environmental skills.

The HRM approach: skills-based management

Research on Human Resources Management (HRM) analyzes the connections between four levels of skills: individual, collective, organizational and environmental skills¹. The notion of skill is understood here as “the capacity of an individual, a working group or a company to mobilize resources (knowledge, know-how and behaviour” (Aldebert and Loufrani-Fedida, 2013, p. 57). In the innovation domain, this definition is aimed at mapping skills and explaining their dynamics. HRM therefore assumes that human resources and skills are key factors in innovation (Purcell, 1999; Lepak and Snell, 1999). Nevertheless, this approach is focused on managing individuals, e.g. knowledge workers (Drucker, 1993, 1999) and their skills, perceived as human capital (Aliouat and Nekka, 2000). In other words, these workers' individual skills lend them a strategic

¹ *The notion of environmental competence has rarely been studied in HRM; it mainly concerns external knowledge outside the company's control.*

power. On an operational level, management developed on the basis of skills and its strategic target are thus centred on the specific management of individuals in order to keep them in the organization (Blackler, 1995; Reed, 1996; Scarbrough, 1999).

Beyond these different issues, HRM studies put forward two approaches for skills-based management, one of which is bottom-up and the other top-down. The first bottom-up approach is based on analyzing the aggregation of individual skills: from the work situation (individual or professional skills) to the combination of these individual skills in a work collective (collective skill) (Bataille, 2001; Retour and Krohmer, 2006). The challenge comes at operational level, and relates to the capacity of a collective to resolve common and/or pooled operational problems. This analysis is necessarily limited by the fact that collective skills are presented as the sum of individual skills, whereas an analysis should look at the outcome of cooperation between stakeholders in order to build up knowledge. However, the human dimension of collective skills is difficult to apprehend because it is made up of knowledge that individuals and the group does not totally master. In fact, it is not possible to ascertain how much knowledge a group has invented. In our research, we therefore consider that collective skills are fuelled by knowledge possessed by an individual and a group of individuals, by knowledge and know-how aimed at building up shared representations, and knowledge-understanding resulting from exchanges between individuals using a shared and formalized language (Retour, 2005).

The second, top-down, approach centres on identifying the operational organizational set-ups (e.g. project teams) through which collective knowledge develops; these are thus formalized into collective skills (Attias-Delattre, 2011). The latter result from a combination of internal and external individual skills gathering into organizational coordination modalities those create formal and informal interactions. It is at this point that we make our analysis of organizational skills, based on coordination, routine and shared language.

Thus, HRM approaches emphasize collective skills. In the bottom-up approach, the managerial challenge centres on individuals possessing key or rare skills, and in the top-down approach it involves teams possessing resources that are mapped. Despite the dearth of studies on organizational and environmental skills in HRM, it is worth noting that in both approaches the characteristics of these skills partially overlap those of knowledge. Indeed, if the extent of knowledge is broader than skills, then managing skills

will involve optimizing resources (Dietrich *et al.*, 2010; Aldebert and Loufrani-Fedida, 2013).

The strategic approach of organizational skills

The strategic approach, the resource-based model, aims to identify what “a company can do” (Barney, 1991; Grant, 1991) in order to create value by drawing on skills, knowledge and organizational structures. This approach allows us to analyze how an organization creates and integrates internal or external knowledge and implements (applies) them within a formal and informal organizational framework (Rindova and Kotha, 2001, Montealegre, 2002). In this sense, organizational skills (although neither visible nor observable) are common practice and part of formal coordination modalities (like structure) and informal ones (like interpersonal exchanges). Organizational skills emerge from processes to develop collective skills and organizational set-ups: the capacity of a collective of individuals at work to constantly invent innovations beyond the organizational supports that structure it.

With this approach, organizational skills can also integrate environmental skills, which correspond to an organization’s capacity to mobilize knowledge in its environment (stakeholders outside the company like research laboratories, suppliers and clients) that *are beyond its control*. Thus, this collective expertise and knowledge is implemented and developed by organizational structures in order to be formalized into organizational skills.

This approach takes us back to the connection between skills and knowledge. Although skills and knowledge are often linked, the two notions do not involve the same challenges. Knowledge is the result of a managerial action that aims to produce skills that can be identified and evaluated. When the aim is mapping (e.g. skills inventory) and evaluating, it is thus a team’s skills and incompetencies that are described. Yet in an innovation process, the major focus is on existing knowledge and knowledge gaps. Even if an analysis of skill characteristics does not aim to evaluate a research team’s lack of competencies, it should nevertheless point to the evaluation of a lack of knowledge in its members. It is this last challenge that an open innovation skills analysis should take into account.

The approach of organizational skills through knowledge

This organizational skills approach in open innovation connects a strategy,

developed in an outfit, with operational activities, formalized into collective skills². Concerning the second aspect, it is the analysis of knowledge that allows us to understand the dynamics of skills in this linear logic made up of key skills, organizational skills, collective and individual skills.

In order to characterize organizational skills, Blacker (1995) puts forward a typology of organizational knowledge according to where it occurs: in individuals and routines (which he calls *embodied* and *embedded*) and in brains, dialogue and symbols (*embrained*, *encultured* and *encoded*). The main contribution of this analysis is to shed light on the dynamics of knowledge. This is not only individual, collective or structural: it takes the form of “communication-intensive organizations” (Attias-Delattre, 2011b), i.e. based on communication and collaboration in the key process. These elements are present in research done by Grant (1996) and Wallin & von Krogh (2010) on knowledge analysis. Their studies help us to understand the dynamics of organizational skills at different levels (organizational, collective and operational) using the following:

- Rules and directives: the capacity to regenerate

“Rules may be viewed as standards which regulate the interactions between individuals” (Grant, 1996, p. 114). In this approach, knowledge analysis is rooted in both the accumulation of knowledge and in the organizational capacity to formalize coordination processes. In an open innovation situation, formalizing these processes is not enough. This is because in an open model, it is not so much the knowledge mobilized that is essential, as the direction given to its mobilization. The rules and directives here represent a communicational meditation that makes innovation possible by furnishing it with organizational logistics. Thus, collective knowledge and skills are rooted in the organizational capacity to formalize common representations of a solution, i.e. whether or not to pursue an innovation project, whether to integrate different stakeholders in the process. The rules and directives mainly have a communications objective: “low cost method communicating”.

² *Organizational skills are analyzed for their capacity to overcome the limits of its members' way of thinking (Teece et al., 1994) through its organizational set-ups in order to integrate fragmented and individual knowledge (Grant, 1996). This integration leads to conceive the organization as a set of capabilities organized into a structure or architecture (Grant, 1996). However, the notions of structure and architecture do not only cover formal structure, they also encompass routines (forms, rules, norms, conventions [March, 1991]).*

- Sequencing

This involves emphasizing the stages of the innovation process. In an open innovation situation, we are as interested in the innovation as a result as we are in the action of innovating. Multidisciplinary teams with more or less defined objectives work together at every stage of the project. A representation of the innovation stages is functional by nature: it is broken down into the professions and implemented resources that allow skills to be produced with a view to performance. By placing ourselves in a temporal dimension, the gates of passage from one stage to another constitute the key elements of these stages for the teams.

- Informal routines

The construction of organizational skills is done within a decision-making group that “allows both a community of targets and a matching of action” (Savoyant, 1999). However, decision-making “is the result of a confrontation” (De Terssac and Chabaud, 1990) “of representations from the group’s members” (Troussier, 1990). Thus, informal routines are analyzed in the action of the decision-making process at collective and individual level; informal routines structure tacit knowledge while creating the group’s memory (Walsh and Ungson, 1991; Anand *et al.*, 1998; Ackerman and Halverson, 2004; Cardin, 1995; Weick, 2001; Chedotel and Pujol, 2009) through a “repertoire of responses” and a “grammar of action” (Habermas, 1986). Informal routines thus contribute to building a collective memory that is an essential lever to ensure the long life of an open model.

- Group problem-solving and decision-making

We have shown that in an open innovation situation, collective skills manifest themselves in the development of decision-making processes. At individual level, activating collective decision-making processes presupposes one condition: that group members acquire social skills (Cannon-Bowers *et al.*, 1995; du Chatenier *et al.*, 2010). These are the capacities for communication and negotiation implemented during interactions; they are specific to each situation encountered. These social skills are both inter-personal (e.g. being able to speak in public, able to listen, notice other people’s reactions) and organizational (e.g. draw up a road map, cooperate) (Stevens and Campion, 1994). In this sense, collective skills acquired during the decision-making process is an inter-communicational skill on the problem rather than a skill of a communicational character. Thus, a group discussion should not only serve to find a recognized technical

solution, it should also guarantee inter-communicational rules of communication (rules and directives, coordination modes, routines) in order *that everyone has an opportunity to contribute to finding* a legitimate solution.

In conclusion, our theoretical analysis of organizational skills has shown that previous research has mainly centred on mapping or photographing organizational skills (Danneels, 2002; Belderbos *et al.*, 2004; Trott, 2005; Adebart and Loufrani-Fedida, 2010). Yet in an open innovation process, organizational structures and skills are two facets of the same open innovation activity. In an open innovation situation, the outcome of these interactions is of a strategic, organizational and operational nature. This means that organizational skills only really make sense when analyzing the emergence and validation of new knowledge resulting from a strategy supported by the organizational structure. Consequently, our perspective on analyzing organizational skills considers innovative activities (individual and collective), their formal and informal structuring, their validation, and their integration.

In this first part, we have highlighted the contribution that published studies have made regarding organizational structures and organizational skills for an open innovation model. Despite the interest of these studies, some issues remain unanswered and have directly guided our research:

- Literature on organizing open innovation is centred on highlighting organizational characteristics in general. It gives little information on actual organizational support, which, at a more aggregated level, takes into account internal and external stakeholders' effective involvement in managing open innovation;
- Despite their variety, these organizational characteristics are never connected with developing organizational skills.

Thus, in our research, organizational structures and organizational skills are analyzed at each phase of the inbound open innovation process.

3 Empirical case study

3.1 Methodological approach

As we have just shown, existing studies have done very little to develop issues regarding organizational set-ups linked to building organizational skills in an open

innovation model, calling for a qualitative research based on a single case study. This research method seems particularly well suited to fully understanding a specific issue. The choice of a single case can be justified provided that it is “representative” or “typical” (Yin, 2003). This research uses the “qualitative case study” of a major French international group in the high-tech sector, over a period of four years. The goal was to analyze specific phenomena which have been little studied to date and which correspond to particularly innovative situations (David and Hatchuel, 2007). The case was selected for its very dynamic R&D strategy based exclusively on an inbound open innovation model for *sustainable urban transport*, as well as its activity in the highly innovative and competitive high-tech sector. The results draw from an analysis of data collected since 2008. Semi-formal interviews were regularly held with a technical department manager, the head of an R&D laboratory, the technical department’s external projects manager, and the group’s IP managers. The interview guidelines were produced by analyzing structural characteristics put forward in published works. The results of the interviews were validated by the interviewees. Secondary data (internal and external documentation) also corroborated the information obtained through the interviews.

Last but not least is the group’s ambition to set up multiple open innovation projects, in particular with an inbound approach. These open projects aim to develop technological solutions rather than final products; these solutions in fact take the form of fairly developed technological demonstrations that could be used by different partners in their programmes for developing totally distinct products. Inbound open projects rarely concern the development phases of a concrete product.

3.2. Results

This research points to two types of result. The first of these underlines the organizational arrangements established in a perspective of managing open innovation projects (3.2.1.). The second identifies the organizational skills implemented throughout the different stages of an inbound open innovation process (3.2.2).

3.2.1. Overview of organizational arrangements

The group studied builds up networks of external partnerships with different stakeholders depending on the type of project. This network can be used to choose a partner in line with a project’s strategic importance:

- “strategic” projects are established with special partners with long-standing relationships (3-4 years). The established trust makes it possible to set up a common laboratory within the project, make joint investments and physically exchange researchers between sites;

- “multi-stakeholder” projects result from European calls for tender. Their main objective is to develop collaboration with several stakeholders of different natures, i.e. research institutes, suppliers, clients and competitors. These relationships can then evolve to become a strategic project;

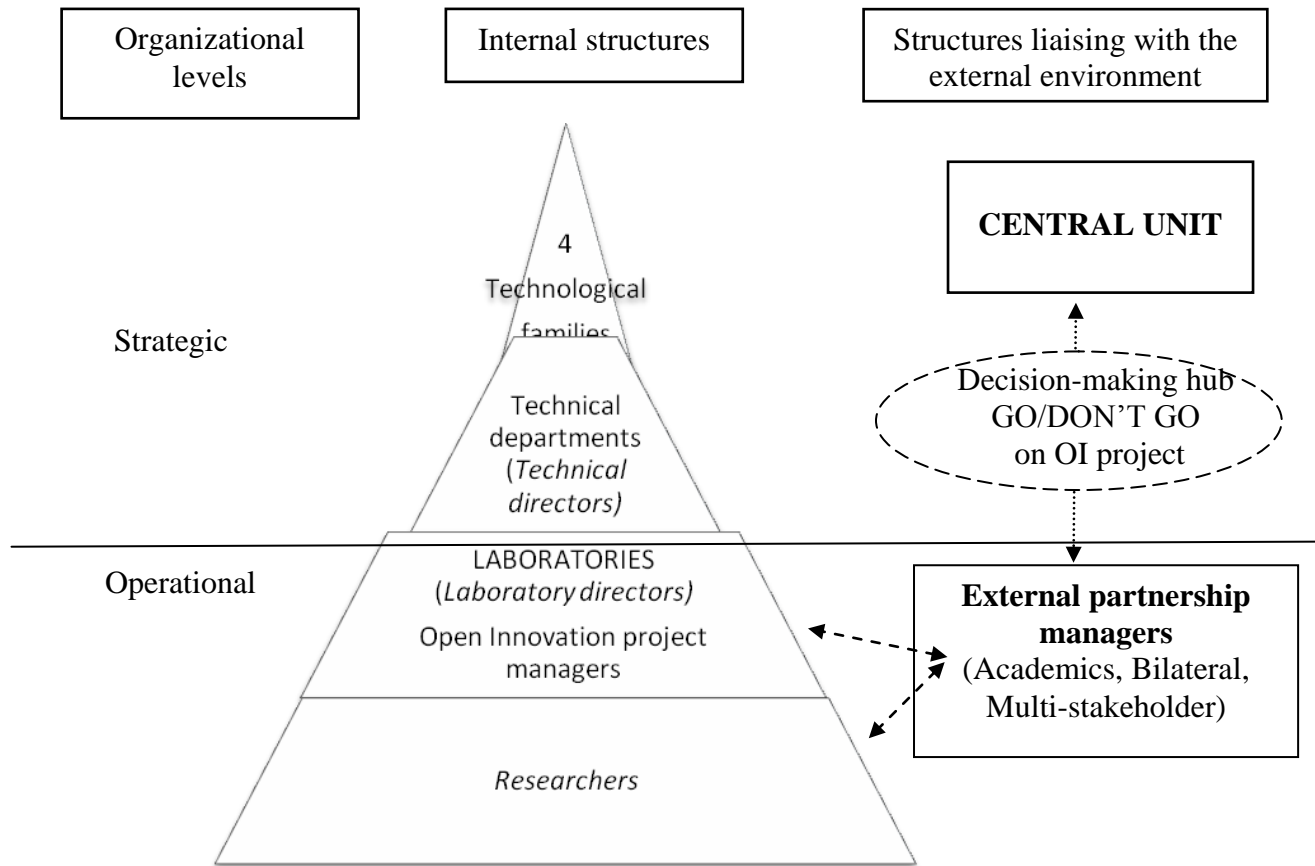
- “bilateral” projects are put together with external partners that possess specific technological skills. These partners can become special partners on a strategic project, depending on the quality of knowledge produced and the exchanges.

Thus, these different open projects can evolve in different directions: from a bilateral framework agreement into a strategic framework agreement, or a European call for tender into a bilateral project with a special partner. The creation of the network is supported by a specific organizational design applied at two levels: strategic and operational (Figure 1). For each of these levels, we will study the overall structure and the special organizational arrangements used for managing open projects.

- *Overall strategic structure*

On a strategic level, R&D management is organized by technological families that correspond to families of products. Currently, four technological families exist, each of which is managed by an R&D vice president who establishes the strategic priorities in terms of innovation. To support these families, technical divisions supervise research activities by the group’s main technical domains. Their mission is to coordinate the associated laboratory activities, mainly inbound and outbound open projects. This cross-cutting organization aims to coordinate strategic decisions between product families and technical divisions. On one side, annually, the board of directors and family vice-presidents define the axes and research objectives. On the other side, on an everyday level, they support projects put forward by the technical departments and ensure that their results are used in several families of products.

Figure 1 – Organizational design: strategic and operational level



- Specific strategic structures, centred on managing the interface with the external environment

Within the technical departments, a specific structure called the “central unit” is created solely to manage external relations. This unit coordinates all of the group’s open innovation projects with clearly defined missions. This starts with selecting propositions for open projects, studying how they connect with the general strategy, and validating the project’s content before it is put into operation by the research laboratory. Then, when the research activities take place in the laboratories, the unit monitors their progress and finally, checks whether the targets are achieved. To carry out these missions, the director of the unit works with several external partner managers (e.g. laboratory directors, project

managers and researchers). The latter are split into type of partnership, i.e. those with academic stakeholders, bilateral partnerships with companies (suppliers, clients or other external organizations), or multi-stakeholders involved in European calls for tender. These managers also handle all interactions with the external environment: from mapping out stakeholders to making external and internal contacts, and negotiating the signature of contracts. Once the framework agreement has been signed, the research laboratory is responsible for the operational implementation of open projects.

To sum up, the unit coordinates the strategic aspect of open innovation projects and does so following steps and procedures that are clearly defined for all families and technical departments, by:

- studying the benefits of the project in strategic, technological and financial terms;
- establishing consortiums with multiple partners (major companies, SMEs, universities and research centres, public organizations, etc.);
- signing standard framework agreements for calls for tender or specific framework agreements for bilateral projects.
- checking that results match the targets of open projects.

In addition, this central unit submits the projects to a cross-cutting decision-making committee comprising heads of technical departments, project and laboratory managers, and the unit manager. This committee positions the central unit's innovation proposition and validates the "open/or not" decision for the innovation project. Its objective is to decide whether the innovation project will be open or not, define the type of collaboration, the partners and the clauses of the contract. This decision is formalized by a specific procedure called the "*initial gate of passage*".

- *Overall operational structures*

Research laboratories manage the operational implementation of research projects. From an organizational point of view, the laboratory director works with the technical director of the department at a strategic level and with the person responsible for the product line at operational level. This open innovation process is supervised by a "project manager" who coordinates the activities of both internal researchers and external project participants. Each researcher is associated with a single laboratory. However, the cross-cutting structure means that she or he can also be part of open projects supervised by other technical departments. Thus, the group's cross-cutting approach, both strategic

and operational, encourages the development of researchers' individual skills as well as the creation of new collective skills within research teams.

- Specific operational structures for open projects

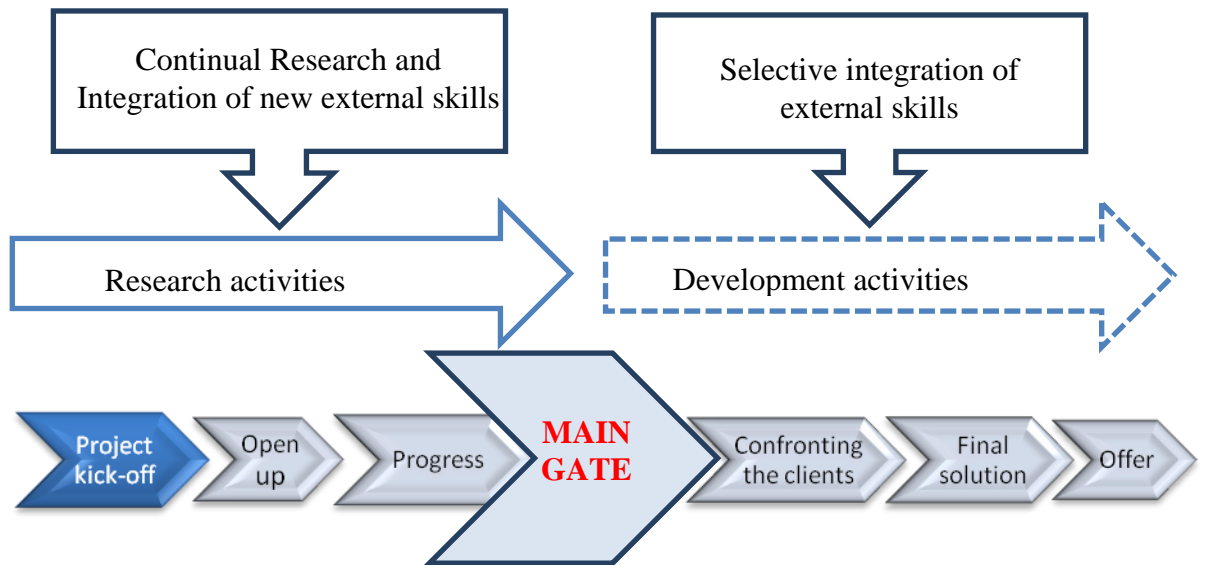
The most active research laboratories in terms of open projects delegate the supervision of these projects to an “external partnership manager” named within the laboratory. He or she acts as a middleman between the central unit and the open project manager. The project manager is responsible for the project's operational management, in particular exchanges with the outside and the progress of stages. However, the group's cross-cutting structure is not restricted to this activity: like the researchers, they can be associated with several types of project carried out in their laboratory and other technical departments. This cross-cutting nature consolidates the integration of specific skills and the creation of collective skills “tailored” to each project.

The analysis of general open innovation structures broken down to the strategic and operational levels needs to be completed by a detailed analysis of the steps of an open innovation project. This approach will give us a better understanding of the dynamics of the organizational skills used in a concrete research project.

3.2.2. *Open innovation process: sequential presentation*

Our research centres on analyzing organizational skills throughout the various stages of an open innovation project as they occur in the laboratory studied. Described sequentially (Figure 2), the process is structured into six steps around a “main gate” that marks the point between research activities mostly carried out in collaboration with external actors (upstream), and the development activities of these results, which mostly involve internal stakeholders (downstream).

Figure 2 - Phases of the innovation process



Phase 1: Project kick-off

The aim of this step is to validate whether or not to kick-off of a research project by answering a key question: “go or don’t go?” Individual projects can either be proposed by the laboratory director or the technical department director in a “technology push” approach, or by the product line manager in a “market pull” approach. The decision-making process is thus a joint one, and the people involved come from within the group, i.e. the technical department director, the laboratory directors, the project manager and the researchers. These different stakeholders bring the required expertise to accomplish the main activities of this step, which relate to technological monitoring, the definition of technological priorities, the study of the freedom to operate and legal protection. These operational activities are carried out drawing from internal knowledge and informal procedures. On the other hand, the final decision to go or not to go with the research project is a formal procedure and depends on the group’s strategic R&D objectives or future clients’ identified requirements. However, although coordination procedures during this step have been recently put in place in order to save communication costs, they are identical and standardized for both open innovation and closed projects.

Phase 2: Decision to open up a project to the outside

This is the open model's actual departure point, since this phase involves a decision on whether the research project will only be set up internally or whether it will open out to external stakeholders. The "open or close innovation process" decision involves the vice-presidents of the technological families, the laboratory director and the technical department director. Open innovation mainly involves high-tech projects for the future, which require pooling complex and varied knowledge. The decision depends on strategic and technological criteria as much as the market. In fact, the final decision is influenced upstream by specific operational activities, including finding and evaluating partners, how wide to open (i.e. national or international), the establishment of industrial property and the final framework agreement. These activities therefore depend on the knowledge of all internal stakeholders, on comparisons, and on communication-based mediation that makes it possible to decide to open up. As for the first step, the decision is formalized thanks to pre-defined rules for all technical departments. Thus, the process that leads to this choice depends on both pre-established rules and the creation of new organizational knowledge.

Phase 3: Establishment and progress of the open project

This stage involves the operational progress of the project, which can last 12 to 24 months. Collaboration with external stakeholders mainly takes place during this stage and follows few specific rules and procedures. This joint work between internal and external stakeholders calls for social skills, which are both inter-personal (e.g. ability to explain, be patient, understand, negotiate, work together, speak and understand different languages) and organizational (e.g. collaborate, draw up plans). These skills allow stakeholders to build up a common language together with a technological aim. However, throughout this stage, their activities are guided by targets set out in the framework agreement and by the production of formalized results that feed into the following stage.

Phase 4: "Main Gate" to development

The crucial point of an open innovation project is the "main gate", which opens out towards developing the technical solution. The decision-making procedure is collective, initiated by the research project manager. The final decision is made by the department's technical manager and the product line manager, who possess the technical,

industrial and commercial skills to validate the development of the project's future applications. The decision-making process is thus based on their individual and collective skills accumulated throughout the preceding steps of the project, and on the confrontation of their strategic and operational representations of the project.

They ultimately deliver a formal document setting out the technical parameters and possible applications as well as the industrial impact of the technological solution. This framework document is common to all of the technical departments, and sets out the essential criteria for making the decision. Thus, the passage through the "main gate", as for step 2, involves formal procedures, formalized documents, and clearly defined decision criteria. This is one of the two major decisions in an open innovation project. The first relates to the actual existence of the research project, the second finalizes the external collaboration.

In fact the first four phases, lasting three years on average, take place in an open model. They are followed by the industrial development phases, which are mainly carried out by the group's internal stakeholders. External stakeholders occasionally intervene in the following phases (e.g. phase 5) involving a final client or a special R&D partner.

Phase 5: Confronting the clients

The industrial development of each technological solution cannot be envisaged without adapting to the client's requirements. This stage therefore involves studying the concrete applications of the technological solution in connection with the external client so as to draw up a prototype. Frequently, the client is involved right from the second stage of the project as an external partner via its R&D department. At this stage, its engineering department is involved in defining the industrial applications. For the internal stakeholders, the decision is taken by the laboratory director, the technical department director and the product line manager. This decision-making process is based on "*the accumulation of past capabilities and common know-how in the collective memory*" (inside source) of internal and external stakeholders. This also helps reduce the communication costs in the development of the project. Although the writing of the call for tender and response to clients are both standardized, the preparatory work remains informal.

Phase 6: Final solution

This decision making involves improving the prototype using complementary technology so as to finalize the product for the client. This final solution is demonstrated to the external client as well as to different internal technological families in order to optimize the profitability of the open project. The product line manager and marketing manager decide on the final solution. In house, this involves organizing and structuring knowledge in order to adapt the solution to the demands of internal and external clients. During the negotiation with clients, the comparison of representations helps build up a common, specific language by using technological, commercial, inter-personal and negotiating skills.

Phase 7: Putting together the final product

The marketing manager and product manager supervise the final product’s actual specifications and its introduction into the group’s catalogue. The offer will be different depending on individual clients’ specific demands. This therefore requires a single connection between stakeholders possessing highly varied skills of a technical, commercial and legal nature. Although the framework of the final offer is standardized, it does allow some liberty in finalizing the content of the offer. This is a decision made entirely by the internal stakeholders.

The organizational arrangements established during the different phases of the project continue to exist independently of the individuals that comprise it. They have an in-house stability and the capacity to evolve in order to accompany the opening up of the innovation process. This means that internal and external knowledge can be organized and structured in a specific way when an individual open project is set up. The various aspects, shown in table 1 below, are taken up in the next part of our discussion.

Table 1: Organizational skills and stages of the open innovation process

Sequences	1 Initial Gate	2 Open up	3 Progress	4 Main gate
Stake -holders	- Technical department director - Laboratory director - Research OI Project	- Vice-presidents of technological families - Technical department director	- Laboratory director - Researchers - External	- Technical department director - Laboratory director - Research OI project

	manager -Researchers	- Laboratory director	stakeholders	manager - Product line manager - Researchers
Activities	- Technological monitoring - Definition of technological priorities - Definition of object of the project - Industrial property	- Search for partners - Decision on type of open innovation (national/ European) - Decision on industrial property - Draft framework agreement	- Research activities on the open innovation project's technical aspect	- Technological demonstration of projects - Definition of applications of technological solution and functional uses
Rules and directives	General framework of project	Framework agreement with external partners	Main gate preparatory documents	Form for transferring results towards development
Informal routines	In-house comparison of representations and integration	In-house comparison of representations and integration	Comparison of representations in-house and with external partners. Integration	
Group problem solving	GO/DON'T GO?	Open / Not open	Solve operational problems	GO/DON'T GO to industrial development

Sequences	5 Confronting clients	6 Final solution<	7 Offer
Stakeholders	- Technical department director - Laboratory director - Product line manager	- Product line manager - Researchers	- Marketing manager - Product line manager
Activities	- Drawing up of bids for tender (80%)	Demonstration: - to clients	Final solution

	- Decision on the product - Response to clients (20%)	- to external collaborators Definition of final product	
Group problem solving	Customer decision	Industrial solution	End/Not end
Rules and directives	Prototype specifications	Framework document defining the final product	Framework of final offer
Informal routines	Comparison of representations with external client and integration	Comparison of representations with each internal and external client and integration	In-house comparison of representations and integration

3 Discussion

The objective of this article is to shed light on organizational skills by looking at the organizational set-ups that foster their construction in the case of an inbound open innovation process. To make things simpler, the main lessons learned from this study are summed up in a table (Table 1). The structure and construction of organizational skills are closely linked in open model management. Several points are worth underlining.

By taking into account the role of organizational arrangements in building up organizational skills (Chesbrough 2003, Charoni *et al.*, 2010) this study proposes a detailed analysis of the specific structures put together at every stage of an open innovation process. As mentioned in the first part of this research, few studies have specifically centred on the actual organization of the stages in an open process. This research therefore provides a rare study context by emphasizing the main characteristics of organizational arrangements throughout a real-life open innovation project. More precisely, an analysis of our case study highlight the following:

- Firstly, our analysis sheds new light on research done by Naqshbandi and Kaur (2011), which claims that coordination between top management and the various research stakeholders plays a key role in the cohesion and success of open innovation. In the case studied, this connection between strategy and operations is

present in the subordination of each laboratory's project to the group's strategic priorities. This subordination emerges in two strategic plans drawn up at strategic level for each technical department and for the group's four technological families: the Strategic Business Plan, which defines the development focus of all of the products, and the Technical Strategic Plan, which sets out the technological objectives. These plans constitute an essential guide for choosing laboratories' open projects.

Our analysis also brings insight into the actual modalities of this coordination. In fact, coordination between deciders at strategic level (vice-presidents, technical department) and operational level (laboratory) is constant rather than just at the launch of an open project. This cooperation aims to optimize results for the whole group and create a network of partners of trust. Thus, coordination ensures that the results of open projects in several product families, as well as the different skills of laboratory researchers (internal and external), are all used on the same project.

- Secondly, our study adds to discussions on decentralization in an open innovation process. We observe a fairly "hybrid" model that hinges on the centralization of decisions when moving from one step to the next, and a decentralization in operational activities within each step. We consider that this result comes close to the concept put forward by Mortara and Minshall (2011) on the open innovation model's evolution towards a more flexible approach. The group studied guarantees flexible coordination through informal exchanges between family vice-presidents, technology department managers, and laboratory managers. Thanks to this flexible coordination, the group's strategy can be adequately implemented and continually fuelled by the department's creative momentum. Indeed, laboratories' open project propositions are supported by top management in terms of skills (external or internal from the other laboratory) and additional funds.
- Thirdly, our study highlights the crucial importance of an interface with the industrial property department when implementing inbound open innovation. According to Lhuillery and Pfister (2009), strong patent protection affects a firm's opportunities to access technologies. Nevertheless, our study shows that in inbound open innovation, patent protection makes it easier to share project results and guarantees their successful implementation in the firm's product. Moreover, IP rights help to harness a firm's benefits (Grindley and Teece 1997). IP is an important tool that creates a

platform for technology transfer and collaboration within an open innovation model (Veugelers and Cassiman, 1999). Hence, companies' involvement in open innovation may depend on the strength of IRP protection and early collaboration with the IP department. In our case, protecting all technological results is a vital criterion in the decision to open up.

- Finally, this case study contributes to earlier research, bringing new insight into specific structures set up to manage links with the external environment. According to literature, these specific structures are devised to implement and promote openness (Chesbrough and Crowther, 2006), as well as to manage relations with external partners and monitor the acquisition of the results targeted (Chiaroni *et al.* 2010). Our research therefore puts the emphasis on a specific structure, the "central units" at strategic level and the "external partnership managers" at operational level, which create new organizational skills involving different internal stakeholders, new roles (e.g. gate keepers) and different partners.

In this organizational context, our research brings insight into understanding organizational skills:

- Firstly, our results help us understand the way that organizational skills are built up at each stage of an open innovation process. The key contribution is that we can go further than the photographic approaches that appear in literature, both in terms of mapping skills and knowledge and in terms of functional structures. We propose, on the contrary, a sequential approach. This perspective is fundamentally new. For each phase of an open innovation process, organizational skills are analyzed through the organizational arrangements that structure them and the knowledge implemented. This rationale gives us a much more detailed understanding of organizational skills. It reveals the complexity of interactions between the knowledge possessed by the different internal and external stakeholders, and the formal rules and informal routines that make it easier to work together and achieve the targets of an open project. Existing studies have not taken this kind of approach, even in an embryonic manner.
- Secondly, our research qualifies results by Trott and Hartmann (2009) on the major role that strategic decision collectives, in particular "gate keepers", play in the success of an open innovation process. Our results show that these gate keepers only occur at decisive stages in order to guarantee a project's strategic coherence. However, other

decision-making collectives are established to ensure projects' operational continuity. These are obviously formal and visible, but their role is to structure the dynamic of organizational skills between the strategic and operational levels.

- Thirdly, we shed new light on the formal logic in open innovation. In this sense, our research refines the results of Damanpour (1987), who considers that low formalization facilitates the adoption of technical innovations and knowledge exchanges. In our case, we observe existing rules and directives for stakeholders right from the first stage of their project. However, our sequential approach reveals two types of formalization: intense formalization during the passage from one stage to the next, and low formalization within each stage. These intense and low formal procedures are established for three essential activities: administrative (follow-up on delivery of results at each stage and operational progress), technical (control of technical parameters with external partners), and commercial (study of whether in line with customer expectations).

- Fourthly, our study adds to works on the conception processes by skills and knowledge, analyzed as a whole (Encaoua *et al.*, 2001, Hatchuel *et al.*, 2001, Le Masson *et al.*, 2006). In our case, this not only involves case-by-case coordination of individual, collective or functional skills (e.g. R&D, marketing) during the different stages, but also the long-term structuring of organizational skills to optimize the (internal and external) coordination and communication costs of the entire innovation process. Thus, taken as a whole, this process represents a totally separate open innovation function. According to Le Masson *et al.* (2006), this can be characterized by inputs such as organizational skills (rules, directives, sequencing and available knowledge), collective, individual and environmental skills, and by outputs in the form of the new knowledge produced.

Taking inputs in their final state, our analysis helps make the link between the two approaches to skills: bottom-up and top-down. By identifying inputs for each open project through what the company knows *how to do* (Barney, 1991, Grant, 1991) and especially by *what it does not know how to do*, we illustrate the major importance of taking a strategic approach to skills to implement the progress of an open project. However, at operational level, an HRM approach guarantees the optimization of the necessary resources (Dietrich *et al.*, 2010, Aldebert and Loufrani-Fedida, 2013) by managing the individual, collective and organizational skills useful for producing new knowledge. It is this connection between a strategic approach and HRM that guarantees the objectives of the project's internal and external collaborations.

Lastly, our research slightly opens up the black box of skills in open innovation at operational level. Many studies have pointed out that, for stakeholders, the dynamics of organizational skills can only produce knowledge if they are based on two complementary elements: informal routines between stakeholders in order to conceive innovative solutions, and group problem-solving, which gives individual stakeholders an opportunity to participate in the decision-making process (Grant, 2006, Wallin and von Krogh, 2010). Our case study confirms the role of informal routines in building a common representation of problems to allow the production of new knowledge (Grant, 1996). Our results refine the author's perspective, by highlighting the construction of common representations to solutions (and not problems) as the outcome of informal routines. This is because the internal and external knowledge mobilized by the project team aims not only to attain a common vision of the problem, but in particular to build a common representation of the solution. Among these informal routines, we stress the major role of the collective memory of judgement (Walsh and Ungson, 1991; Anand *et al.*, 1998; Ackerman et Halverson, 2004; Cardin, 1995; Weick, 2001, Chedotel and Pujol, 2009) as a vital lever in building up a solution. This collective memory provides stakeholders with a grammar of action (Habermas, 1986) that allows them to combine their individual and collective skills in finding a solution. Because informal routines do not twirl around the organization without an operational outcome, this collective memory is also partly formalized in the visible organizational set-ups. Thus, in our case study, informal routines, and in particular the collective memory of judgement, are a key factor in building up the organizational skills required for future open innovation projects. In addition, as shown by Grant (1996), we also observe that these informal routines guide interpersonal communication in the decision-making collective. In our case of open innovation, it is the organizational skills already built up through projects that create inter-communicational communication rules. These guarantee that each internal and external stakeholder has the opportunity to contribute to group decision-making.

5. Conclusion

The objective of this research was to elucidate the organizational skills employed for inbound open innovation by analyzing how they are structured within organizational arrangements. This exploratory analysis of organizational skills adds a

complementary perspective to those on the arrangements and skills required for inbound open innovation. Despite the representative character of the selected case, more specifically, this article extends previous research on several levels:

- Firstly, it sheds light on the organizational arrangements of open innovation by precisely describing the organizational support, stakeholders and decisions at each phase of the open model in its inbound dimension. This research includes both organizational issues and skills-based issues by showing how they effectively interweave at the most aggregated level of links between external and internal stakeholders;
- Secondly, this research adds to analysis on open innovation in terms of organizational skills, which are not just a combination of the individual or collective skills of external and internal stakeholders. We show that they result from a specific organizational framework that built the dynamic of skills.

The managerial implications involve organizational issues, aiming to:

- Reinforce and stabilize open innovation processes by creating specific organizational means for building up organizational skills. We point out that open innovation management currently depends not just on implementing structures, but more importantly, on building up organizational skills. The challenge is to involve external actors with diverse and specific skills that enhance internal skills. The focus should therefore be on developing multi-skills collaboration, in all its complexity, which requires systemic organizational set-ups. The main difficulty is thus to devise organizational arrangement and skills and establish them in the long term.
- Build up and develop organizational skills by creating multiple, open project structures. These skills require an open innovation function encouraging cooperation in a long-term between external and internal stakeholders.

This exploratory research lays the foundations to discuss the role played by organizational arrangements in building up organizational skills in an open innovation model. This discussion is all the more urgent since current studies have made little contribution to the subject, while companies are starting to put greater emphasis on managing skills in their open model and have changed the way they organize themselves to reflect this.

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Technology aggressiveness, open innovation and innovation performance: evidences by a structural-equation-model approach

Davide Aloini*, Luisa Pellegrini

Department of Energy, Systems, Territory and Construction Engineering
University of Pisa
Largo Lucio Lazzarino, Pisa, Italy

Valentina Lazzarotti

School of Industrial Engineering
Università Cattaneo
Corso Matteotti 22, Castellanza, Italy

* *Corresponding author*

Structured Abstract

Purpose – Still little is known about the determinants of the openness degree. Examples of investigated determinants are firm-specific or environmental/external factors. However, the role exerted by some of them remains unclear. In particular, it is still debated the influence by the so-called “technology aggressiveness”. As a matter of fact, evidences on the relationships between the technology aggressiveness and openness are in fact conflicting. The aim of this study is thus to shed further light on the relationship between technology aggressiveness and openness degree in order to give a more conclusive evidence to the debate.

Design/methodology/approach – We elaborate a structural equation model which enriches the state-of-the-art by explicitly testing the interplay among technology aggressiveness, openness (innovatively measured in terms of partner intensity, phases intensity, and variety) and innovative performance. Our study relies on data from more than 400 firms by a survey research developed in Finland, Italy and Sweden.

Originality/value – Findings shows that openness, if measured as partner intensity and phase intensity, fully mediates the relationship between technology aggressiveness and innovative performance, by suggesting that the effectiveness of a firm’s technology aggressive behaviour is strongly related to the intensification of collaboration with the partners along the innovation funnel. Conversely, openness variety seems to play an opposite role and is differently influenced by partner and phase intensity. This result likely emphasises the cost-side of an open behaviour becoming harder to manage, and thus costly, when involving too many different partners, phases and contents.

Practical implications – If one hand firms, which adopt a technology aggressive strategy, are recommended to deeply open their innovation process in order to foster innovation performance. However, due to the fact that a high openness variety could generate some downside, managers should be very careful in the management of different phases, sources and contents. So that a call to find adequate strategies for effectively

managing the collaboration process in order to avoid waste of resources and efforts clearly emerges.

Keywords – Open Innovation, Partner Intensity, Phase Intensity, Openness Variety, SEM.

Paper type – Academic Research Paper

1 Introduction

It is largely recognized by scholars, belonging to several theoretical perspectives (strategic resource-based perspective: von Hippel, 1986; Katila and Ahuja, 2002; innovation management literature: Chesbrough, 2003; Dahlander and Gann, 2010), that cooperative agreements and partnerships aim at creating value and enhancing firm innovativeness. It is also recognized that open innovation resides on a continuum ranging from closed to thoroughly open” approaches and it is usually measured as openness degree through collaboration breadth (i.e. number of external knowledge sources used in innovation activities: Laursen and Salter, 2006) and depth (i.e. intensity of collaboration with each external partner, ranging from surface to deep collaboration as collaborative interactions intensify: Laursen and Salter, 2006; Lazzarotti et al., 2011).

Despite relevant exceptions (Sofka and Grimpe, 2010; Drechsler and Natter, 2012), still little is known about the determinants of the openness degree. Examples of investigated determinants are firm-specific (e.g. innovation-strategy approach and goals pursued with collaborations) or environmental/external factors (e.g. technological and market dynamics). However, the role exerted by some of them remains unclear. In particular, it is still debated the influence by the so-called “technology aggressiveness” construct, intended as the firm technology strategy and its orientation toward high specialization and radical innovation (Miles and Snow, 1978; Brockhoff and Pearson 1992). As a matter of fact, evidences on the relationships between the technology aggressiveness and openness are conflicting. On one hand, literature argues that technological aggressive firms, just because of their specialization and emphasis on radical innovation, are focalized on research activities inside the firm and are reluctant to rely on technologies that are available from external sources (Brockhoff and Pearson 1992; Lichtenthaler and Ernst, 2009). On the other hand, Colarelli O’ Connor (2005) and Lichtenthaler (2008) find that a strong emphasis on radical innovations pushes firms to

adopt approaches based on a higher degree of external technology acquisition because they may not be able to internally develop all the relevant knowledge.

The aim of this study is thus to shed further light on the relationship between technology aggressiveness and openness degree in order to give a more conclusive evidence to the debate. To this purpose, we elaborate a rigorous structural model which enriches the state-of-the-art by explicitly testing the interplay among technology aggressiveness, openness and innovation performance.

2 Research framework and questions

The research framework is depicted in figure 1: it shows the influence of technological aggressiveness on OI choices and the impact of OI choices on innovative performance. In the following we will discuss the state-of-the-art of the literature regarding the relationship between technological aggressiveness and OI choices and soon after we will discuss main results of the literature analyzing the impact of OI choices on innovation performance.

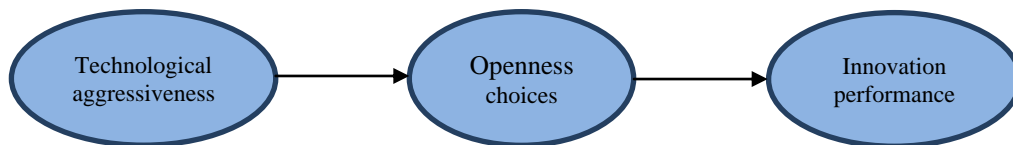


Figure 1 - The research framework

Technological aggressiveness and OI choices

As previously stated, evidences on the relationship between technology aggressiveness and openness are rather scant and conflicting and thus require further extensive investigation. Partly, as shown below, this is due to the different operationalisations of both OI choices and technological aggressiveness.

For example, Lichtenthaler and Ernst (2009) measure technology aggressiveness through three items (*i.* ‘The firm’s emphasis is on radical rather than on incremental innovations’, *ii.* ‘The company’s R&D activities are highly specialised,’ and *iii.* ‘The importance of development activities relative to the firm’s overall R&D activities is high’) and find that technology aggressiveness has a strong influence on a firm’s approach to OI, constituting a major determinant of the degree of opening up the innovation process. More precisely, when these two authors analyse the impact exerted by aggressiveness on technology acquisition (operationalized by asking firms if “a

considerable part of the company's technologies is acquired from external sources"), their results confirm the research hypothesis they formulated, i.e. technology aggressiveness is negatively related to the extent of external technology acquisition. The aspect that differentiates Lichtenthaler and Ernst's (2009) results respect to prior research – they explicitly refer to Brockhoff and Pearson (1992) – is that this relation is not as strong as some findings in prior research indicate. The explanation of the limited strength they found can be retrieved in the fact that firms are forced to increasingly acquiring external technology, with technological exploration to be interpreted as a must rather than an option. In other words, with the trend toward OI, firms may have to choose to acquire external technology relatively independent on their degree of technology aggressiveness. Surprisingly, when Lichtenthaler and Ernst (2009) analyse the impact exerted by an aggressive technology strategy on technology commercialization (operationalised by asking firms if they 'used external technology commercialisation a lot over the past years') their results contradict the research hypothesis they formulated (i.e. technology aggressiveness is negatively related to the extent of external technology commercialisation). Indeed, contrarily to research expectations, they find the opposite results: firms with an aggressive technology strategy do not rely less but more on external technology exploitation. This result can be explained through the fact that external technology commercialisation nurtures important strategic benefits in terms of the possibility of setting industry standards, entering into new markets, and realising learning effects. All in all, first results indicate that an aggressive technology strategy is negatively related to the degree of external technology acquisition and positively related to the degree of external technology commercialisation.

While focusing the attention on only one of the three items which operationalise the construct 'technology aggressiveness' (see above) – i.e. only on the firm's emphasis on radical rather than on incremental innovations – Lichtenthaler himself (2008) finds that the degree of openness seems to rise with the emphasis on radical innovation, especially concerning the degree of external technology commercialisation. Two reasons can explain this fact: on the one side, the opportunity to commercialise knowledge which, not applied in the organisation, reveals to be residual; on the other side, the possibility to facilitate the acceptance on the market, as well as the creation of a standard. But also when analysing technology acquisition, radical innovation exerts a strong positive impact in that firms

which emphasise radical innovation are not able to develop all knowledge internally, but rather have to strongly rely on complementary external sources (Lichtenthaler, 2008).

This result, in particular, deserves further analysis because the impact of the emphasis on radical innovation is controversial. Indeed, when analysed as an item within the technology aggressiveness construct, it seems to have a negative impact on the degree of external technology acquisition, but, if analysed individually it shows the opposite influence, i.e. a positive influence on openness, interpreted as an inbound process. The inconclusiveness of the debate in the literature is even stronger if we include in the analysis the contribution of Laursen and Salter (2006) who indeed find that only one dimension of openness - search depth (but not breadth) - is associated with radical innovation: *“[i]n early stages of the product life cycle when the state of technology is in flux, innovative firms need to draw deeply from a small number of key sources of innovation, such as lead users, component suppliers, or universities. In these early stages, only a few actors may have knowledge of the key technologies underlying the evolution of the product. Innovators need to cling to these sources, drawing deeply from their knowledge and experience. As the technology and market mature and the network supporting innovation expands, more and more actors inside the innovation system retain specialist knowledge. In order to access the variety of knowledge sources in these networks, innovative firms need to scan across a wide number of search channels. In doing so, they seek to find new combinations of existing technologies to enable them to make significant improvements in their existing products”* (p. 146).

OI choices and performance

The impact of OI models on performance has been investigated in terms of company's competence base, development costs and time to market of new products/processes, the level of innovativeness of new products/processes and sales volume/market acceptance of new products.

Literature is unidirectional in showing the impact of the outside-in process on the access and integration of internal company capabilities with new and complementary knowledge of external firms (Gassmann and Enkel, 2004). Instead, literature results are not unidirectional as far as the reduction of development time is considered: for instance, if on the one side Gassmann and Enkel (2004) state that the benefits of co-operation are seen in an improvement in the competitive position and in a risk minimisation, but not in

a reduction of development time, on the other side, according to Kolk and Puümann (2008) firms not concentrating on Open Innovation strategies fail, as rising development costs and shorter product life cycles make it increasingly difficult to justify investments in innovation.

Many contributions in the literature support the impact of open innovation on the level of innovativeness (Lichtenthaler, 2008; Dahlander and Gann, 2007). Laursen and Salter (2006) quote many studies the point to the importance of open behavior by firms in their search for innovative opportunities and they suggest that performance differences between organizations can be ascribed to this behavior.

Lichtenthaler (2008) underpins the effect of open innovation on firms' innovativeness and hence competitive position; similarly, Dahlander and Gann (2007) show that the relationships with other actors help firms to increase innovativeness. Also, Laursen and Salter (2006), while investigating the role of external search strategies in shaping innovative performance, suppose that those organizations that invest in broader (breadth) and deeper (depth) search of external partners may have a greater ability to adapt to change and therefore to innovate: searching widely and deeply across a variety of search channels can provide ideas and resources that help firms gain and exploit innovative opportunities. However, their results put in evidence that the over-search may produce negative consequences on innovation performance itself because of the search costs it implies. Results show that the relationship between innovative performance and the search breadth/depth presents tipping points after which openness—in terms of breadth and depth—can negatively affect innovative performance.

Research hypotheses

The discussion above puts in evidence the existence of an important gap in the extant literature, which concerns the lack of a framework that, while considering concurrently technological aggressiveness, OI choices and innovation performance, helps the readership to understand if openness (intended as outside-in process) performs a mediation role in the relationship between technological aggressiveness and innovation performance. Indeed, with the exception of Laursen and Salter (2006), to our best knowledge no work has been carried out on the relationship between the technology aggressiveness, the OI choices and performance. Building on the only contribution

which considers the above relationship (between technological aggressiveness, OI choices and innovation performance) - i.e. Laursen and Salter (2006) - we go a step further operationalising OI choices not only in terms of partner from which ideas and technological opportunities can be drawn, but also in terms of contents they provide and phases of the innovation funnel which are porous to knowledge flows from the outside toward the inside. According to this operationalisation of OI, we expect that the aggressive firms that intensely focus on radical innovation not only are likely to draw more deeply from few external sources of innovation than firms that are not aggressive (Laursen and Salter, 2006), but also that they intensely open their innovation funnel in very few phases of the innovation funnel, specifically the early phases of the innovation process, to absorb external knowledge. This is underpinned by those contributions that show that in the early phase of the product life-cycle innovations, come from a narrow range of sources (De Backer, López-Bassols and Martinez, 2008; Perkmann and Walsh, 2007), in many cases from universities and research centers. Indeed, De Backer, López-Bassols and Martinez (2008) find out that universities and government research institutes are generally considered to be an important source of knowledge transfer for the innovation activities of companies, especially in more upstream/research activities. Perkmann and Walsh (2007) confirm, at least for universities, De Backer, López-Bassols and Martinez (2008)'s results: "*The concepts of open, networked and interactive innovation, however, would suggest that actual relationships between universities and industry [...] – play a stronger role in generating innovations*".

Differently, if the nature of the innovation is incremental, many different sources of innovation are involved and firms need to be able to work all along the innovation funnel with many different actors in the innovation system (Laursen and Salter, 2006), that bring in the collaboration very different contents. According to Tushman and O'Really (1996) and Abernathy and Utterback (1975), firms may focus on 'fine-tuning' the product by means of incremental improvements which are inspired by many different sources of innovation, in terms of both partners (Laursen and Salter, 2006) and contents (Huizingh, 2011; Bengtsson et al., 2013), and which involve almost all the phases of the innovation funnel. Indeed, along the different phases of the funnel, different partners may bring in the collaboration many contributions in terms of access to cutting-edge technologies, new products and markets (Azadegan and Dooley, 2010), technological and production

capabilities (Oh and Rhee, 2010) and supply chain management capability as well (Wu et al., 2006).

Therefore the following hypotheses can be put forward:

HP 1: The more technologically aggressive are the firms, the less effective partner, phase and content variety will be in influencing innovative performance.

HP 2: The more technologically aggressive are the firms, the more effective partner and phase intensity will be in influencing innovative performance.

3 Methodology

3.1 Sample and data collection

We relied on a survey research developed in 2012 by a group of researchers from three different countries: Finland, Italy and UK. In order to ensure comparable results across nations, before each country began conducting the survey within their respective countries, guidelines regarding the design phase were distributed. We followed different steps for the survey development (Forza, 2002); the following describes the details of each of these steps.

Sample

Concerning sample, three main concerns were considered: target and frame population, sample design and sample size, as follows:

- Target and frame population: To draw the population frame, it was recommended that each country refer to widely available sources to promote study replicability. Hence, for the selection of the firms the use of the NACE Rev. 2 codes was suggested. In addition, it was recommended concentrating the analysis on the manufacturing industry (though CI also takes place in service industries or public administration), because theory-testing research requires a well-developed body of knowledge, and manufacturing is no doubt the most investigated field in the literature regarding open innovation; hence, the codes 10-32 and 98 in NACE Rev. 2 were chosen.

Finally, in order to best represent open innovation activities, the recommendation was to include all statistical units with no less than 10 employees.

- Sample design: The choice was to conduct probabilistic sampling in order to ensure representativeness of the sample and, hence, the generalisability of results (Babbie, 1990).
- Sample size: Each country was urged to reach a minimum sample of 70 firms.

Data collection method

The data were collected by means of questionnaires distributed by email to participants. The advantages of such method include low cost, completion at the respondent's convenience, absence of time constraints, guarantee of anonymity and reduction of interviewer bias (Forza, 2002). Its shortcomings, on the other hand, are represented by lower response rate as compared to other methods, longer completion times and greater effects due to the lack of both interviewer involvement and open-ended questions.

Measurement instrument

The survey was conducted as a questionnaire whose items regarded company characteristics (in particular size and industry), the OI choices in terms of partners, phases and content, and the effects of OI on performance.

Answers are measured by perceptible 7 point Likert scales, ranging from 1 = "not at all"/"strongly disagree" to 7 = "to a very high extent" /"strongly agree". In addition, respondents could choose "I do not know".

The measurement instrument was developed with specific guidelines for: (i) wording (the way questions are posed to collect specific information), (ii) respondent identification (identification of the appropriate respondents for the questionnaire) and (iii) rules of questionnaire design (following rules of courtesy, presentability and readability to help and motivate respondents to answer).

With regard to wording, closed questions were used (except for those regarding the company's name, number of employees, and the previous fiscal year's turnover), and to avoid double-barrelled questions (i.e. questions with different subparts with different possible answers).

Regarding respondent identification, participating countries were urged to identify people who were knowledgeable about OI, in particular R&D managers or similar.

The questionnaire was drafted in conformity with the design rules and supplemented with a clear, but concise introduction providing an explanation of the aims of the survey, instructions for filling it out and the guarantee of confidentiality.

Pilot testing the questionnaire

A test of the resulting questionnaire was conducted on two groups of subjects: colleagues and target respondents.

As for colleagues, the questionnaire was distributed to a group of colleagues to check whether the questionnaire accomplished its objectives. For target respondents, after the questionnaire was translated into the native language, each country had to involve a number of firms in order to gather feedback on anything that might affect the answers. These two tests were conducted independently.

Data sample

We could rely on a database of 415 firms spread across the three countries (87 firms in Finland, 152 firms in Italy and 176 firms in Sweden). Such firms can be taken as representative of manufacturing firms in their respective countries.

3.2 Constructs

The main variables investigated in the paper are reported in table 1. Beyond the technology aggressiveness, our model includes a multi-faceted measure of openness, through the variables partner intensity (i.e. to what extent firm interacts with the different players of the innovation process); phase intensity (i.e. the firm's level of collaboration with partners at the different phases of the innovation process); and openness variety (i.e. the overall variety of the innovation process measuring the number of different external players, phases and contents here included). Finally, the measure of innovation performance is well grounded in the open innovation literature coherently with Lazzarotti et al. (2011). More exactly:

- Openness Strategic Orientation: this construct, whose items are reported in table 1, measures the level of technological aggressiveness. Although the operationalisation of this construct is newly created, some measures are underpinned by the literature:
 - i.* We focus on radical rather than incremental innovation is adopted from Lichtenthaler and Ernst (2009);
 - ii.* We have a broad product/market portfolio:

adapted from Lichtenthaler (2008) and *iii*. We have a broad technology portfolio: adapted from Lichtenthaler (2008);

- Openness innovation performance: The operationalisation of this construct, which is built on Chiang and Hung (2010), has been published in Lazzarotti et al. (2011). Its items are shown in table 1;
- Openness Intensity (Partner): the operationalization has been published in Lazzarotti et al. (2011), which builds on Laursen and Salter (2006). Seven external sources of knowledge and technology for innovation were considered (universities and research centres, innovation intermediaries, government agencies, customers, suppliers, competitors, companies operating in other industries). To compute Openness Intensity (Partner), firms were asked to indicate on a 7-point Likert scale the intensity of collaboration with each external source;
- Openness Intensity (Phase): firms were asked to indicate to what extent they collaborated in the last five years with external sources along the five phases of the innovation process, from idea generation to commercialisation (idea generation, experimentation, engineering, manufacturing, commercialisation). This construct, which is adopted from Lazzarotti et al., 2011 and Lazzarotti and Manzini, 2009, has an explorative nature: it aims to deepen the state of the art literature that, mainly focused on the 'who' question (i.e. the partners to be involved), not rarely has overlooked the 'where' question, i.e. the number and type of phases of the innovation process to be opened to external partners in order to collaborate and, hopefully, co-create along the innovation funnel (Lazzarotti and Manzini, 2009; Ferrero et al., 2013);
- Openness Variety aims to measure heterogeneity of sources during the openness innovation process. Specifically, the proposed construct accounts for diversity in partner enrollment, related phases of the innovation process and, finally, contents exchanged. Items which characterize this construct are built in order to measure (1) the number of different partners actively involved in the innovation processes, (2) the number of different phases interested by external collaboration and (3) the number of different contents concerning for example access to new technology, process and product innovations, or more broadly capabilities and/or competences (reference items are reported in appendix).

3.3 SEM

The research model has been evaluated using a Structural Equation Modelling (SEM) approach since it is widely recognized as having substantial advantages over the first-generation techniques such as principal components analysis, factor analysis or multiple regression (Anderson et al., 1988; Chin, 1998; Shah et al., 2006). The SEM method in fact allows researchers to model, simultaneously estimate and test complex theories with empirical data.

After the theoretical specification of the research model and the sub-sequent definition of the structural model and the related constructs (see previous sections where hypotheses elicitation and construct operationalization are discussed), the main steps for model testing are reported here following:

- a1) Collect data for model testing;
- a2) Test reliability of constructs;
- a3) Test the structural model;
- a4) Evaluate the model fit, and
- a5) Interpret the results and eventually refine the model.

4 Analysis and results

As anticipated, we have first tested constructs' reliability; after that, causal relationships were introduced and evaluated by testing the full structural equation model.

4.1 Construct reliability

CFA was assessed to validate reliability of adopted constructs and measures. We have assumed Content Validity to be maintained, since the constructs are mostly well-grounded in the literature. Reliability of constructs was then tested using the internal consistency method that is estimated using Cronbach's alpha (Cronbach, 1951; Nunnally, 1978; Hull and Nie, 1981). Typically, reliability coefficients of 0.70 or higher are considered adequate (Cronbach, 1951; Nunnally, 1978). Nunnally (1978) further states that permissible alpha values can be slightly lower (0.60) for newer scales. As an addition, loadings and their statistical significance (Dunn et al., 1994) for constructs' items were examined as preliminary evidence of convergent validity.

Outputs from the analysis are reported in table 1 and show that all the theoretical constructs exhibited quite acceptable levels of reliability. Results show that all the factor

loadings are above the .60 and that the alfa-cronbach indexes respect the selected threshold in order to allow confirming reliability of the constructs. Just a critical point has been evidenced and it is about the Openness Variety construct which present a Cronbach's alpha Index of .55. At the same time, the novelty of the construct proposal support us in maintain Openness Variety into the investigated model with an exploratory connotation.

Table 1 - Measures

Measures	Factor loadings
<i>Openness Strategic Orientation (Alfa-Cronbach .82)</i>	
We prioritise new product and service development and innovation to meet new and changing consumer demands	.67
We aspire to be the technological leader	.74
We focus on radical rather than incremental innovation	.70
We try to hire the best scientists and experts in the market	.66
R&D and marketing are our core competencies	.71
We normally use innovative, flexible and non-routine technologies	.73
We have a broad product/market portfolio	.61
We have a broad technology portfolio	.72
<i>Openness Innovation Performance (Alfa-Cronbach .82)</i>	
Reduce innovation risks	.78
Reduce new product/process development cost	.83
Reduce time to market	.77
Introduce new or significantly improved products or services	.74
Introduce new or significantly improved process of producing our products or services	.68
<i>Openness Intensity (Partner) (Alfa-Cronbach .67)</i>	
Universities and research centres	.60
Innovation intermediaries	.63
Government agencies	.66
Customers	.61
Suppliers	.60
Consumers	.61
<i>Openness Intensity (Phase) (Alfa-Cronbach .70)</i>	
Idea generation	.80
Experimentation	.84
Engineering	.73
<i>Openness Variety (Alfa-Cronbach .55)</i>	
Partner Variety	.72
Phase Variety	.77
Content Variety	.72

4.2 Structural model

The structural model was finally tested. Main results are summarized in figure 2 neglecting for sake of clarity and simplicity the other model parameters (e.g. construct covariance, factor loadings and errors) which can be found in the appendix.

The hypothesized relationships between Openness Strategic Orientation and Innovation Performance constructs, as mediated by the Openness Intensity (here measured both in term of Partner and Phase Collaboration) are supported by the data. Standard regression weights are .59 (significant at the .001 level) between Openness Strategic Orientation and Openness Intensity (Partner) constructs and .47 (significant at the .001 level) between Openness Intensity (Partner) and Innovation Performance. In the case of Openness Intensity (Phases) their measures are .41 (significant at the 0.001 level) and .19 (significant at the 0.01 level) respectively.

As concerning the construct Openness Variety, instead, it is evident the central role on the final impact on Innovation Performance. Regression weight is negative -.27 (significant at the 0.01 level). The negative impact is in its turn influenced by the constructs Openness Intensity (Partner) and (Phase). The first positively impacts on Openness Variety: measured regression weight is .40 (significant at the 0.001 level). The second pattern, on the contrary, reveals a negative impact: regression weight is -.29 (significant at the 0.001 level).

Figure 2 and Appendix report details about the estimated impact of Openness factors on the Innovation Performance construct.

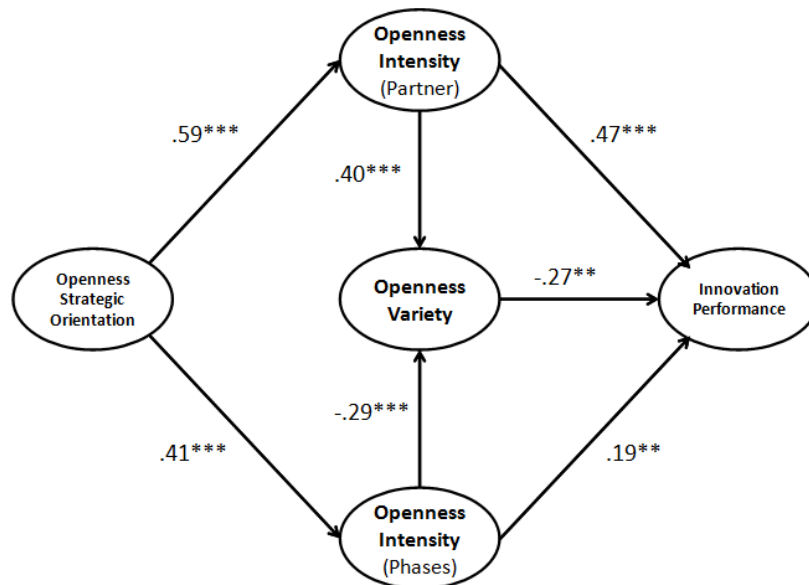


Figure 2 - The structural model

4.3 Model fit

As recommended, a set of multiple fit indexes (see table 2) was used to check the goodness-of-fit of the measurement scale with data. Goodness-of-fit criteria evaluate how well the data fits the proposed model and are generally categorised into three groups representing (absolute) model fit, (incremental) model comparison, and model parsimony (Schumacker and Lomax, 1996). Concluding, these evidences provide an overall good support for the results to be deemed an acceptable representation of the hypothesized constructs.

Table 3 - Multiple fit indexes

Index	Value for RI	Recommended values For a good fit	Recommended values for very good fit	Sources
χ^2	607.6	-	-	-
RMSEA	0.06	< .08	< .05	Byrne, 1998
NFI	0.82	>.8	> .9	Byrne, 1998; Zhang et al., 2002
N-NFI or TLI	0.87	>.8	> .9	Byrne, 1998; Zhang et al., 2002
CFI	0.88	>.8	> .9	Byrne, 1998; Zhang et al., 2002
IFI	0.89	>.8	> .9	Byrne, 1998; Zhang et al., 2002
PNFI	0.71	-	> .5	Byrne (1998), Mulaik et al. (1989).
PCFI	0.77	-	> .5	Byrne (1998), Mulaik et al. (1989).
χ^2/df	2.34	>1 and <5	>1 and <3	Bollen (1989); Carmines and McIver (1981); Hair et al. (1998); Jöreskog, 1969

5 Discussion

Findings show that strategic orientation construct is positively related with openness if measured as both openness intensity (partner) and (phase) (relationship with openness variety instead is not significant), which in their turns, are positively related with innovation performance. As an addition, preliminary evidence from the model also seems to suggest full mediation of these two constructs between technology aggressiveness and innovation performance since the direct relation becomes not significant if analysed concurrently.

Thus effectiveness of a firm's technology aggressive behaviour obtaining higher innovation performance seems strongly related to the intensification of collaboration with the partners along the innovation funnel. Conversely, openness variety seems to play an

opposite role which is differently affected by openness intensity (partner) and intensity (phase). Particularly, when interpreted in terms of openness intensity (partner) and variety, the relationship between openness construct and innovation performance confirms the pattern evidenced by Laursen and Salter (2006). Increasing collaboration with partners is positively related with higher innovation performance but this is also related with a major variety of the collaboration exchange which has in its turn a negative relation with final innovation performance so limiting the previous positive effect.

This result clearly emphasises the cost-side of an open behaviour becoming harder to be managed, and thus costly, when involving too many different partners, phases and contents; and, it also alerts about the need to find adequate strategies for effectively managing the collaboration process in order to avoid waste of resources and efforts. Possible routes obviously spread from reducing the system complexity e.g. limiting partner, phase and content variety, to trying to manage the increased process complexity e.g. through the identification of adequate managerial levers, and also the definition of criteria for optimal allocation of resources supporting/driving the focalization of efforts depending on context specific factors/needs.

On the contrary, if openness is interpreted as phase intensity, i.e. the intensity of external collaboration during the different phases of the innovation process, the model shows an interesting effect of openness Intensity (phase) on openness variety. If it is still true that Openness Intensity (Phase) construct is positively related to Innovation Performance, Openness Intensity (Phase) has a negative relationship with Openness Variety (which in its turn is negatively related with Innovation Performance) so that suggesting a restrictive effect on Openness Variety. Thus, the higher the collaboration intensity during the different stages of the innovation process the lower is likely to be the overall Openness Variety in term of Partners, Phases and Contents. This condition could also limiting the negative effect of Openness Variety on Innovation Performance.

A first interpretation of this evidence may also suggest that phase focalization is a possible candidate (or strategy) in order to manage complexity of the collaboration process and thus a way to deal with the costs and potential inefficiencies of Open Innovation. Keeping collaboration efforts high and focused on specific process phases, avoiding marginal/superficial involvement of resources potentially leading to misuse and dispersion, might help firms in limiting, selecting or managing Openness Variety more effectively and finally obtaining better innovation results.

6 Conclusions

This study contributes on the debate about the type of relationship linking technology aggressiveness and openness. Results show that openness, if measured as partner intensity and phase intensity, mediates the relationship between technology aggressiveness and innovation performance. In other words, the direct relation between technology aggressiveness and innovation performance is not significant, by suggesting that the effectiveness of a firm's technology aggressive behaviour is strongly related to the intensification of collaboration with the partners along the innovation funnel. Conversely, although openness variety is positively related to partner intensity, variety seems to play an opposite role. This result likely emphasises the cost-side of an open behaviour becoming harder to manage, and thus costly, when involving too many different partners, phases and contents (Laursen and Salter, 2006; Praest Knudsen and Bøtker Mortensen, 2011).

Beyond the emerged results as concerns the interplay among the investigated variables, the originality and the value of our paper reside also in two methodological connotations:

- A more fine-grained definition of the openness concept, which takes into consideration other facets of openness with respect to those usually analysed in the literature;
- A powerful statistical model, as SEM, offering great advantages and flexibility in order to match the theoretical model with the data, and especially to model complex relations amongst multiple variables, consider unobservable latent variables, evaluate measurement errors for observed variables and constructs. This usually leads to more valid conclusions on the construct level.

Practical implications – Firms, which adopt a technology aggressive strategy, are recommended to deeply open their innovation process in order to foster innovation performance. However, due to the fact that a high openness variety could generate some downside, managers should be very careful in the management of different sources and contents.

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APPENDIX

Table A1 Structural model AMOS estimates

			Estimate	S.E.	C.R.	P	Label
F3	<---	F8	,868	,127	6,835	***	par_16
F4	<---	F8	,429	,081	5,292	***	par_23
F9	<---	F3	,380	,084	4,517	***	par_19
F9	<---	F4	-,389	,111	-3,499	***	par_25
F7	<---	F3	,399	,073	5,434	***	par_17
F7	<---	F9	-,239	,076	-3,141	,002	par_18
F7	<---	F4	,224	,085	2,643	,008	par_24
Man11_3_1	<---	F4	1,000				
Man11_2_1	<---	F4	1,543	,178	8,663	***	par_1
Man11_1_1	<---	F4	1,314	,153	8,614	***	par_2
Man21_1_1	<---	F7	1,000				
Man21_2_1	<---	F7	1,190	,084	14,227	***	par_3
Man21_3_1	<---	F7	1,047	,080	13,107	***	par_4
Man21_4_1	<---	F7	,753	,071	10,534	***	par_5
Man21_5_1	<---	F7	,724	,079	9,218	***	par_6
Man14_8_1	<---	F8	1,000				
Man14_7_1	<---	F8	,897	,098	9,190	***	par_7
Man14_6_1	<---	F8	1,299	,125	10,393	***	par_8
Man14_5_1	<---	F8	1,263	,146	8,673	***	par_9
Man14_4_1	<---	F8	1,139	,132	8,641	***	par_10
Man14_3_1	<---	F8	1,234	,131	9,443	***	par_11
Man14_2_1	<---	F8	1,482	,141	10,530	***	par_12
Man14_1_1	<---	F8	1,106	,122	9,054	***	par_13
Partner Variety	<---	F9	1,000				
Phase Variety	<---	F9	,673	,106	6,347	***	par_14
Content Variety	<---	F9	,923	,151	6,120	***	par_15
Man10_3_1	<---	F3	,777	,088	8,815	***	par_26
Man10_2_1	<---	F3	,718	,093	7,711	***	par_27
Man10_1_1	<---	F3	1,000				
Man10_6_1	<---	F3	,517	,082	6,313	***	par_28
Man10_5_1	<---	F3	,560	,092	6,098	***	par_29
Man10_4_1	<---	F3	,541	,088	6,131	***	par_30

Where: F3, F4, F7, F8, F9 represent Openness Intensity (Partner), Openness Intensity (Phases), Innovation Performance, Openness Strategic Orientation and Openness Variety respectively.

Table A2 Measure for the construct “Content”

Items
<i>Contents exchanged during the innovation process</i>
Access to leading edge of technology
Innovative products and/or services
Innovative processes
Opening up new markets
Reliable deliveries
System responsibility (SCM Capability)
Project Management Capability
Improvement Capability

Crowdsourcing and Open Innovation for sustainable company growth: a Brazilian case study

Fernanda D'Arrigo *, Ana Cristina Fachinelli

Department of Business Administration
University of Caxias do Sul
Rua Francisco Getúlio Vargas, 1130 - Caxias do Sul

** Corresponding author*

Structures Abstract

Purpose: The article presents a study about knowledge mobilization for sustainable growth. Thus, the present study aims to advance the understanding of how crowdsourcing and open innovation can mobilize knowledge to generate actions in a company that will stimulate its sustainable growth.

Design/methodology/approach – We propose a theoretical and descriptive approach based on literature review about crowdsourcing, open innovation and sustainable growth of the company. A single case study, using qualitative interview and data content analysis, was carried out in a large Brazilian building and developing company in order to analyze how crowdsourcing and open innovation actions can provoke sustainable ideas and organizational growth.

Originality/value – The construction sector is a relevant participant in the Brazil's economy. It was responsible for over 5% of the country's gross domestic product (GDP) in 2012 (IBGE, 2012). The companies in this sector in Brazil have been going through a continuous growth process. The study pursues providing evidence of the positive effects of the use of crowdsourcing via a web based platform through which information and innovative ideas are shared within this competitive sector in a sustainable way.

Practical implications – The strategic management between non-monetary social and environmental activities and economic success is necessary for a sustainable business company (Schaltegger et al. 2011). Sustainable company growth is a challenge for companies facing a tough competitive scenario in the business environment they operate. The case study used shows a large Brazilian company that has been dedicating time to acquire crowd-source knowledge and combining that with their expertise and ideas. This has resulted as the case study will show in a tool that has contributed to improving its internal processes as well as the application of an overall more sustainable business model. The implementation of ideas resulting from the knowledge acquired through crowdsourcing also improved the company's relationship with its customers and other stakeholders.

Keywords – Crowdsourcing, Open Innovation, Sustainable Growth, Knowledge Mobilization

Paper type – Academic Research Paper / Practical Paper

Introduction

Besides being a challenge for companies, knowledge mobilization is an important issue in terms of research since many studies have indicated that knowledge is the basis for innovation (Bennet and Bennet, 2007) and specially open innovation (Abouzeedan and Hedner, 2012). Companies have been using the open innovation channels, to mobilize outsiders' knowledge. External knowledge, applied in internal company issues, can develop innovative business to the company and result in a new way of managing the interaction between company and community. These acts have shown positive results in the companies' operational practices and communities' welfare (Chesbrough, 2003). Within open innovation scenario new tools can grow such as crowdsourcing, a phenomenon which also relies in the constant interaction between company and community. Nevertheless communities are human knowledge exchange cooperatives and Crowdsourcing use the crowd's cooperation to problem-solve company's issues. Most crowd-source communities are formed out of self-interest and the mutual economic benefit for the participants. Outsiders' participation is considerably higher when actions result in mutual benefits (Howe, 2008). Innovation become easier when companies are able to align the open and shared knowledge with action for sustainable growth, ensuring the company's profitability and social and environmental well-being of the community and stakeholders (Savitz, 2007; Sanford 2011).

This study aims to understand how the articulation between open innovation and crowdsourcing platforms can generate ideas that mobilize external and internal knowledge. Furthermore this articulation can result in development of processes, products and services and improvements in the economic, environmental, and social perspective. A case study was carried out in a large Brazilian construction and developing company, to illustrate how the articulation of knowledge mobilization and open innovation tools can help ensure the company's sustainable growth.

1. Open Innovation and Crowdsourcing

Open innovation concepts are not new in the practices of organizations, however the term was popularized in academic research environment by Chesbrough (2003), aiming to explain the changes in innovation processes of companies. It expands the capacity for innovation across organizational boundaries and combines internal and external ideas into architectures and systems whose requirements are defined by a business model. The

business model utilizes both external and internal ideas to create value, while defining internal mechanisms to claim some portion of that value (Chesbrough; 2006). A permeable environment between the company and the environment encourages constant interaction between the parties, increasing knowledge spread. Abouzeedan and Hedner (2012) note that open innovation requires the sharing of knowledge and resources to carry out innovation activity within and among organizations. Open innovation is powerful (Loren, 2011). It can demonstrate skill, mitigate risks for the company, increase revenues, and even transform company's model of business, launching a company ahead of its competitors. A well planned and executed open innovation program can release value restrained in unrealized ideas. The open innovation is a multifaceted concept applied in different contexts. Questions related to intellectual property or even other phenomenon as with open source, crowdsourcing, innovation distributed and other terminologies are still in discussion, so the major differences or equalities are not clear yet.

Specifically about Crowdsourcing, some studies indicate that the term has been increasingly associate to open innovation (Bücheler, Fuchslin and Sieg, 2011; Chanal et AL. 2008, Sloane; 2011). Hossain (2013) highlights that crowdsourcing is showing great growth strategies for organizations, for good practical performance, in the other hand the "rigorous research" still extremely scarce. Sloane (2011) defines crowdsourcing an extrapolation of open innovation when the company throws a complex challenge to a specific group in order to solve technical or scientific problems. Several authors use the concept of crowdsourcing to describe a problem-solving tool, which uses individuals connected to the internet, through an open call to seek solutions (Howe, 2008; Brabham, 2008; Vukovic, 2009; Ribiere & Tuggle, 2010; Doan et al., 2011; Kazai, 2011). Some publications report crowdsourcing beyond the problem-solving. It can be a source able to generate many new ideas (Heyes et. Al. 2012; Ribiere and Tuggle 2010, Poetz and Schreier, 2009). Brabham (2008) also enlarge the Crowdsourcing concept as problem-solving. According to the author, it's a phenomenon which groups of people, in certain circumstances, can overcome specialists. Outsiders may provide new perspectives to internal problems. And work interconnecting internal and external ideas in an environment of cooperation, aggregation, consensus and teamwork is transforming innovation scenario (Chesbrough, 2011). O job previously limited to organization boundaries, in a shared information environment can be done by anyone with common interests (Howe, 2006; Whitla, 2009). The constant interaction and exchange of

knowledge creates a constant flow of information shared between the parties characterizing moments of knowledge mobilization.

2. Knowledge Mobilization

Knowledge Mobilization is defined as the process of creation, assimilation, leveraging, sharing and application of knowledge in a certain community. In human and social sciences Knowledge Mobilization involves the movement of the effective creation and adaptation from the source (researcher or specialist) up to application (practitioners, community leader, community) by effective and sustainable actions (Bennet and Bennet, 2007). Considering that knowledge is constantly changed when transferred between people, findings and hypotheses from experts when mixed communities can result in a very different direction of the expected result. According to Bennet and Bennet (2007) once knowledge emerges through research, it can create a strong bond with the community and may be the link to integrate the researcher community and the practitioner community, using older experiences and moreover represent a new social configuration.

It may seem that crowdsourcing and open innovation follow different paths of knowledge mobilization in relation to the origin point of new knowledge. The suggestions from the communities of open innovation and crowdsourcing arise from various sources, usually not experts (Lebraty and Lebraty, 2013). Even though Knowledge Mobilization and open innovation tools present different knowledge sources, they are both connecting to similar principles. According to Levin (2008) the relationship between knowledge and its use runs in both directions; practice affects research just as research affects practice. The stemming population ideas are suggestions for improvement that subsequently will be use by companies' experts to find creative and sustainable solutions. The concepts are interconnected by a common goal: the use of knowledge to create value for the community and organization. The Bennet and Bennet (2007) adds the importance of the strategically mobilized networks, such as the open innovation and crowdsourcing platforms, to consider important issues. With this information development tools, technological orientated, is possible share knowledge and information among stakeholders, and further develop sustainable actions.

3. Company sustainable growth

In academic research the term sustainable related to economic performance of the companies is still quite wide. Many authors consider that sustainability can interfere positivity in communities' welfare (Pätäri AL. 2013; Fosfuri et. Al., 2013; McAdam and Leonard, 2003; Stundivant e Ginter 1977). In the other hand, some authors (Dely 1990; Bromiley and Marcus, 1989) believe that economic and sustainable involvement of the company and that of a community are paradoxes and impossible to be a successful combination.

Even given the diversity of views on this relationship, it is undeniable that sustainability has become a mainstream policy to business,

Companies are operating in scenery of open communication with customers and stakeholders in general, which exert a charge for sustainable actions, far beyond the charges demanded by governments (Esty and Winton, 2006). However the concern about the environment (social e ecological) can be for some companies a leap frog to a competitive advantage in business (Bellia and Pilato, 2013; Schrettle et. AL. 2013; Takala Et. AL, 2013; Porter and Van der Linden,1995; Garriga and Melé, 2004). Companies that focus on costs and environmental risks and corporate social responsibility realize, in the course of time, more opportunities for growth and profit will be created through sustainability (Esty and Winston, 2006).

At this point it is important to highlight that it is the sustainable growth of organizations that makes a difference, not just development. According to Bartelmus (2012) sustainable development can be applied to everything: business, people, governments, but can get lost in vague goals and not consistent metric, often directly associated with the human and emotional needs, making a generic concept and poor of indicators. The sustainability in economic activity has a greater chance of success than the holistic vision of development. According to Penrose (1959) growth of the firm means not only the increase in the volume of products, but a gradual change in the economy. It is a natural condition that will occur when the internal and external environment provide favorable conditions.

Savitz (2007) utilize the concept of "Triple Bottom Line" to defend the involvement of sustainability in the corporate environment for business growth. According to the author sustainable company conducts its business to generate naturally a flow of benefits to all stakeholders, employees, customers, business partners, the communities within it

operates and obviously shareholders. It might seem a utopian vision, that of a community that benefits directly as it enriches shareholders, but through strategies and routine actions this can indeed happen. Companies that grow sustainably have to focus on the business, but also on social and environmental issues. The company's sustainable growth needs the management of tangible and intangible resources to find the "sweet spot," In other words, a situation or place that a combination the best conditions for the achievement of a goal / profit mingle inseparably with the search common good of the stakeholders (Savitz, 2007). Sanford (2011 p.) also highlights the importance of the relationship with stakeholders. "Responsible companies "do the right thing" when it involves all stakeholders". Right action with customers, employees, local communities, investors, planet or any other stakeholder can not only transform the economic performance (increased sales / profits and market share), but also play a central role in curing social and environmental problems. To managers it is undoubtedly a great challenge to maintain the perfect balance between profitability, economic performance and social performance. But the effort for the development of sustainable actions ends up generating value in consumer perception. Sustainability in company stock can add business value by reducing risks and the strategic management between non-monetary social and environmental activities and economic success is necessary for a sustainable business company (Schaltegger et al. 2011). And further whether the aim is to generate value, the role of the intangible becomes increasingly important for the economic growth of the company and its impact on social and environmental relations.

Many times the intangibles are not directly related, however, it is an important background for actions. Some authors depict knowledge as an important factor for sustainable growth of the organization. Yusof and Bakar (2012) discuss knowledge as a valuable resource to increase the company performance in a turbulent environment. However, when poorly managed, knowledge becomes irrelevant and useless in companies. Hence the mobilization of knowledge can be an element that contributes significantly for high and sustainable performance, especially if it is built on sustainable relationships (Bennet and Bennet, 2007).

Method

Case studies enrich the theory through practical applications in the real world. They are rich in data and can become inspirations for others in future studies (Eisenhardt and

Graebner, 2007). A case embedded in theory, serves as illustration for future cases, and might become a base-case to develop new ideas around the subject (Siggelkow, 2007). According to Schaltegger et al. (2011) to select a business case for sustainability the interviewer needs to discover a situation where economic performance increases while the corresponding company takes in consideration, not only its success but also environmental and social issues important for the stakeholders and the community. But often what appear to be such a case is in fact not. Cases can give a distorted image because the results stated as examples of sustainability are not the product of strategically created conditions. In those cases the alleged sustainability may not sustain the test of time. In the area, of sustainability cases do not just happen. They have to be created, and strategically thought. A business case for sustainability is characterised by three requirements that have to be applied. First, the company has to voluntarily commit to an activity with the intention to contribute to the solution of societal or environmental problems and not only be motivated by legal requirements or stick profit driven motives, but must exhibit a real concern about the environment. Secondly, the activity must also help create a positive business effect contributing to the company's success. These effects must be measurable in a convincing and tangible way (reducing costs, increasing sales, competitiveness, customer retention, reputation, etc.) The cause and effect relationship can be direct or indirect, but may not be speculative. And finally in the company's strategic planning in the case the matter of sustainability needs to be a clear goal imbedded in its corporate culture as a mean to success.

Crossing Schaltegger et. AL (2011) considerations for sustainable cases with open innovation and crowdsourcing cases, grounded in knowledge mobilization, become easy to realize the singularity of the case. Similar cases were not identified in other studies of synergistic integration of concepts; therefore this case study may serve as an illustration for future studies in that field. To characterize the case study documentation was created based on reports, publications and other disclosed data in the company's media channels. With the media published data associated with theoretical background a semi-structured questionnaire was developed consisting of two in-depth interviews with qualitative character. A social media manager and the technician responsible for the web open innovation platform answered the surveys in order to investigate the disclosed information as well as add more information about the company, guidelines, policies, actions and practical applications. After the data was collected from the surveys, content

analysis technique was used to describe the content of the messages. Content analysis was chosen to allow the researcher understand and capture the perspective of the answers, and to know the environment within where the event took place (Roesch, 2005).

To analyze were the first twenty ideas already adopted by the company in their business originated the online platform was used. The period for the analysis of the case study was between august 2nd and September 27th 2010. The categories of analysis used were the “Triple Bottom Line” for sustainability, so the original ideas of the users were analyzed from the web; the use of the idea in the projects of the organization and the economic, environmental and social benefits generated by each idea.

The case study

The real estate sector in Brazil has been expanded to record levels since the 2000s, driven by the country’s economic development, credit expansion, and the strengthening of capital markets. According to the trade union of sale, rental and property management in São Paulo in the first half of 2013 only in the São Paulo’s metropolitan region sales had an increase of 46% compared with the same period of 2012. This data have focus only in São Paulo. In the national scene the construction industry is responsible for more than 5% of the country's GDP, employing over 3.6 million people (CBIC, 2013). Some government programs to stimulate sector are responsible for the increase of sales. The largest government housing initiative is called “Minha Casa, Minha Vida”. In Brazil traditionally interest rates are relatively high and owning one’s own home is out of reach for a substantial part of the population if commercial banking is the only source available for a mortgage loan. This program offers low interest financing assistance to the population to buy their own home. By doing so it also increases the demand for a specific type of home. It was responsible for almost two million homes sold between 2011 and 2013. In 2013 31% of the homes sold in Brazil where through this program. In the same period the government invested R\$ 193 billion, and held about 1.3 million jobs in 2013 which represents 2.6% of the formal labor force of the country’s economy who were involved in building these homes (CBIC, 2013).

Even in a favorable economic and financial scenario the construction industry has a poor knowledge management, causing a huge loss of resources of all kinds (Abdul-Rahman and Wang, 2010). The company, object of this study has operated in construction, development, purchase, and sale of real estate for over thirty-six years and

serves more than ten thousand customers along the country. Beside the factor of being a traditional company, the singularity of the case comes from new uses of knowledge. The company promotes the best use of resources and knowledge management in their business policy, and is keen to demonstrate in its guidelines the environmental responsibility, through interaction in the development of sustainable actions. In 2011, the company formalized through its annual sustainability project a “Sustainability Policy”. The goal is generate financial returns to investors and also help society to develop, focusing on the social and environmental perspectives, in order to minimize impacts and operational risks in the medium and long term.

This business policy pursues a healthy work environment, encouraging innovation in business with focus on financial returns, and also the reducing of the impacts on the environment and communities. To reach these goals the company encourages rational use of resources through new technologies and processes and the reuse of waste. To encourage and adopt sustainable practices beyond company’s boundaries, a program of action was developed called “Collaborative Consumption”, defined by the company as the sharing, exchanging, loaning, renting and donating goods and services without need to purchase them, allowing the economy of resources and avoiding waste. The Collaborative Consumption gained force due to the growth of on-line relationships and networks, allowing the information exchange and valuing sustainable habits. As a stimulus the company conducts research and invites partners to apply and promote that practice. The company also utilizes different platforms in order to develop spaces that encourage collective intelligence, where new ideas are welcome and the community feels comfortable to share new solutions.

The concept of Collaborative Consumption consists of three elements: Collective and Collaborative Knowledge; Open innovation combined with Crowdsourcing and Co-creation, and Collaborative Use of the products. **The Collective and Collaborative Knowledge** is an internal portal where knowledge is shared through meetings, discussions, forums and where employees can discuss ideas and propose solutions. The program has a collaborative database of studies and academic papers, articles, and cases of students from different areas that help spread relevant knowledge and information. In order to facilitate the participants access and use of this medium a number of adult training courses have been developed about construction programs as well as about digital literacy. The teachers are professionals, highly familiar with the subject matter,

that on a volunteer basis provide training to all workers of the company with the aim of including them in this project.

Open innovation, crowdsourcing and co-creation are actions developed through an online platform with open access and meant to be used as well by company workers as members of the general public. On this platform any comment aimed at suggesting an idea, or even the initial thought of an idea without limiting any subject matter may be posted. The intent of this platform is that any idea, no matter how simple or complex, that could lead to improving production, output, or to the improvement of the welfare of the community, from whomever in the company and disregarding the hierarchical internal structure can be evaluated. While on the other hand the public. People can talk on the website about their dreams houses, relationship between the Company and the community. The website has collected a significant amount of relevant information. From 2010 to 2012 the portal reached 224.762 visitors and 2.270 of these submitted their ideas and comments by participating in a bonus score program. The majority of participants were men (75%). These participants helped create a database of 1.949 ideas about issues such as safety, accessibility, leisure, convenience, welfare, finance, information technology, sustainability, marketing, sales and customer relationships, pets, infrastructure, and design. The ideas came from different parts of the country, with most coming from São Paulo, but many were also from Rio de Janeiro, Minas Gerais, Paraná, Brasília, Rio Grande do Sul, Bahia, Pernambuco, and Ceará. In social networks like *Twitter* and *Facebook*, the scope of the program hit 21.917 occurrences, the majority (92%) were neutral and only 0.1% were negative. The company, after testing many of the ideas generated through the portal has applied 35 ideas of these, which have contributed to the company's innovation and the improvement of processes and products. The incoming ideas from the platform are tested by a multidisciplinary team and if approved, adapted to a compatible format and then applied. The categories used in the analysis phase were based on the "Triple Bottom Line" theory, dealing with responsibility for sustainable business growth and the environmental relationship. Elements that were considered in the evaluation phase were the application that the company used in the processes and the economic, social and environmental benefits of each action (table 1). In the analysis it is possible see that even the simplest actions arising from clients' common problems when analyzed and expanded by internal teams, can develop innovation in products, improve the involved processes and achieve sustainable solutions. Cost

reduction, reuse of resources, better use of space, security and convenience to customers are the kind of improvement goals of the actions resulting from this process. The ideas provide a base for development of specific solutions to deal with specific problems. In the cases that, after the internal process within the company to evaluate the idea and decides to implement it, a significant product/process improvement occurred and consequentially a social or sustainable improvement was also registered. Sometime an idea can generate benefit for the three foundations of the “Triple Bottom Line” in the same action, i.e. Bake sharing, the digital panel energy consumption.

Specifically about crowdsourcing as a problem-solving tool, the company developed some projects which positive results. Since 2009 the company uses the network to find solutions, i.e. the announcement of a new institutional collaborative consumption. The company would like to see how the market expert could solve this specific challenge. They recurred to the crowd looking for an advertisement to encourage the practice of collaborative consumption, to highlight the differences and actions already promoted by the company. With the challenge the company was able to see how the crowd was facing collaborative consumption and realign the guideline of the company policy. The winner won seven thousand reads. Another challenge in crowdsourcing area in the platform was to create hoardings which could transmit company values by visual project that agree with the company's enterprises. The winner of that contest had his idea printed on the enterprises' hoardings and also received as prize four thousand reads.

About **Products Collaborative Consumption** the company believes that attitudes, ideas and sustainable practices are habits. Reeducation for conscious consumption, through modern developments may offer conditions for making more sustainable houses and apartments. Technology offers numerous conveniences and facilities, and it allows products to be made causing less impact to the environment. Collaborative Consumption is a change of habits, and so the company encourages customers to use sustainable practices in their day life. Following the initiative was developed action like “Bikes sharing”. The company provides common bicycle stations to condominium members, so people use their cars less and thus less pollution for the planet attaching the concepts of sustainability to urban mobility. Other initiative is the “Car Sharing” this one offers to the condominium members a company's car to mobility inside neighborhood. Thus people do not need to use their own vehicles to get around within the condominium and even favors interaction between community members when the rides

are shared. The company is investing resources in order to pursue new environment friendly sources of energy. Internal researchers have been testing clean energies like: photovoltaic and wind energy. In order to reduce the impact of garbage in the environment the company is investing in the use of composting plants. A collaborative consumption application was developed to help exchange and share objects with the network. Following the Triple Bottom Line it is important to highlight the economic performance of the company. In the third quarter of 2013 profits of R\$ 62 million were reported. At that moment in time the Year To Date profits had already reached the R\$ 178 million. The third quarter 2013 company reported a net income of R\$ 436 million (47% increases over the previous year) and the markup was 14%. The financial results of 2013 show a positive development contributing to the company economic growth.

Conclusion

The study on the knowledge mobilization to leverage sustainable growth reveals that open innovation and crowdsourcing still represent a challenge for companies, mainly when they intend to use these concepts in order to gain competitive advantage as state Bücheler, Füchslin and Sieg (2010). To manage these concepts the company needs flexibility, cooperation, teamwork (Howe, 2008; Chesbrough, 2011). Of these platforms arise ideas, solutions and knowledge originating from different sources as customers, experts, stakeholders in order to improve products, services, and consequently the communities and individual welfare (Esty and Winton, 2006; Savitz, 2007; Sanford, 2011). The analysis of the case also shows the presence in Companies in the USA of the entrepreneurial awareness about reducing activities that generate a negative environmental impact and that a "collaborative consumption" programs, can be successful where the company is able to interconnect financial benefits to social and environmental benefit.

Emphasizing the strength of a sustainable organization policy is important. As cited by Schaltegger et. AL (2011) the business case for sustainability should be created, it does not just happens. The company studied offered through its policies and guidelines the necessary elements to create a unique case involving synergistically tools open innovation and crowdsourcing in order to create, promote and encourage sustainable actions. Another singular fact to be considered in the study is that the organization is inserting in an overheated economy sector which culturally does not invest its resources

in intangibles. From the actions' analysis it is possible to notice that, even in this complex market, the company has the willingness to innovate in the way it constructs its building, respects the environment, facilitates and launches new ventures, anticipates trends and relates with customers. This company's environment of concern and open expression created by the web platform encourages ideas and values the intangibles. It has generated positive results for the organization. Even the simplest idea related to the needs of customers and the community, explained in a crowdsourcing/open innovation platform and connected with company's internal experts, can develop innovative actions in relation to products, processes and services.

During the process of exchange and interaction between the company and the community the knowledge mobilization is reinforced (Bennet and Bennet, 2007). In different moments in the report the perception of how important relationships are in this process can be detected. It is clear that platform allows many ideas to develop because it stimulates the value adding element of knowledge mobilization and that this results in innovation at product and services level and in sustainable growth of the company.

Table 1

PLATFORM SUGESTION	USER DESCRIPTION ACTION ¹	AVAILABLE AT:	IMPROVED ACTION PERFORMED BY THE COMPANY	ECONOMIC BENEFIT	ENVIRONMENTAL BENEFIT	SOCIAL BENEFIT
CLEAN ENERGY GENERATION	Enjoy the water fall by gravity pipes to a construction, through an internal system accumulate energy to illuminate hallways and livings with LED systems	http://tecnisaideias.com.br/web/ideias/geracao-de-energia-limpa	The LED lighting, the air-conditioned in the ballrooms are fueled by renewable energy. And besides, at the construction sites of projects is used solar energy (all showers are heated by this system). The company has been using solar energy and wind energy.	Reduction of energy cost, water reuse and better use of resources.	Reuse of water and resources, without requiring the production of energy.	
USE OF NON-SKID FLOOR AS STANDARD TO AVOID ACCIDENTS	The use of non-slip flooring throughout the building as a safety standard would be something important to the welfare of the resident and his family. Should be a standard in all houses.	http://tecnisaideias.com.br/web/ideias/utilizacao-de-piso-antiderrapante-como-norma-para-evitar-acidentes	The company created the gerontology awareness, which besides anti-skid flooring, added a number of safeguards to ensure the safety of people at all ages. This project have been deployed more handrails on stairs / pools and bars support. In bathrooms, doors with larger spans more ramps and wider sidewalks, among other actions to make the safest and most democratic of all ages areas.	Organizational innovation in the company, and value creation to brand and enterprises.		Safety and comfort in buildings. Prevention against the risk of accidents.
STRUCTURE TO STIMULATE THE USE OF	Incorporation of an efficient structure of bicycle racks, with	http://tecnisaideias.com.br/web/ideias/estrutura-que-	The bicycle racks have some basic equipment for maintenance of bicycles.	Organizational innovation in the company,	The bike may be the best alternative to the	Encourages physical exercise,

BICYCLES AT HOME AND AT WORK	space for small repairs and maintenance. The idea can be applied in residential and commercial projects as well, creating better conditions for the user who wants to go to work by bike. In residential bike racks could be restricted to an air pump, some basic tools and a tripod to suspend the bike during maintenance. It would be interesting locker rooms with showers and bins to store personal items cyclist. With this stimulus, more people would use the bike to go to work.	estimule-o-uso-das-bicicletas-em-casa-e-no-trabalho	And besides the new enterprises in São Paulo and Curitiba already have the "Bike Sharing" program, where common use of bicycles are offered to residents of the developments.	and value creation to brand and enterprises.	chaotic road traffic of large cities to reduce the emission of damaging gases to health and the planet.	and strengthen ties with neighbors.
DIGITAL PANEL SHOWING THE SPENT OF EACH ELECTRIC DEVICE	More important than a sustainable home is to explain to the customer why sustainable is important, and a great way to make it happen is showing the economy done by right environmental actions. A digital panel can show the expense of each home product. It can reduce energy cost by demonstrate clearly the spending.	http://tecnisaideias.com.br/web/ideias/painel-digital-mostrando-o-gasto-de-cada-item-eletrico-da-casa	Residents of São Bernardo do Campo projects were the first to receive a digital monitor coupled to the light box that allows the resident to check the consumption of appliances in real time. The electrical system will be grouped into five circuits that will record separately the consumption of the refrigerator, the washing machine, the microwave, the sockets and the general lighting environments. On the LCD screen it can check the snapshot and cumulative energy consumption of each item and estimate of the value of the account at the end of the month. Consumption can be followed by internet. ²	Process innovation. Customers reduced up 20% of monthly spending on energy.	Avoid excessive expenditure of energy, ie, better use of resources.	Consumer awareness of appliances which use the most energy, promoting ecological awareness.
GARAGE SHELVES	Imagine the following situation: You are a surfer, skater, cyclist, practitioner of any other sport / activity that requires a great outfit, but unfortunately you live in urban centers. All weekend you grab your board in your room, go down 13 flights of stairs because your board does not fit in the elevator and go to the coast. On the back is the same thing, only you're even more tired. Current garages should be about 3 or 4 feet tall, are generally tight horizontally, but there is a big gap in the ceiling. The proposal is	http://tecnisaideias.com.br/web/ideias/garagem-com-prateleiras	For the enterprises already delivered, shelves were provided in the spaces available. The company is seeking to take advantage of the space garages increasingly. In São Paulo was released the first garage with infrastructure for hybrid cars.	Best use of the spaces of customers as a way of innovation in the company. Customer generates less effort and more practicality. Creates value for the company's relationship with the customer.	Better use of space.	More convenience.

	to create guards suspended volumes in the garage to store objects.					
EXCLUSIVE DISCOUNTS	The company could offer some advantages to exclusive discounts, i.e. on telephone operator, cable television, gyms, furniture and electronics store, cinemas and parks.	http://tecnisaideias.com.br/web/ideias/descontos-exclusivos-technisa	Besides finding partners for services such as on cue, the company also sought partners to develop more sustainable products.	Partner companies to provide better services and products to customers. These partnerships also encourage innovation in the company.		
FOLDING WALLS	The apartments have to use all the spaces. It would be great if the company did hinged walls so that we can move the walls so he could make more spaces.	http://tecnisaideias.com.br/web/ideias/parades-articuladas	In enterprises with Gerontology Consciousness several areas have articulated walls. In other enterprises hinged walls can be used as needed by the client. It was not implemented in all works because of rise costs.	Value creation in enterprises and branding	Better use of space.	More convenience and comfort
PRECISION SWITCHES (AND REGULATION)	Combine switches to control intensity (analog or digital) would be of great value to assist in saving energy. For example, imagine that in addition to a switch on and off may have a control bar, or a button that makes you vary the intensity of energy that pass through it, do that during the day, or even overnight, the desired brightness can be achieved. It is an example of the usefulness in addition to potential savings with this control.	http://tecnisaideias.com.br/web/ideias/interruptores-de-precisao-e-regulagem	Some enterprises already have this service of progressive enlightenment. Launches planned in most environments already has this device.	Organizational innovation in the company, and value creation to brand and enterprises.	Energy resources save	More comfortable
ROOFS AND REFLECTORS HEATERS	The roofs of the houses could be formed by reflective materials that soft heat absorption by the housing.	http://tecnisaideias.com.br/web/ideias/telhados-refletores-e-aquecedores	The experts inside the company analyzed, developed a system of roofs that absorb solar energy, saving electrical energy. In a new development we used the green roof system, enabling the absorption of sunlight.	Cost reduction in electricity and better use of resources	Green areas in the roofs	
QR CODE	This idea is based on Qr Code, a new bar code which can be used as a marketing tool. The Qrcode can be used on company announcements in the media, billboard, booklets, folders, and others. Qrcode may provide property information, photos, videos. All this in "customer's hand."	http://tecnisaideias.com.br/web/ideias/qrcode-um-novo-jeito-de-se-comunicar-com-seu-cliente	In 2012 the company invested in the creation of QR Code application technology "augmented reality" that allows customers to view the facade and around a building before it is ready.	Organizational innovation in the company, and value creation to brand and enterprises.	Using the technology, thus reducing the expense of paper and therefore lower deforestation.	Convenience, safety shopping.
CUSTOMIZATION OF	Buy an apartment in	http://tecnisaideias.com.br/web/ideias	An application called "Digital Survey" was	Innovation in process	With the use of internet is not	Increased reliability

APARTMENT IN VIRTUAL PLANT	labor is complicated. My idea would be an application to the company that, when buying an apartment in the plant, the customer can choose the options of flooring, wall color, crockery, etc site. The client can also be used for models of decorative objects and furniture for your apartment already imagine the way he is. This application will also serve to monitor the progress of the work, in which stage is so. I believe so, the customer would keep your dream closer to reality until the completion of the works.	s/personalizacao-virtual-dos-apartamentos-na-planta	developed. The customer can make the process of inspection before delivery of the keys, more agile and secure. Also works for videos accompaniments are available within social channels.	improvement. Possibility for the client to follow the company promises. Value creation and brand reliability.	necessary to travel to the works, saving resources.	and security.
FAUCET ON BALCONIES FLATS'	The apartments without barbecue do not have faucets in the balcony. The idea is to include the balconies faucets for easy cleaning with water for watering plants and other needs.	http://tecnisaideias.com.br/web/ideias/torneira-em-sacadas-de-apartamentos	Besides the implementation of faucets on the balconies of the apartments, was developed in partnership with two other companies ecological, a grip done by 100% renewable and ethanol produced from sugar cane	Answer a perceived need by the customer. Increasing degree of customer relationship.	Ecological grid is produced with renewable source material, not generating consequences to the environment	More convenience.
CRUSHERS INSTALLATION	Support the creation of waste grinders in the sinks of the enterprises, with a particular pipeline that takes it to an appropriate location for trash	http://tecnisaideias.com.br/web/ideias/instalacao-de-trituradores	The idea of installing crushers in each habitation unit would considerably raise the cost of the project. But from this idea developed composting plants in the neighborhoods of the company, reusing waste. ³	Eliminates high costs of waste disposal in the projects and ensure proper disposal of waste.	Reuse of residues, proper waste disposal and processing of waste into fertilizer.	Awareness of the importance of separation and recycling. Recyclable residues are used by cooperatives.
CONDOMINIUM STORAGE	Rresidents complain about lack of space to store objects and obsolete files other belongings end up cluttering your space in the apartment. The company could make room in storage boxes for old object, safely and necessary care. These boxes could be on garage floors to facilitate the logistics, getting more accessible transportation.	http://tecnisaideias.com.br/web/ideias/self-storage-no-condominio-1	From the suggestion the garages spaces were readapted to meet customer needs.	Value creation to the company's brand and enterprises.	Better use of space.	More convenience.
INCREASE SAFETY IN BUILDINGS WITH BIOMETRIC LOCKS	All external locks in buildings and homes, external doors should have biometric locks, probably with digital identification, and the possibility of using a common key as backup.	http://tecnisaideias.com.br/web/ideias/aumentar-a-seguranca-nos-predios-fechaduras-biometricas	Some new enterprises are already receiving biometric locks. The company also analyzes a solution to increase the security locks on all the developments, so as not to raise costs.	Differential security, creating value for the company enterprises.		More safety to inhabitants

CONTEST BUILDING CONCEPT	Contest promoted by the company for architectural design of Building Concepts. The winner would receive a prize, beyond professional disclosure. Could be a way to prospect for professionals in architecture and graphic design. All rights in the designs would be sent to the company.	http://tecnisaideias.com.br/web/ideias/concurso-predio-conceito	Was released in the crowdsourcing platform within the portal open innovation challenge: "Brazilian Challenge competition creative decoration services, interior design and architecture." The platform received solutions to the challenge and the best solution has been awarded seven thousand dollars.	Open Innovation to create and develop new ideas.	New technologies that enable better use of resources and ecologically correct materials.	Team work and cooperation
GAS LEAK DETECTOR	Equip apartments with leak detector gas sensor that monitors and gas central kitchen, reducing the risk of fire / explosion. As people stay less and less time at home during the day, it is necessary that the alert is displayed in the lobby of the building, which can be done using the installation of intercom.	http://tecnisaideias.com.br/web/ideias/detector-de-vazamento-de-gas	At first leak detectors were deployed in the central gas ventures of units. The company still studying the implementation of individual detectors.	Ensures greater safety of the customers and the enterprises become safer.	Prevents gas leak disaster or other substances	More safety to inhabitants
GAMER SALOONS	Usually "Gamers" are introverted, even anti-social, prefer to live in virtual worlds. To make this group of people to meet and socialize better, the idea of a Gamer Hall in condominiums where people in this group could have video-game, interacting with another "gamers" and letting that anti-social life, which is one of the reasons of depression in many people.	http://tecnisaideias.com.br/web/ideias/salao-gamer-em-condominios	All new enterprises already have play areas that promote interaction among residents. Some areas counts with utilities so that the public can best use them free. Also the developments with Consciousness Gerontological prioritize socializing and leisure facilities offer integrated so that the elderly do not become isolated. A games room next to the playground, encouraging interaction.	Creates company value by answering the need of clients.		Social inclusion of condominium members of all ages. Sharing of information and knowledge.
EXCLUSIVE SHOPPING COLLECTIVE	Could be a electronic billboard in the condo with an application for the use of collective purchasing. The idea consists of a particular company offering only intended for audience development.	http://tecnisaideias.com.br/web/ideias/compras-coletivas-exclusiva-tecnisa	Partnerships have been developed with several companies to offer discounts to customers. These discounts are sent via e-mail.	Customer value. Establishment of partnerships.		
<ol style="list-style-type: none"> 1. By ethical reasons was chose not to disclose the names of the authors of ideas. The platform the company discloses the surnames of authors and commentators according to the registration done. 2. The company deployed individual consumption meters for each residence. In 2010 an estimated 33,059 cubic meters of water have been saved. In 2012 the estimated water save rate was 122,796 m³ (Relatorio de Sustentabilidade Tecnisa, 2012). 3. A company recycled more than 32 tons of used material in the enterprises in 2012, an increase of over 20% over the previous year (Relatorio de Sustentabilidade Tecnisa, 2012) 						

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Intangible assets and innovation openness in R&D intense companies: an empirical analysis

Francesca Michelino *, Antonello Cammarano,
Mauro Caputo

Department of Industrial Engineering
University of Salerno
Via Giovanni Paolo II, 132 - 84084 - Fisciano (SA)

Emilia Lamberti

Department of Enterprise Engineering
University of Rome "Tor Vergata"
Via del Politecnico,1 - 00133 - Roma (RM)

** Corresponding author*

Structured Abstract

Purpose - The diffusion of the open innovation paradigm has been changing the ways in which firms acquire, manage and exploit their intangible assets. It is widely recognized that intangible assets play a relevant role for companies in creating and developing their core competences, thus yielding competitive advantage and leading to innovativeness. This paper aims at analysing the composition of intangibles portfolio of R&D intense companies and relating it to the degree of openness of their innovation processes. Further, the linkage between portfolio composition, structural features and performances of companies is investigated.

Design/methodology/approach - To analyse companies' stock of intangibles, we recorded them in different categories and calculated composition ratios. In order to quantify the degree of openness of companies we considered revenues and costs from open innovation activities and investments and divestments of innovation-related intangibles, occurring in either separate acquisitions or within business combinations. Finally, different variables are used to describe structural features and performances of companies. The analysis is performed on a sample of 243 world top research and development (R&D) spending companies, according to *The 2012 EU Industrial R&D Investment Scoreboard*, for which the 2012 annual reports were analysed. Results are discussed from cluster, one-way ANOVA and correlation analyses.

Originality/value - The paper contributes to the existing literature on the measurement of open innovation from two perspectives. First, it focuses on the pecuniary dimension of the phenomenon, using quantitative, objective data. Second, while most literature is focused on inbound metrics, our paper suggests a set of metrics which can be used for both inbound and outbound processes, allowing to define the ways in which companies can capture value from the exploitation of their technology, i.e. the business models of

companies. Moreover, the paper contributes to the understanding of the relevance of intangible assets in open activities.

Practical implications - The paper addresses the need for operative, practical instruments, which can help managers to monitor the impact of the investment in intangibles on companies' innovation processes after an open-oriented approach. It proposes a set of metrics enabling to evaluate their core competences and relate them to the propensity to open up innovation processes. Further, given the availability and objectivity of annual report figures, this accounting framework can also be used by decision-makers for comparisons over time and space, also allowing the benchmarking with competitors.

Keywords - Open innovation, Intangible assets, Innovation metrics, Bio-pharmaceutical, Technology hardware & equipment.

Paper type - Academic Research Paper

1 Introduction

Open innovation (OI) has been one of the most debated topics in innovation management research in the last decade and can be defined as *“the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively”* (Chesbrough et al., 2006). The adoption of the OI paradigm has been changing the ways in which firms acquire, manage and exploit their intangible assets. As a matter of fact, after an open perspective, the firm becomes an active participant in the innovation market, acquiring knowledge assets from outside and selling or licensing the intangibles which are internally unexploited.

Firms may open up their innovation processes on two dimensions, namely inbound and outbound (Gassmann and Enkel, 2004), the former referring to enriching the company own knowledge base through the integration of suppliers, customers and external knowledge sourcing; the latter to earning profits by bringing ideas to market, selling intellectual property (IP) and multiplying technology by transferring ideas to the outside environment.

Despite the large attention OI has raised in literature, innovation measurement is still looking for an appropriate metrics system that monitors the investments and the effects of open vs. closed innovation approaches, in order to help companies to find their right balance. The measurement of the value of OI activities is increasingly important and metrics systems are not yet adapted to monitor and measure the value of such activities (Enkel and Lenz, 2009). Moreover, while a large number of studies focuses on the inbound dimension of openness by analysing the acquisition of external knowledge (e.g.,

Laursen and Salter, 2006), less attention has been paid to outbound processes: Poot et al. (2009) encourage scholars to explicitly measure outflows of knowledge in future studies.

Therefore, the purpose of this paper is to contribute to the existing research on OI, by analysing the companies' intangibles portfolio composition and relating it to the degree of openness in their innovation processes. The research questions we aim at answering are how the openness of a firm can be measured after an accounting perspective, which are the categories of intangibles that mostly characterize open companies and which is the linkage between portfolio composition, structural features and performances of companies. In doing so, we use secondary data gathered from annual reports of companies in order to define both the intangibles portfolio composition and all the costs, revenues, new investments and divestments linked to open innovation.

Our paper is organised as follows. In the next section, a literature review on the approaches to the measurement of openness is reported, with a particular focus on intangibles. Section 3 provides a detailed description of our framework. In Section 4 the application of the framework to a sample of 243 world top R&D spending companies is reported. The companies, belonging to bio-pharmaceutical and technology hardware & equipment industries, were selected from *The 2012 EU Industrial R&D Investment Scoreboard* (JRC, 2012) and their 2012 annual reports were analysed: results from cluster, one-way ANOVA and correlation analyses are outlined. Discussions and conclusions, including limitations and suggestions for further research, close the work.

2 Literature review

In what follows, literature contributions concerning the measurement of open innovation will be briefly presented, with a particular focus on intangible assets, in order to underline the relevant role of intangibles in innovative activities.

Since the definition of the open paradigm in 2003, Chesbrough underlines the *pecuniary* dimension of the phenomenon: one of the six principles of the OI concept states "*we should profit from others' use of our IP, and we should buy others' IP whenever it advances our own business model*". Literature contributions using pecuniary variables to measure the openness degree of companies include the percentage of sales in products and services from external technologies and the percentage of net income generated from own technology licensed to other firms (Chesbrough, 2004), the new revenues opportunities deriving from licenses, spin-off and sales divestiture and the cost

savings from leveraging external development (Chesbrough, 2006), as well as the investment per year in collaborative R&D (Al-Ashaab et al., 2011). Actually, the pecuniary features are innate in the definition of the OI paradigm itself, through in- and out-licensing, minority equity investments, acquisitions, R&D contracts, spin-outs and sale of innovation projects (Chesbrough and Crowther, 2006).

Yet, even if a number of studies underlines the economic issues of OI (Enkel et al., 2009), most contributions do not use pecuniary variables to measure the degree of openness of companies, rather adopting different perspectives.

As to inbound processes, there is a strong body of literature based on the Community Innovation Surveys which measures OI through the external *sources of knowledge* (Ebersberger et al., 2012; Köhler et al., 2012; Laursen and Salter, 2006; Poot et al., 2009; Salge et al., 2012; Sofka and Grimpe, 2010; Tether and Tajar, 2008). Moreover, Chesbrough himself defines a number of variables that do not refer to the pecuniary issues of OI: for example, OI effects can be measured in terms of *time* savings from both inbound and outbound practices (Chesbrough, 2004; 2006).

A further set of OI metrics can be traced back to *industrial property rights*: protection breadth, i.e. the wideness of IP rights such as patents, trademarks and copyrights (Ebersberger et al., 2012) and the number of patents per year as a result of collaborative projects (Al-Ashaab et al., 2011) can be both considered as proxies of OI.

Moreover, some studies suggest operational measurements for OI related to the *collaborative projects* in which the companies are involved (Al-Ashaab et al., 2011; Chesbrough, 2004) and the *human resources* within the companies that take part to such collaborations (du Chatenier et al., 2010) together with the new models for managing scientific personnel (Petroni et al., 2012). Finally, OI can be considered as a set of *practices* for profiting and also a cognitive model for creating and researching those practices (Chesbrough et al., 2006), with the usage of different openness practices in the stages of concept, development and commercialization (van der Meer, 2007).

From this brief overview of the literature it is clear that a number of different approaches are used to measure the degree of openness of companies, consistently with the multidimensional nature of the phenomenon. Yet, if for some non-pecuniary approaches the operationalization of the OI concept is widely recognized, after a pecuniary perspective a comprehensive measurement system is still lacking. Further, no link is found in literature between the accounting measurement of OI with intangibles,

even if the role of intangible assets is of great interest for innovation (Kaplan and Norton, 2004). As a matter of fact, intangibles provide shelter for innovators, since they are difficult to imitate, and may bring competitive advantage and lead to innovativeness (Cho and Pucik, 2005; Cohen and Levinthal, 1990; Nonaka, 1991). In theoretical and empirical studies, most researchers have used intangible assets as proxies for innovative activities (Lev, 2001; Milbergs and Vonortas, 2004), and treat expenditures on intangibles as investments in innovation capacity (Arundel, 2007; Corrado et al., 2006; Nakamura, 2001): the variation in intangible assets between two periods can be considered as a proxy for current innovation effort (Rogers, 1998). Cañibano et al. (2000) point out that financial statements could provide a sound basis for the measurement of innovation if they included more relevant information on the intangible determinants of the companies value. In fact, in industries in which knowledge is the main source of future benefits, the information provided by financial statements may have little or no relevance at all, as investments in R&D and other innovative activities are not appropriately reflected in them: as a matter of fact, they are either fully expensed as incurred, or amortized over short periods of time.

Thus, from all the previous considerations, two gaps emerge as to the measurement of open innovation: first, the lack of operationalization of OI after an accounting perspective and, second, the lack of linkages between the accounting measurement of OI and intangibles. This paper aims at filling these gaps complementing the existing measures of openness with a systematic framework based on the quantification of the pecuniary flows in OI transactions. Also, it provides a set of accounting indicators for analysing companies' intangibles portfolio in order to relate its composition to the degree of openness of their innovation processes.

3 Framework: definition of the indicators

The methodology we suggest is intended to evaluate how the companies' intangibles portfolio composition is related to (1) the degree of openness, (2) the structural features and (3) the performances of companies (Figure 1).

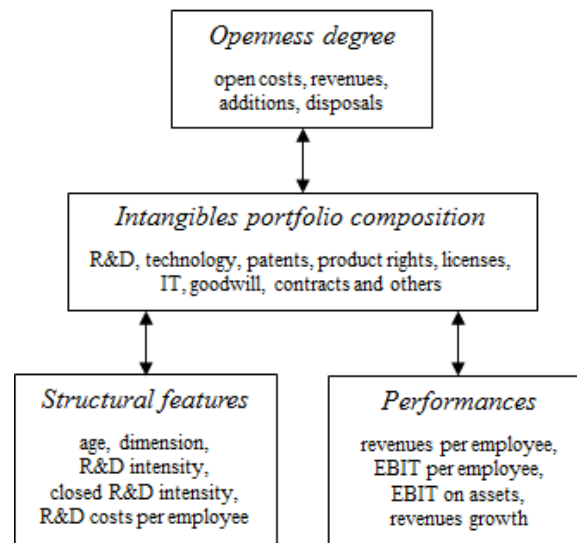


Figure 1 Relationships under investigation

In what follows, a detailed description of our methodology is reported, with the definition of intangibles shares, open innovation metrics and structural variables.

3.1 Intangibles shares

In order to analyse companies' intangibles portfolio, we grouped all the different intangibles reported in annual reports in 10 categories¹:

- *R&D*, e.g. development projects, in-process R&D;
- *technology*, e.g. core technology, product and process technology;
- *patents*, e.g. patent rights, acquired patent portfolio;
- *product rights*, e.g. trademarks, brands;
- *licenses*, e.g. license payment, license fees;
- *IT*, e.g. computer programs, software development costs;
- *other IPRs*, e.g. intellectual property, intangible rights;
- *goodwill*;
- *contracts, agreements & relationships*, e.g. customer base, non-compete agreements;
- *other intangibles*, e.g. intangible assets under construction, internally developed intangible assets.

¹ See Appendix A for the list of terms we grouped in each category of intangibles.

Note that we have included the general categories ‘other IPRs’ and ‘other intangibles’ because, in different cases, in the notes to the financial statements it is not better specified the kind of intangible.

In order to determine the intangibles portfolio composition, some ratios can be calculated, as the net value of the specific category of intangible disclosed in the notes to the financial statements divided by the total net value of intangibles reported on the balance sheet. Thus, 10 shares can be defined, e.g.:

$$R\&D\ share = \frac{R\&D}{total\ intangibles}$$

All the shares range from zero to one, respectively corresponding to the case in which the portfolio does not contain the specific category of intangible and to the case in which it contains exclusively this category.

3.2 Open innovation metrics

A comprehensive measure of OI after an accounting perspective can be obtained through the quantification of the economic and financial flows characterizing the transactions in the innovation market.

OI transactions can be divided into inbound and outbound ones, the former characterized by innovation-related costs and intangible investments, the latter by innovation-related revenues and intangible divestments. Costs and revenues affect the income statement of the company and will be defined economic measures of OI, additions and disposals regard the balance sheet and will be termed financial measures.

As to open costs, we have to include all the costs carried by the company for the internal use of external R&D and IP resources, as well as all the R&D and IP costs internally developed for external use. On the contrary, all the costs internally generated for internal use have to be excluded (e.g., R&D staff costs incurred for internal activities or costs carried to internally develop IP that will be used by the company itself).

Within open revenues, we have to consider all the revenues deriving from the external use of internally developed R&D and IP. On the contrary, all the revenues deriving from product sales have to be excluded.

Thus, open costs and revenues comprise collaborative costs and revenues, referring to joint development projects with third parties under long-term agreements; costs deriving from the outsourcing of R&D services and revenues resulting from R&D services

performed on behalf of third parties, including grants received from the government for R&D activities; in-licensing costs, out-licensing revenues and royalty fees paid or received. The first two categories concern R&D, while the third regards IP; further, three different underlying logics can be defined, from an increase of knowledge for both the parties, through the delivery of a black box, to the concession of a right without the transfer of ownership.

As to additions and disposals we have to include all the new investments and divestments of innovation-related intangibles, such as acquisitions of in-process R&D, development projects, licenses, patents, trademarks and other intellectual property rights, technology rights and goodwill, occurring either in separate acquisitions or within business combinations, mergers and acquisitions (BCMAs). Thus, two different logics can be defined as well. When a separate acquisition occurs, a focalized interest on an intangible, e.g. a specific patent, can be outlined. On the contrary, within BCMAs, the acquiring company can be interested not only on the recognized intangibles, but also in the knowledge and the expertise of people working in the acquired firm. Such a distinction makes it important to consider the goodwill arising from BCMAs as a proxy for intellectual capital, consistently with literature (Boekestein, 2009; Brännström et al., 2009).

Note that not all the increases and decreases of intangibles can be considered as open, since we have capitalization of development costs or internally developed intellectual property rights, amortization, impairment charges, reclassifications and currency translations, which are all linked to internal accounting operations and adjustments, rather than to exchanges with third parties.

According to the proposed framework, OI is a four-dimensional phenomenon, represented by costs, revenues, additions and disposals. In order to quantify the degree and define the nature of OI, four basic indicators can be calculated by comparing, for each of the four components, the items deriving from OI to the related items which define the total business of the company:

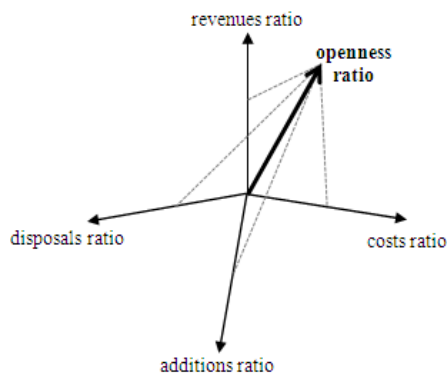
$$\text{Costs ratio} = \frac{\text{costs from OI}}{\text{total R\&D and IP costs}}$$

$$\text{Additions ratio} = \frac{\text{additions from OI}}{\text{total intangibles}}$$

$$\text{Revenues ratio} = \frac{\text{revenues from OI}}{\text{total revenues}}$$

$$\text{Disposals ratio} = \frac{\text{disposals from OI}}{\text{total intangibles}}$$

Thus, OI can be represented in the space R^4 (Figure 2), where each of the basic ratios is a Cartesian coordinate and each company can be represented as a point, whose distance from the origin is proportional to its total degree of openness.



$$Openness\ ratio = \sqrt{\frac{Costs\ ratio^2 + Revenues\ ratio^2 + Additions\ ratio^2 + Disposals\ ratio^2}{4}}$$

Figure 2 Open innovation four-dimensional space

All the ratios range from zero to one, respectively corresponding to a totally closed and a totally open behaviour.

3.3 Structural features and performances

In order to describe structural features and performances of companies we considered a number of variables. As to structural features we used:

- *age*, measured in number of years from the date of establishment;
- *number of employees*, as a proxy of firms' dimension;
- *R&D intensity*, defined by R&D expenditure on total revenues;
- *closed R&D intensity*, measured as R&D expenditure net of open costs on total revenues, as a proxy of absorptive capacity (Cohen and Levinthal, 1990);
- *R&D costs per employee*, as a proxy of the focalization on R&D of human resources.

Further, the following performance indicators were considered:

- *revenues per employee* and *EBIT per employee*, as measures of company efficiency;
- *EBIT on assets*, as a proxy of company profitability;
- *growth*, measured in terms of annual increases of revenues.

4 Application of the framework

4.1 Sample

The suggested framework was applied to a sample of 243 world top R&D spending companies, according to *The 2012 EU Industrial R&D Investment Scoreboard*, for which the 2012 annual reports were analysed². Two industries were selected: bio-pharmaceutical and technology hardware & equipment; according to ICB codes, the former is divided into biotechnology (BIO) and pharmaceutical (PH) segments, the latter in computer hardware & office equipment (HW), semiconductors (SC) and telecommunications equipment (TLC) segments. We excluded all the companies for which (1) their annual reports, available on the internet, were either incomplete, with no notes to the consolidated balance sheet and income statement, or not filling IFRS or US GAAP standards; (2) no intangibles are disclosed in the balance sheet; (3) only the gross carrying amounts of the different types of intangibles are disclosed in the notes.

Data collected from the annual reports were used to define, for each company, the intangibles shares, the total openness ratio and its components (i.e. costs, revenues, additions and disposals ratios), the structural features and the performances.

4.2 Cluster analysis

In order to group together the companies having similar compositions in their intangibles portfolio, a Ward hierarchical clustering with squared Euclidean distances was performed using the intangibles shares as clustering variables. Different solutions with different numbers of clusters have been compared and five clusters have been chosen, trying to balance different criteria, such as statistical significance, easiness of interpretation, and consistence of each cluster.

² When the annual report refers to the year ended before 30th June, the 2012-2013 report was considered, otherwise the 2011-2012 one. All data were converted in euro by using the exchange rates as of 31st December.

The five clusters³ obtained were named after the intangibles prevailing in the portfolio (Table 1):

- *R&D owners* (12,8% of the sample) - the intangibles portfolio of the companies in this cluster is mainly characterized by R&D;
- *technology owners* (25,5% of the sample) - the intangibles portfolio of the companies in this cluster is represented by the prevalence of technology and goodwill;
- *patents owners* (4,9% of the sample): the intangibles portfolio of the companies in this cluster is mainly characterized by patents;
- *product rights owners* (7,0% of the sample): the intangibles portfolio of the companies in this cluster is represented by the prevalence of product rights;
- *goodwill owners* (49,8% of the sample): the intangibles portfolio of the companies in this cluster is mainly characterized by goodwill.

As we can see from our results, *goodwill owners* represent the largest cluster with about half of firms in the sample pursuing acquisition strategies since goodwill can be registered only when a BCMA occurs.

Table 1 Clusters definition: mean values of intangibles shares

Shares	R&D owners	Technology owners	Patents owners	Product rights owners	Goodwill owners	Total sample
R&D share	77,8%	3,0%	0,6%	2,9%	2,7%	12,2%
Technology share	1,1%	22,2%	2,3%	1,7%	7,1%	9,6%
Patents share	1,6%	3,6%	76,1%	0,1%	3,0%	6,4%
Product rights share	3,3%	1,1%	0,2%	60,1%	3,8%	6,8%
Licenses share	2,6%	5,3%	2,2%	0,2%	0,5%	2,1%
IT share	1,9%	11,5%	2,5%	0,8%	0,8%	3,8%
Other IPRs share	0,3%	9,7%	0,0%	0,0%	0,5%	2,8%
Goodwill share	10,2%	24,9%	15,2%	32,3%	74,0%	47,5%
Contracts share	0,9%	8,5%	0,3%	0,0%	6,0%	5,3%
Other intang. share	0,4%	10,1%	0,6%	1,9%	1,7%	3,7%
Total	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Further, one-way ANOVA was performed to determine whether the belongingness to the clusters is a discriminating factor for the variables under study (Table 2): most of them resulted to have statistically different mean values among the five clusters.

³ See Appendix B for the list of companies and clusters.

Therefore, Tables 3 to 6 provide the description of the clusters in terms of segment, openness, structural features and performances.

Table 2 One-way ANOVA - discriminating factor: clusters belongingness

Variable	df		Variance		F	Sig.
	between	within	between	within		
Segment	4	238	14,365	1,787	8,038	0,000 **
Revenues ratio	4	238	0,521	0,089	5,862	0,000 **
Costs ratio	4	238	0,160	0,028	5,655	0,000 **
Disposals ratio	4	238	0,002	0,002	1,221	0,303
Additions ratio	4	238	0,009	0,042	0,211	0,932
Openness ratio	4	238	0,158	0,028	5,657	0,000 **
Age	4	238	4,391E+03	1,545E+03	2,842	0,025 *
No. of employees	4	238	2,589E+09	1,369E+09	1,892	0,113
R&D intensity	4	238	83,201	26,221	3,173	0,015 *
Closed R&D intensity	4	238	40,267	11,660	3,453	0,009 **
R&D costs per employee	4	238	1,160E+05	1,144E+04	10,135	0,000 **
Revenues per employee	4	238	2,915E+05	6,398E+04	4,556	0,001 **
EBIT per employee	4	238	5,228E+04	2,968E+04	1,762	0,137
EBIT on assets	4	238	0,193	0,089	2,171	0,073
Revenues growth	4	238	2,549	0,621	4,105	0,003 **

Table 3 Cluster description by segments

Segment	R&D owners	Technology owners	Patents owners	Product rights owners	Goodwill owners	Total sample
BIO	13 41,9%	10 16,1%	4 33,3%	4 23,5%	14 11,6%	45 18,5%
PH	7 22,6%	17 27,4%	2 16,7%	13 76,5%	20 16,5%	59 24,3%
HW	3 9,7%	3 4,8%	2 16,7%	0 0,0%	19 15,7%	27 11,1%
SC	1 3,2%	24 38,7%	3 25,0%	0 0,0%	40 33,1%	68 28,0%
TLC	7 22,6%	8 12,9%	1 8,3%	0 0,0%	28 23,1%	44 18,1%
Total	31 100,0%	62 100,0%	12 100,0%	17 100,0%	121 100,0%	243 100,0%

As to the segments, the following results are observed (Tables 2 and 3):

- *R&D owners* are mainly represented by biotech companies, followed by pharmaceutical and telecommunications equipment ones;

- *technology owners* are primarily characterized by semiconductors companies, followed by pharmaceutical and biotech ones;
- *patents owners* are mainly represented by biotech and semiconductors companies;
- *product rights owners* are only characterized by bio-pharmaceutical companies;
- *goodwill owners* are mainly represented by semiconductors companies.

Table 4 Clusters description: mean values of openness ratios

Openness ratios	R&D owners	Technology owners	Patents owners	Product rights owners	Goodwill owners	Total sample
Revenues ratio	29,8%	18,6%	39,8%	7,7%	8,6%	15,3%
Costs ratio	18,4%	10,7%	11,0%	1,4%	4,2%	7,8%
Disposals ratio	0,3%	1,4%	2,7%	0,0%	0,7%	0,9%
Additions ratio	12,8%	12,4%	8,7%	15,5%	13,3%	12,9%
Openness ratio	24,6%	17,5%	26,4%	11,2%	11,7%	15,5%

As regards openness degree (Tables 2 and 4):

- *patents* and *R&D owners* are more open than the companies belonging to the other three clusters, particularly as to revenues and costs;
- no significant differences among clusters are found as to both additions and disposals ratios.

Table 5 Clusters description: mean values of structural features

Structural features	R&D owners	Technology owners	Patents owners	Product rights owners	Goodwill owners	Total sample
Age	22	37	54	51	45	41
No. of employees	1.056	17.059	12.827	12.638	21.071	16.497
R&D intensity	23,3%	14,6%	3,8%	18,2%	12,0%	12,3%
Closed R&D intensity	19,1%	13,4%	3,6%	17,7%	11,3%	11,5%
R&D costs per employee (k€)	188	83	162	87	61	90

As to the structural features, the following results are obtained (Tables 2 and 5):

- *R&D owners* are represented by the youngest firms in the sample. They also have higher R&D intensity, absorptive capacity and R&D focalization of the human resources;
- *patents owners* are characterized by the oldest companies in the sample. They also have lower R&D intensity and absorptive capacity;
- *goodwill owners* are the companies with the lowest R&D focalization;

- no significant difference among clusters is found as to dimension.

Table 6 Clusters description: mean values of performances

Performances	R&D owners	Technology owners	Patents owners	Product rights owners	Goodwill owners	Total sample
Revenues per employees (k€)	456	304	445	483	301	341
EBIT per employee (k€)	-25	4	-7	108	12	11
EBIT on assets	-8,8%	-2,3%	2,1%	16,4%	1,7%	0,4%
Revenues growth	43,8%	11,7%	83,3%	17,1%	2,3%	15,0%

As to performances (Tables 2 and 6):

- *product rights owners* show the highest levels of revenues per employee ratio, followed by *R&D* and *patents owners*;
- *patents owners* have the highest revenues growth rate, while *goodwill owners* the lowest;
- no significant differences among clusters are found as to both EBIT per employee ratio and profitability.

4.3 Correlation analysis

Correlation analysis was performed to examine the relationships under investigation (Figure 1). Table 7 shows only an extract of the correlation matrix since we are interested in investigating how openness, structural features and performances are related to the intangibles shares and not in the links between the variables themselves. As we can see from our results, no significant correlations are found as to IT and other IPRs shares.

As to the propensity to open up innovation processes, we found that the prevalence of R&D in the portfolio exhibits a weak positive correlation with openness, particularly as to its economic dimension. Similarly, an high share of patents shows a weak positive correlation with openness, especially as to outbound transactions, while the prevalence of technology is only directed related to open additions. On the contrary, an high share of goodwill in the portfolio is negatively correlated to openness, particularly as to revenues and costs.

As to the linkage with structural variables, our results show that only R&D share is statistically related to all features. In particular, an high share of R&D exhibits a weak negative correlation with age and dimension, a weak positive correlation with R&D

intensity and absorptive capacity, and a moderate positive correlation with R&D focalization of human resources. Further, the prevalence of products rights shows a weak positive correlation with age, and that of patents exhibits a weak positive correlation with R&D costs per employee ratio. Conversely, both an high share of goodwill and of contracts in the portfolio is negatively related to R&D focalization.

Finally, as to performances we found that both the prevalence of R&D and of product rights is directly related to company efficiency; on the contrary, an high share of goodwill is negatively correlated to it. The prevalence of product rights is also directly correlated with profitability, whilst both that of R&D and licenses is inversely related to it. A final remark regards growth; in fact, R&D and patents shares are directly correlated with annual increases of revenues, while the prevalence of goodwill is inversely related to growth.

Table 7 Pearson's correlation coefficients

Variable	R&D share	Technology share	Patents share	Product rights share	Licenses share	IT share	Other IPRs share	Goodwill share	Contracts share	Other int. share
Revenues ratio	,186(**)	-0,039	,211(**)	-0,09	0,071	0,09	0,087	-,249(**)	-0,109	-0,051
Costs ratio	,229(**)	-0,052	0,069	-0,114	0,045	0,093	-0,031	-,234(**)	0,01	0,099
Disposals ratio	-0,045	0,096	,179(**)	-0,072	-0,017	-0,012	-0,027	-0,045	-0,041	0,013
Additions ratio	-0,015	,164(*)	-0,022	-0,018	0,017	-0,089	-0,067	0,036	0,003	-0,071
Openness ratio	,195(**)	0,038	,190(**)	-0,118	0,07	0,048	0,015	-,247(**)	-0,078	-0,019
Age	-	-0,095	0,024	,181(**)	-0,062	-0,027	-0,053	0,125	0,034	0,049
No. of employees	-	-0,041	-0,03	0,076	-0,024	0,019	-0,07	0,125	0,039	0,086
R&D intensity	,178(**)	-0,062	-0,024	-0,047	0,011	-0,014	-0,005	-0,042	-0,063	-0,03
Closed R&D intensity	,199(**)	-0,067	-0,028	-0,05	0,02	-0,022	0,002	-0,05	-0,073	-0,035
R&D costs per employee	,338(**)	-0,079	,150(*)	-0,039	0,077	-0,013	0,068	-,260(**)	-,148(*)	-0,114
Revenues per employee	,179(**)	-0,028	0,093	,144(*)	-0,068	-0,123	0,016	-,131(*)	-0,038	-,135(*)
EBIT per employee	-0,093	0,043	-0,026	,177(**)	-0,071	-0,071	-0,034	0,031	0,043	-0,001
EBIT on assets	-,141(*)	0,041	0,022	,187(**)	-,323(**)	-0,021	-0,02	0,078	0,048	0,029
Revenues growth	,159(*)	-0,03	,191(**)	0,006	-0,056	0,093	0,052	-,241(**)	-0,068	-0,025

5 Discussions

Some discussions can be pointed out as to both the methodology and the results deriving from the application to bio-pharmaceutical and technology hardware & equipment industries.

Despite accounting standards, annual reports can be quite different one from the other in their form. As to revenues, in some cases those deriving from OI are directly disclosed in the income statement exhibited separately from net sales as other income, but in most cases revenues composition has to be detected in the notes. R&D cost composition is never disclosed directly in the income statement and the relative note has to be looked up. Further, some innovation-related costs - such as collaboration profit-sharing or acquired in-process R&D - can be recorded separately from R&D costs in the income statement. In particular, royalties and license fees are disclosed as operating expenses and can be reported as a separate item or included in cost of sales or in R&D costs. Obviously, the denominator of the costs ratio was built by considering all the costs related to the innovation process, even if they were not included in the R&D costs.

As regards disposals and additions of intangibles, two different approaches are used by IFRS and US GAAP. While the former explicitly discloses all additions and disposals - internal, in separate acquisitions and within BCMAs - in the note to intangibles, the latter only discloses additions from BCMAs in the notes regarding business combinations. Thus, in order to obtain the additions and disposals of separately acquired intangibles, the difference between the gross value at the end of the year, the gross value at the beginning of the year, the value of BCMA additions and any impairment charge or reclassification has to be performed. However, this assessment is approximate, because if the difference is positive, we record a separate addition but some separate disposals of lower value might have occurred and vice versa.

As to the analysis of intangible assets, the first evidence from the application is the variety of terminology used to define the same conceptual item within the different annual reports of companies. For this reason we grouped them in different categories⁴ to examine the composition of companies' portfolio.

Further, as mentioned above, we excluded from our sample all the companies for which only the gross carrying amounts of intangibles were disclosed in the notes to the

⁴ See Appendix A for the list of terms we identified for each category of intangibles.

consolidated balance sheet with a single depreciation rate not attributable to the specific categories of intangibles.

As to the application of the framework to R&D intense companies, some results can be pointed out.

First, we found that an high share of R&D or patents in companies' portfolio has a positive and significant effect on the degree of openness of their innovation processes. This is consistent with the results of cluster analysis, since *R&D* and *patents owners* are more open than the companies belonging to the other three clusters. On the contrary, the prevalence of goodwill in the portfolio is inversely related to openness, thus, companies pursuing acquisition strategies, i.e. *goodwill owners*, are less open in their innovation processes. Once again this is consistent with the results of cluster analysis, but also with the observation that BCMA's can be considered as hierarchy mechanisms. Further, as to the components of openness, we found a significant positive relationship between the R&D share with revenues and costs ratio. Thus, *R&D owners* are mainly characterized by inbound and outbound economic transactions. Differently, *patents owners* are mainly represented by open revenues and disposals; therefore, an high share of patents enables those companies to licensing or divesting the intangibles which are internally unexploited. Conversely, we found a negative relationship between the goodwill share with revenues and costs ratio. Thus, the OI processes of *goodwill owners* have a financial nature. Another consideration regards the companies having an high share of technology in their portfolio; their openness is mainly related to the acquisition of intangibles from outside.

Second, as to the structural variables, our results show that only the prevalence of R&D is statistically related to all features. In particular, an high share of R&D is inversely related to age and dimension and directly related to R&D intensity, absorptive capacity, and R&D focalization. These results are consistent with those of cluster analysis. Moreover, the prevalence of products rights is directly related with company age, and that of patents with R&D costs per employee ratio. On the contrary, both an high share of goodwill and of contracts in the portfolio is negatively related to R&D focalization.

Third, as regards performances, we found that both R&D and products shares are directly related to company efficiency; on the contrary, goodwill share is negatively correlated to it. As to profitability, the prevalence of product rights is directly correlated to it, whilst both that of R&D and licenses is inversely related to it. A final remark regards growth; in

fact, high shares of R&D and patents are directly correlated with annual increases of revenues, while the prevalence of goodwill is inversely related to them.

6 Conclusions

Despite the huge interest OI has raised in literature, it is still unclear how to quantify it and what is the relevance of intangible assets in open activities. The aim of this paper is to fill such gaps by providing an accounting framework for both analysing the composition of companies' intangibles portfolio and relating it to the degree of openness of their innovation processes.

The work is based on the analysis of annual reports, defining both the pecuniary flows related to OI transactions - costs and revenues from joint development projects, outsourcing of R&D services or intellectual property licensing and additions and disposals of innovation-related intangibles - and the composition of the internal stock of intangibles. The framework was then applied to a sample of 243 world top R&D spending companies in bio-pharmaceutical and technology hardware & equipment industries, whose annual reports for the fiscal year 2012 were analysed. Both the framework applicability and its explicative power and usefulness were validated.

The paper contributes to the existing literature on the measurement of open innovation from two perspectives. First, it focuses on the pecuniary dimension of the phenomenon by outlining all the economic and financial flows linked to open innovation activities and, after this perspective, it follows Chesbrough's suggestion. Second, it proposes a set of metrics which can be used not only for inbound processes but also for outbound ones, allowing to define the ways in which companies can capture value from the exploitation of their technology, i.e. the business models of companies. Further, the paper contributes to the understanding of the importance of intangible assets in open activities, by investigating which categories of intangibles mostly characterize open companies.

The paper addresses the need for operative, practical instruments, which can help managers to monitor the impact of the investment in intangibles on companies' innovation processes after an open-oriented approach. As a matter of fact, it proposes a set of metrics enabling to evaluate companies' core competences and relate them to the propensity to open up their innovation processes. Further, given the availability and objectivity of annual report figures, this accounting framework can also be used by

decision-makers for comparisons over time and space, also allowing the benchmarking with competitors.

Three limits can be outlined for the work. First, the disharmony of accounting standards over countries limited our analysis only to the companies which adopted either IFRS or US GAAP, resulting in an under-coverage of the sample. Second, being focused on accounting indicators, our framework can be used to analyse only the pecuniary dimension of open innovation (Dahlander and Gann, 2010) and thus it cannot be generalized to such industries as software, where sourcing and revealing are widespread. Third, the analysis is based only on one fiscal year, limiting the generalization of results. At the moment we are collecting data for a longitudinal analysis in order to highlight the trends in open innovation strategies pursued by companies.

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Appendix A. List of intangibles by category

R&D

Acquired R&D
Acquired research and development projects
Advance payments and projects under development
Capitalised expenditure for research and development work
Capitalized development costs
Capitalized development projects
Cleviprex milestones
Completed development works costs
Construction in progress
Deferred development costs
Development costs
Development expenditure
Development projects
Development projects, developed in-house
Development rights
Development services
Development works under construction
In-process R&D
Internally generated development costs
Payments made and capitalized development costs for current projects
Product development costs
R&D
Upfront milestone paid to third parties for development of products

Technology

Acquired and developed technology and software development cost
Acquired product technology
Acquired special technology
Acquired technology rights
Completed technology
Core and developed technology
Core developed technology
Core technology
Core technology and patents
Current technology
Developed and core technology and patents
Developed product technology
Developed technology
Developed technology and other
Developed technology rights
Existing and core technology-product
Existing technology
In-process technology
Patented and completed technology
Product and process technology
Purchased technology
Purchased technology and other intangible assets
System technology
Technology
Technology and patents
Technology intangibles
Technology know-how
Technology licenses
Technology-based

Patents

Acquired patent portfolio
Acquired patents, trademarks, licenses and know-how
Out-licensed patents
Patent licensing
Patent rights
Patented technology
Patents
Patents and acquired R&D
Patents and industrial property
Patents, licenses and similar rights, brands, trademarks and other
Patents, trademarks and tradenames

Product rights

Brand license
Brands
Currently marketed products
Developed product rights
Product intangibles
Product licenses
Product related intangibles
Product rights
Product marketing & distribution rights
Products and product rights
Products, trademarks and other rights
Trade names
Trademarks
Trademarks and brands
Trademarks and tradenames
Trademarks, patents and licences

Licenses

Acquired manufacturing facility production licenses
Licences and software
Licences, patents
License agreements
License agreements and other
License fees
License payment
Licenses
Production licenses

IT

Capitalized development costs for ERP
Capitalized software
Capitalized software licenses
Completed IT development projects
Computer programs
Computer programs and other
Computer software
Internal use software
Internally developed software
IT development projects in progress
IT system projects
IT-software in progress
Purchased computer software
Purchased internal use software, backlog and in-process R&D
Purchased software
Rights/web domains
Software
Software & databases
Software and patents
Software cost
Software development costs
Software licences
Software license and technology

Software licenses and other licenses

Wireless spectrum

Other IPRs

Industrial rights and similar rights and assets

In-licensed rights and patents

Intangible rights

Intellectual property

Intellectual property rights

Intellectual property rights acquired for currently marketed products

Intellectual property rights acquired for in-process R&D

Intellectual property rights, brands and other intangibles

Rights

Goodwill

Goodwill

Contracts, agreements & relationships

Backlog

Business relations

Collaboration agreements

Commercial relations

Concession agreements, software and license

Contract assets

Contract backlog

Contract-based

Contractual agreements

Contractual customer relationships

Contractual relationships

Covenants not to compete

Custode contracts, custode lists and distribution agreements

Customer and distributor relationships

Customer and partner relationships

Customer base

Customer base, trademarks and non-compete agreements

Customer contracts

Customer contracts and relationships

Customer contracts, support agreements and related relationships

Customer list

Customer list and other

Customer loyalty

Customer related intangible assets

Customer relationships

Customer relationships and other intangibles

Customer relationships, covenants not to compete, outstanding purchase and contracts

Development and supply agreements

Distribution agreements

Distribution network

Distribution rights

Existing agreements and customer relationships

Know-how and customer lists

Lease agreements

Maintenance agreements

Maintenance agreements and related relationships

Marketing authorisations

Marketing intangibles

Marketing know-how

Marketing rights

Multiplier contracts

Non-compete agreements

Non-compete arrangements

Power plant development arrangements

Purchase of contractual rights

Reseller & customer relationships

Royalty agreements

Supplier relationships

Supply agreement relationships
Support agreements
Wafer supply agreement
Other intangibles
Acquired concessions/similar rights
Acquisition-related intangible assets
Advance payment
Advances on intangible assets
Assets under construction and payments on account
Business system
Concession, patents and trademarks
Concessions and patents
Concessions, patents, licences and similar rights
Debt issuance costs
Deferred pension costs
Favourable energy credits
Golf club membership
Indefinite lived intangible assets
Intangible assets under construction
Intangible assets under development
Intangible capital work in progress
Internally developed intangible assets
Land use right
Leased assets
Leasehold interests
Note issuance costs
Operating concessions
Other acquisition related intangibles
Other intangibles
Payments on account and assets in course of construction
Regulatory drug approvals, trademarks, software, licences and similar rights
Unamortized intangible assets

Appendix B. The sample

R&D owners		Technology owners	
<i>Company</i>	<i>Segment</i>	<i>Company</i>	<i>Segment</i>
Alexion	BIO	4SC	BIO
Bavarian Nordic	BIO	Ablynx	BIO
Biotie Therapies	BIO	Ark Therapeutics	BIO
Cubist	BIO	Basilea	BIO
Epigenomics	BIO	Biogen Idec	BIO
Gilead	BIO	Biomarin	BIO
Intercell	BIO	BTG	BIO
Lexicon Pharmaceuticals	BIO	Morphosys	BIO
Newron	BIO	TiGenix	BIO
Paion	BIO	Transgene	BIO
TopoTarget	BIO	Canon	HW
Vernalis	BIO	Emulex	HW
Vertex	BIO	Wistron	HW
Axis	HW	Actelion	PH
Promethan World	HW	Alkermes	PH
Xaar	HW	Almirall	PH
Cosmo Pharmaceuticals	PH	Arena	PH
Elan	PH	Bioton	PH
Gedeon Richter	PH	Boehringer Ingelheim	PH
Medicines	PH	Bristol-Myers Squibb	PH
Oasmia Pharmaceutical	PH	Egis	PH
Onyx	PH	Endo	PH
Orexo	PH	Forest	PH
Muhlbauer	SC	GlaxoSmithKline	PH
ADVA Optical Networking	TLC	Laboratorios Farmaceuticos Rovi	PH
Amino Technologies	TLC	Novo Nordisk	PH
Net Insight	TLC	Oxford Biomedica	PH

Option	TLC	Pfizer	PH
Sepura	TLC	SkyePharma	PH
TCL Communication Technology	TLC	Zeltia	PH
Telit Communications	TLC	Advanced Digital Broadcast	SC
Patents owners			
<i>Company</i>	<i>Segment</i>	Avago Technologies	SC
Isis	BIO	Cavium Networks	SC
MediGene	BIO	Cypress Semiconductor	SC
Novozymes	BIO	Dialog Semiconductor	SC
Targacept	BIO	ELMOS Semiconductor	SC
Apple	HW	Imagination Technologies	SC
Delta Electronics	HW	Infineon Technologies	SC
Merck DE	PH	Linear Technology	SC
NicOx	PH	LSI Corp	SC
OmniVision Technologies	SC	Melexis	SC
Tessera Technologies	SC	MEMC Electronics Materials	SC
Triquint Semiconductor	SC	Microchip Technology	SC
HTC	TLC	Micron Technology	SC
Product rights owners			
<i>Company</i>	<i>Segment</i>	Murata Manufacturing	SC
Celgene	BIO	NXP Semiconductors	SC
Impax Laboratories	BIO	ON Semiconductor	SC
Pharming	BIO	Rambus	SC
Swedish Orphan Biovitrum	BIO	SanDisk	SC
AstraZeneca	PH	Semiconductor Manufacturing SMIC	SC
Dechra Pharmaceuticals	PH	Silicon Laboratories	SC
Eli Lilly	PH	Spreadtrum Communications	SC
Krka	PH	STMicroelectronics	SC
Lundbeck	PH	Teradyne	SC
Meda	PH	Adtran	TLC
Medivir	PH	Ciena	TLC
Merck US	PH	Filtronc	TLC
Omega Pharma	PH	JDS Uniphase	TLC
Orion Oyj	PH	Nokia	TLC
Salix	PH	Qualcomm	TLC
Stada Arzneimittel	PH	Research in motion	TLC
Warner Chilcott	PH	ZTE	TLC

Goodwill owners			
<i>Company</i>	<i>Segment</i>	<i>Company</i>	<i>Segment</i>
Affymetrix	BIO	Advanced Micro Devices	SC
Amgen	BIO	Advanced Semiconductor Engineering	SC
CSL	BIO	Advantest	SC
Galapagos	BIO	Aixtron	SC
Genus	BIO	Analog Devices	SC
Illumina	BIO	Applied Materials	SC
Life Technologies	BIO	ARM	SC
Nektar	BIO	ASM International	SC
NPS Pharmaceuticals	BIO	ASML Holding	SC
Qiagen	BIO	Atmel	SC
Silence Therapeutics	BIO	austriamicrosystems	SC
Sygnis Pharma	BIO	Broadcom	SC
United Therapeutics	BIO	Cree	SC
Willex	BIO	Fairchild Semiconductor	SC
Anoto	HW	FEI	SC
Bull	HW	Himax Technologies	SC
Dell	HW	Integrated Device Technology	SC
Electronics for imaging	HW	Intel	SC
Hewlett-Packard	HW	International Rectifier	SC
Intermec	HW	Intersil	SC
Kontron	HW	Kla-Tencor	SC
Lenovo	HW	Kulicke & Soffa	SC
Lexmark	HW	Lam Research	SC
Logitech international	HW	Lattice Semiconductor	SC
NCR	HW	Maxim Integrated Products	SC
NetApp	HW	MediaTek	SC
Pitney Bowes	HW	Mellanox Technologies	SC
Quantum	HW	Micronic Mydata	SC

Ricoh	HW	Microsemi	SC
VeriFone Systems	HW	NVIDIA	SC
Western Digital	HW	PMC-Sierra	SC
Xerox	HW	Qlogic (aprile)	SC
Xyratex	HW	RF Micro Devices	SC
Alcatel-Lucent	TLC	Silicon Image	SC
Arris	TLC	Skyworks Solutions	SC
Aruba Networks	TLC	Smartrac	SC
Avaya	TLC	Suss MicroTec	SC
Brocade Communications Systems	TLC	Texas Instruments	SC
Calix	TLC	Wolfson Microelectronics	SC
Cisco Systems	TLC	Xilinx	SC
Corning	TLC	Abbott	PH
Ericsson	TLC	ALK-Abello	PH
F5 Networks	TLC	Allergan	PH
Finisar	TLC	Biotest	PH
GN Store Nord	TLC	CHR Hansen	PH
Harmonic	TLC	DiaSorin	PH
Harris	TLC	Exelixis	PH
Huawei Technologies	TLC	Galenica	PH
Juniper Networks	TLC	GW Pharma	PH
Motorola	TLC	Hikma	PH
PACE	TLC	Hospira	PH
Parrot	TLC	Johnson & Johnson	PH
Plantronics	TLC	Novartis	PH
Polycom	TLC	Recordati	PH
Radiall	TLC	Roche	PH
Riverbed technology	TLC	Sanofi-Aventis	PH
Sierra Wireless	TLC	Teva	PH
Sonus Networks	TLC	UCB	PH
Spirent Communications	TLC	Vectura	PH
Tecnotree	TLC	Vetoquinol	PH
Vislink	TLC		

Knowledge Transfer in Regional Industry Clusters for Organizational Resilience

Peter Schmiedgen*, Jörg Rainer Noennig

Junior Professorship for Knowledge Architecture
Department of Architecture
TU Dresden (Dresden University of Technology)
01062 Dresden, Germany

* *Corresponding author*

Structured Abstract

Purpose – The aim of the current study was to identify and analyse success factors of knowledge transfer in innovation processes of regional industry clusters that increase organizations' and, in turn, clusters' resilience.

Design & Methodology – The research process consists of three parts: literature review looking at success factors for inter-organizational knowledge transfer in innovation processes, empirical study on the identified factors, and statistical as well as analytical evaluation of the results. Object of the study was Silicon Saxony, Germany – a regional high-tech cluster of producing and developing companies, research and education institutions, suppliers, service providers, and consultancies. After combining the identified factors, derived hypotheses concerning the dependency and correlation were analysed using a standardized online survey: knowledge- and innovation managers of all member organizations of the Silicon Saxony Association were contacted. A total of 55 representatives completed the questionnaire.

Originality & Value – Up to now, research in this field is little and studies are mostly theoretical or qualitative. The current quantitative-empirical study puts dependencies and correlations of factors in evidence that support inter-organizational knowledge transfer in innovation processes building up resilience. Innovation culture was identified as the central factor. Furthermore, with the results four types of organizations were identified and characterized by indicating their participation in the regional industry cluster and their understanding of knowledge transfer.

Practical implications – The results of the study offer a cross-disciplinary argumentation for managers to improve innovation culture and their participation in clusters, which in turn, increases their organizational resilience. Managers are equipped with instruments measuring success factors for knowledge transfer. With the results they can identify weak points in their organization and improve them.

Keywords – Innovation Management, Knowledge Management, Cluster Management, Resilience Management, Communication Management

Paper type – Academic Research Paper

1 Introduction

Regional industry clusters (RICs) are known as essential drivers of innovation and build strong networks that can support organizations in turbulent times. These two advantages of RICs are based on knowledge transfer between the organizations increasing their resilience to global competition (i.e. Langford, 2010; Mattsson, 2009; Porter, 1998, 2000; Wei, 2012). Because of these regional synergies, they are often part of national and international funding-programs developing sector-specific industry.

Often the exchange of knowledge does not happen in the expected amount because the success factors for the transfer are not exactly known (Blomkvist, 2012; Pinho, Rego, & Cunha, 2012). Up to now, research in this field is very little and most analyzes are theoretical or qualitative. Filling this gap, the aim of the current study was to identify and analyze success factors of knowledge transfer in innovation processes of RIC that increase also organizations' and, in turn, clusters' resilience.

Upon this introduction, the paper starts with a theoretical framework of the topic and an introduction of the key terms in chapter two. Chapter three explains the research design of the current study, introduces the identified success factors of inter-organizational knowledge transfer in innovation processes in RIC connected to resilience approaches, and describes the derived hypothesis. Chapter four gives an overview to the used methods and in chapter five the findings of the statistical analysis are presented.

2 Theoretical framework

Innovation management: In literature "innovation" has a huge range of different definitions. This study is based on a wide understanding of this term. Innovations are in seen in different levels – innovation in...

- products / services
- processes / methods
- strategies / business models
- organisational structures
- social systems

Besides the multi-level understanding of innovation, innovation management has a diverse functional spectrum, too: On the one hand, innovations can't be managed but, on

the other hand, innovations can also not be taken for granted. Therefore, the task of innovation management is not only planning, organizing, leading, evaluating, and deploying personnel in innovation processes but also improving a holistic creative environment and indicating important impact ranges (Richardson, 2010; Tidd & Bessant, 2009). Consequently, innovation management has the main task to support a wide understanding of its' broader potentials and is not only responsible for inventions in research and development departments (Müller-Prothmann, 2006). With the increasing adoption of open innovations strategies the borders of innovation management disappeared and made it even more complex to meet all stakes of involved internals and externals. One of the main factors in these processes is knowledge transfer.

Inter-organizational knowledge transfer in innovation management: Sharing knowledge is an essential part of innovation processes and thus, a main challenge for employees that are responsible for organizational innovation management (Billington & Davidson, 2013; Hayes & Fitzgerald, 2009; Love & Roper, 2009). In literature a lot of models and approaches can be found for intra-organizational knowledge sharing (Fang, Yang, & Hsu, 2013; Pinho et al., 2012). But knowledge transfer triggered by open innovation strategies is still mainly unexplored field. Thus, the current study focuses the exchange of knowledge between organizations in innovation processes.

Resilience in regional industry clusters: RICs are concentrations of legally independent organizations in a region that are operating in the same, similar, or complementary industrial sectors. Clusters are geographic concentrations of interconnected companies, specialized suppliers and service providers, firms in related industries, and associated institutions (e.g. universities, standards agencies, and trade associations) in particular fields that compete but also cooperate (Porter, 1998). An association membership connects them and builds an additional brand. The aim of the cluster is to increase competitive advantages over organizations that are not part of the cluster. For that, the organizations indirectly and directly support each other (Porter, 1987, 1991, 2000):

- Indirect support: For example, other successful companies in the cluster attract new customers (B2B and B2C), highly educated employees (high potentials), and new company locations.

- Direct support: For example, other organizations cooperate, collaborate, share resources, and build long-term business links with the own organization.

These are in short the advantages of RICs. Of course, there are also disadvantages that the current study does not focus.

The question is: how do these factors support organizational resilience? For a long time in context of organizations, the term resilience was understood as the capability to react fast to crises, to learn from them, and to be “immune” in future. Newer approaches added the competence to start an innovation loop while counteracting disturbances and discussed the role of regional clusters building a strong network in dynamic markets (Giroux, 2012; Giroux & Prior, 2012; Malone, 2002; Nielsen, 2006; Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008; Seville, 2008). The symbiotic of RIC-relationships and their co-evolutionary orientation makes organizations, and in turn the cluster resistant against disturbances. Especially in times of increasing unforeseeable crisis or disasters this empowers organizations resilience by building up strong and flexible networks of knowledge (Brandenburger & Nalebuff, 1996; J. Wang, 2007; W.-T. Wang & Belardo, 2009). Additionally, innovation loops can be structured and established together. Thus, learnings can be shared and costs as well as resources of these innovation processes can be split to build up resilience (Brandenburger & Nalebuff, 1996).

In conclusion to the theoretical background and the current state of research, this study focuses the exchange of knowledge in innovation processes between organizations that are located in the same region and operate in a similar sector as an essential part for creating resilience.

3 Research design

3.1 Research process

The research process consists of three parts: literature review investigating success factors for inter-organizational knowledge transfer in innovation processes in RIC connected to resilience approaches, empirical study on the identified factors, and statistical as well as analytical evaluation of the results.

In the first step, relevant literature was sighted focussing on factors increasing and supporting inter-organizational knowledge transfer processes that are connected to resilience approaches in the research fields of innovation management, communication management, and knowledge management. Then, hypotheses were formulated based on assumed dependencies. Finally, a study was carried out analysing these hypotheses. Object of the empirical study was Silicon Saxony – a regional high-tech cluster of producing and developing companies, research and education institutions, suppliers, service providers as well as consultancies. All of these organizations are located in Saxony/Germany and are operating in the following branches: micro- and nano-technologies, software, applications, smart-systems, and energy-systems.

3.2 Research focus: success factors for knowledge transfer

The following success factors improving the inter-organizational knowledge transfer were identified:

Awareness: Organizations that are not aware of the meaning of inter-organizational knowledge transfer do not set up structures, cultures, and strategies supporting internal as well as external innovation management. As a result the network-support in crisis gets more improbable. This, in turn, affects the whole cluster cause its resilience is also based on a high number of connected members (McAslan, 2010; Pinho et al., 2012; Szulanski, 1996, 2000).

Face-to-face communication: Inter-organizational knowledge transfer consists of complex communication processes. Different mind-sets, educational backgrounds, and even specialist-languages of all involved parties hinder an efficient exchange of know-how. Consequently, all senses must be used and instant check-backs should be possible (synchronicity). Up to know only face-to-face communication can support these needs. Especially, complex, unforeseen situations require barrier-free communication channels (Daft & Lengel, 1984, 1986; Daft, Lengel, & Trevino, 1987; Klitmoller & Lauring, 2013).

Involvement: Knowledge transfer is an act of communication and it is widely spread that managers think that good communication is always naturally given. But knowledge transfer is complex and with the support of professional communication management it can be improved (Chua, 2004). Furthermore, the characteristic of innovation culture is shaped by the involvement of all departments in the organization.

Time: One of the most recurring factors in literature is time. If the management does not concern time for workshops, meetings, or events in schedules of knowledge carrying employees the bidirectional transfer won't happen. But also the person him or herself has to reserve available time to interact with representatives of other organisations (Pinho et al., 2012; Szulanski, 1996, 2000).

Innovation culture: Every organization evolves an individual culture that is part of the corporate identity and includes shared rituals, beliefs, opinions, norms, values, behaviours, etc. The innovation culture represents the attitude towards innovative processes and their impacts to the organization. A high innovation culture is seen as an essential factor to increase the intra- and inter-organizational knowledge transfer. In these environments all employees are called upon to actively share their knowledge in innovation processes regardless of their position or hierarchical level (Hall & Goody, 2007; Jones, Cline, & Ryan, 2006; Whitman & Panetto, 2006). There are regulated incentive systems that support idea creation and it is known that the success of the organization depends on on-going innovations - even in times of crisis.

Understanding of knowledge transfer: For an efficient knowledge transfer the advantages of this process and its long-terms effects must be known. A wide understanding means that employees not only reduce the exchange of know-how on items focusing a direct connection to financial aspects (i.e. acquisition of new customers, applications for funding, or increasing sales) (Earl, 2001; Faucher, Everett, & Lawson, 2008; Paulin, 2011; Shaw, Hall, Edwards, & Baker, 2007; Wei-Tsong & Belardo, 2005). If they understand the broader potentials they can actively attract transfer partners that help also to overcome disturbances.

Open innovation: If an organization shuts down its gates it may not lose important IP. But on the other hand, it is isolated from the rest and "innovation doesn't take place in isolation [...]" (Tidd & Bessant, 2009, p. 62). The same principle works for unsteady market developments: nowadays organizations have a better chance to survive with a strong (knowledge-) network (Billington & Davidson, 2013; Chesbrough, 2003).

Cluster participation: Just to be a formal part of a RIC is not all. Most of the potentials and advantages of a RIC can only be used by an active participation. Thus, organizations must actively interact and share their knowledge to be recognized and build up strong and save relationships (Porter, 2000).

State of development: The state of development of knowledge transfer is a self-assessment and a benchmark between organizations. If an organization is critical with its performance it has recognized its backlog-demand to other members of the cluster and sees possible starting points for improvement (see also Pallier et al., 2002).

3.3 Hypotheses and research model

Hypothesis 1: Knowledge transfer in RICs is seen as an important issue in future.

H1: μ Importance will increase $>$ μ Importance will remain the same or will decrease

H0: μ Importance will increase \leq μ Importance will remain the same or will decrease

Hypothesis 2: Knowledge transfer in innovation processes via face-to-face is still the preferred form of communication within a RIC.

H1: μ Face-to-face communication $>$ μ Any other forms of communication

H0: μ Face-to-face communication \leq μ Any other forms of communication

Hypothesis 3: The more the department of communication management is involved, the higher is the innovation culture.

H1: μ Innovation culture with high involvement of communication management $>$ μ Innovation culture with low involvement of communication management

H0: μ Innovation culture with high involvement of communication management \leq μ Innovation culture with low involvement of communication management

Hypothesis 4: The more the responsible employee spends time on innovation management, the higher is the innovation culture.

H1: μ Innovation culture with high work-share on innovation management $>$ μ Innovation culture with low work-share on innovation management

H0: μ Innovation culture with high work-share on innovation management \leq μ Innovation culture with low work-share on innovation management

Hypothesis 5: The higher the innovation culture, the higher is the participation in the RIC.

H1: μ Participation in RIC with high innovation culture $>$ μ Participation in RIC with low innovation culture

H0: μ Participation in RIC with high innovation culture \leq μ Participation in RIC with low innovation culture

Hypothesis 6: The higher the innovation culture, the wider is the understanding of knowledge transfer in innovation management.

H1: μ Understanding of knowledge transfer in innovation management with high innovation culture $>$ μ Understanding of knowledge transfer in innovation management with low innovation culture

H0: μ Understanding of knowledge transfer in innovation management with high innovation culture \leq μ Understanding of knowledge transfer in innovation management with low innovation culture

Hypothesis 7: The higher the innovation culture, the higher is the state of development of knowledge transfer in innovation management.

H1: μ State of development of knowledge transfer in innovation management with high innovation culture $>$ μ State of development of knowledge transfer in innovation management with low innovation culture

H0: μ State of development of knowledge transfer in innovation management with high innovation culture \leq μ State of development of knowledge transfer in innovation management with low innovation culture

Hypothesis 8: Organizations with an open innovation strategy have a higher state of development of knowledge transfer in innovation management than organization with a closed innovation strategy.

H1: μ State of development of knowledge transfer in innovation management with open innovation strategy $>$ μ State of development of knowledge transfer in innovation management with closed innovation strategy

H0: μ State of development of knowledge transfer in innovation management with open innovation strategy \leq μ State of development of knowledge transfer in innovation management with closed innovation strategy

Figure 1 shows the presumed connections between the identified success factors of knowledge transfer and assigns the described hypotheses. Based on this theoretical background a questionnaire was created including all operationalized success factors (see appendix) and some further questions to characterize the persons and their organizations in the sample.

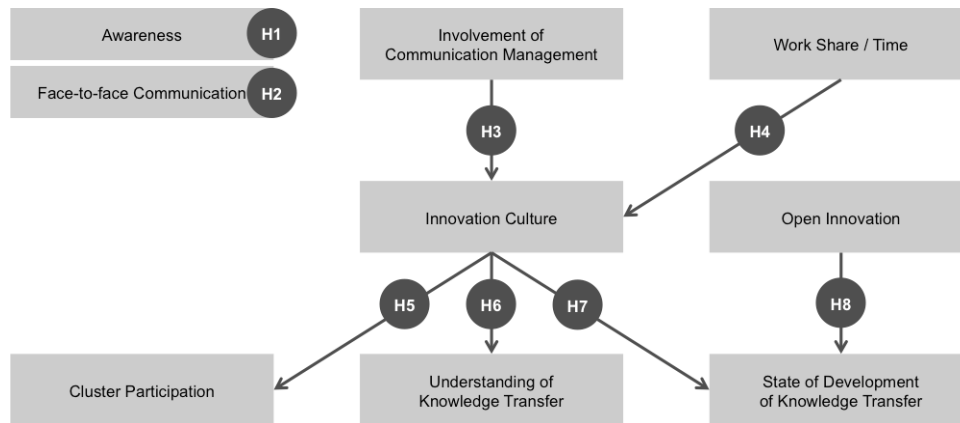


Figure 1: Research model

4 Methods

4.1 Sample, data collection and analysis

An invitation was sent via email distribution lists to the member-organizations of Silicon Saxony. It included the request to forward the email to the person in the organizations who is responsible for innovation management. Furthermore, the email consisted of a short explanation of the research interests, a statement of support for the research of the Silicon Saxony Association, and a link to the online questionnaire. All collected data was anonymous.

The questionnaire was online from December 7th 2010 to January 16th 2011. Two reminder emails were sent in this period within an interval of two weeks. A total of 55 organizations (24% response rate) completed the questionnaire. In a few cases of the following statistical analysis the sample is a bit lower because only 42 of 55 answered all questions. The rest filled out 75% of the questions or more – datasets with less response were filtered out.

The data was statistically analysed following the hypothesis and using SPSS-Software. The following statistical tests were used: univariate Anova for analysis with mean values and Spearman's rank correlation coefficient (r_s) for analysis of correlations of metrical data or recoded ordinal data.

4.2 Indices and recoding

For the analysis of the hypothesis several indices were created out of a set of appropriate questions:

Innovation strategy: The respondents had to evaluate eight statements in question 3 (Q3 see appendix). These statements were randomized in their order and consisted of four characteristics of open innovation and four of closed innovation following Chesbrough 2003. In the first step, all values of closed innovation were multiplied with (-1) and then the mean values of all answers were calculated. The index “Innovation Strategy” provides information if the organization has an open or closed innovation strategy – the higher the value, the more open (scale: -6 to 6). Organizations with negative values were grouped in category “Closed Innovation” and organizations with a value of 0 or higher were grouped in category “Open Innovation”.

Innovation culture: This index is based on Q4 (see appendix). The mean value of the answers to three statements focussing the innovation culture was calculated (scale: 1 to 6). The higher the index value, the higher is the innovation culture. For some analysis and figures a dichotomous variable of the index “Innovation Culture” was used: organizations with a value 4 or lower have a low innovation culture and respondents with a value above 4 have a high innovation culture.

Understanding of knowledge transfer: The index is based on Q5 (see appendix). The items focusing a direct connection to financial aspects were filtered out to evaluate a wide understanding of knowledge transfer in innovation management: “acquisition of new customers”, “application for funding”, and “increasing sales”. In the second step, the mean value was calculated of the remaining six items (scale: 1 to 6). The higher the index, the wider is the understanding of knowledge transfer in innovation management.

Cluster participation: The index is based on Q6 and Q7 (see appendix). In the first step, Q6 was recorded: If the organization was active in a working group and in a sub-cluster it got value 2. If it was only active in one of both it got value 1. Members of Silicon Saxony that were neither active in a working group nor in a sub-cluster got value 0. As a second step, the mean value of interests in activities in the cluster (Q7) was calculated and added to the values of Q6. The sum builds the index “Cluster Participation” (scale: 0 to 8). The higher the index value, the higher is the participation in the regional cluster.

5 Findings

5.1 Sample characteristics

The asked innovation managers had an average professional experience in the field of innovation management of 10.9 years. They spend 22.0% of their work time in innovation management. 59.5% have a degree in engineering, 23.8% in natural sciences, and 11.9% in economics. The organizations they work for focus mostly on innovations in products & services (\bar{O} rank: 1.59), processes & methods (\bar{O} rank: 2.27), and strategies & business models (\bar{O} rank: 2.61). Their fields of competence are mainly the manufacturing industry (45.5%) and service & consulting (34.5%). More than a half of the organizations have 50 or more employees. The following table 1 shows all recorded data of the organizational characteristics.

Table 1: Organisational Characteristics

Field of competence	%	Types of innovation	\bar{O} Rank
Manufacturing Industry	45.5	Products / Services	1.59
Service / Consulting	34.5	Processes / Methods	2.27
Non-University Research and Education	9.1	Strategies / Business Models	2.61
University Research and Education	5.5	Organisational Structures	3.85
Supplier	3.6	Social Innovations	4.42
Other	1.8		
Sector	%	Employees	%
Semiconductor	58.2	1 to 10	25.5
Equipment	25.5	11 to 50	21.8
Electronic	25.5	51 to 100	16.4
Computer	21.8	101 to 500	23.6
ICT	18.2	501 to 1,000	5.5
Automotive	14.5	1,001 to 5,000	5.5
Photovoltaics	10.8	5,001 to 10,000	0.0
Medical Technology	9.1	More than 10,000	1.8
Environmental Technology	7.2		
Aerospace Technology	3.6		

5.2 Analysis of hypotheses

Hypothesis 1 - Knowledge transfer in RICs is seen as an important issue in future: More than two thirds of the responsible persons for innovation management see an

increasing importance of knowledge transfer between organizations in RICs (see fig. 2). Hypothesis 1 is confirmed.

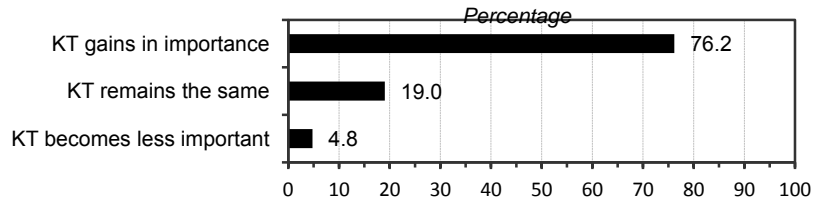


Figure 2: Q11 - What is your prediction of the future role of knowledge sharing in innovation management between organizations in regional industry clusters? (n = 42)

Hypothesis 2 - Knowledge transfer in innovation processes via face-to-face is still the preferred form of communication within a RIC: Figure 3 shows that knowledge transfer via face-to-face with 47.6% is the most used communication form in RICs. It is followed by internet-platforms (38.1%) and email (28.9%). New media channels like video-chats (42.9%) or wikis (40.5%) are often used for internal knowledge transfer but not in the innovation management within the RIC. Hypothesis 2 is confirmed.

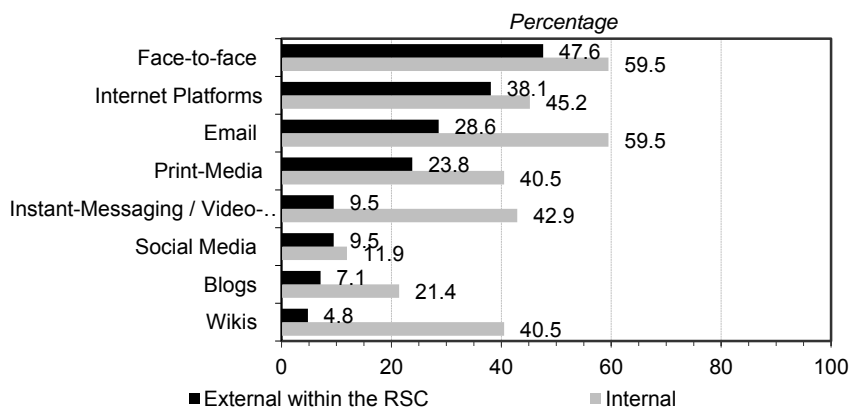


Figure 3: Q10 - When you think of the internal and external communication: how are the following channels used for knowledge sharing in innovation management. Please specify if these channels are used "internal" or "external within the regional industry cluster". (n = 42)

Hypothesis 3 - The more the department of communication management is involved, the higher is the innovation culture: By comparing the mean values of the involvement of the communication management departments in organizations with a high innovation culture ($\bar{x} = 4.00$) and a low innovation culture ($\bar{x} = 2.92$) a significant difference ($p = .027$) can be confirmed. A significant correlation ($r_s = 0.348$; $p = .038$) can also be identified between innovation culture and involvement of the communication management department (see also fig. 4). Hypothesis 3 is confirmed.

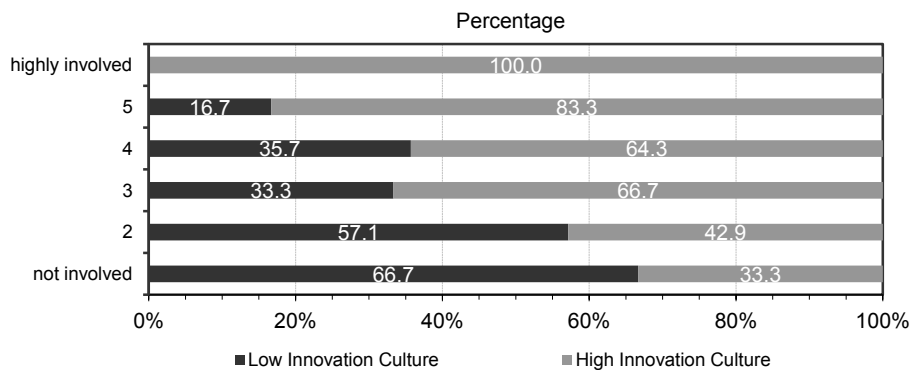


Figure 4: Q2 - Please think of all innovation processes in your organization: how much are representatives of the following departments involved in innovation processes? Please use a scale from 1 "not involved" to 6 "high involved". & Index Innovation Culture (n = 36)

Hypothesis 4 - The more the responsible employee spends time on innovation management, the higher is the innovation culture: In organizations with a low innovation culture the mean value of the work-share for innovation management is 14.2% and 26.8% in organizations with a high innovation culture. There is also a significant correlation between both variables ($r_s = 0.427$; $p = .005$). Hypothesis 4 is confirmed.

Hypothesis 5 - The higher the innovation culture, the higher is the participation in the RIC: A not significant trend ($p = .063$) could be identified between innovation culture and cluster participation. Hypothesis 5 is not statistically confirmed but a trend could be observed.

Hypothesis 6 - The higher the innovation culture, the wider is the understanding of knowledge transfer in innovation management: There is a significant correlation between

innovation culture and the understanding of knowledge transfer in innovation management ($r_s = 0.419$; $p = .005$). Hypothesis 6 is confirmed.

Hypothesis 7 - The higher the innovation culture the higher is the state of development of knowledge transfer in innovation management: No significant correlation could be measured ($r_s = 0.212$; $p = .177$) but a visible trend was identified in figure 5. Hypothesis 7 is not statistically confirmed.

Hypothesis 8 - Organizations with an open innovation strategy have a higher state of development of knowledge transfer in innovation management than organizations with a closed innovation strategy: Figure 6 shows a visible trend between innovation strategy and development of knowledge transfer but it could not be proved statistically ($r_s = 0.209$; $p = .196$). Hypothesis 8 is not statistically confirmed.

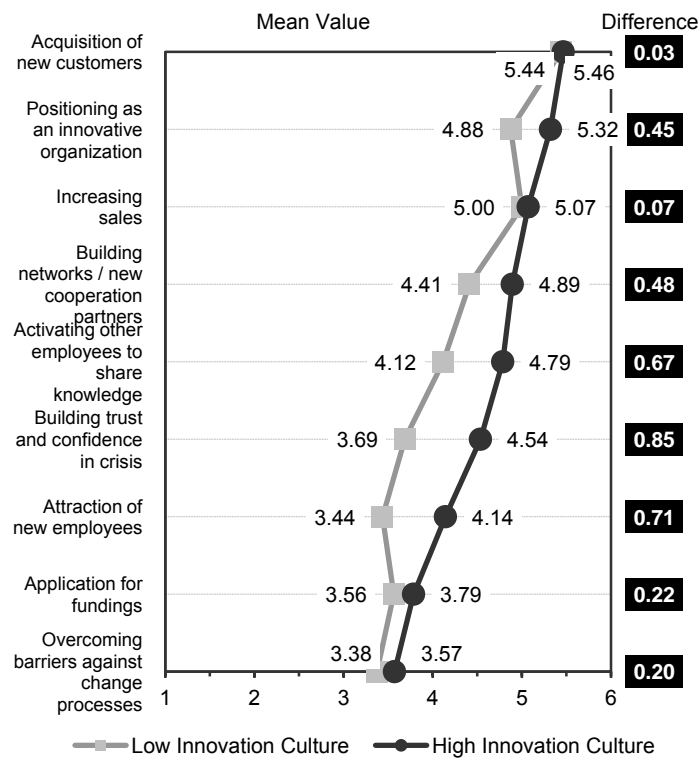


Figure 5: Index Innovation Culture & Q5 - How would you evaluate the following aim of internal and external knowledge sharing? Please use a scale from 1 “unimportant” to 6 “very important”. (n = 44 to 45)

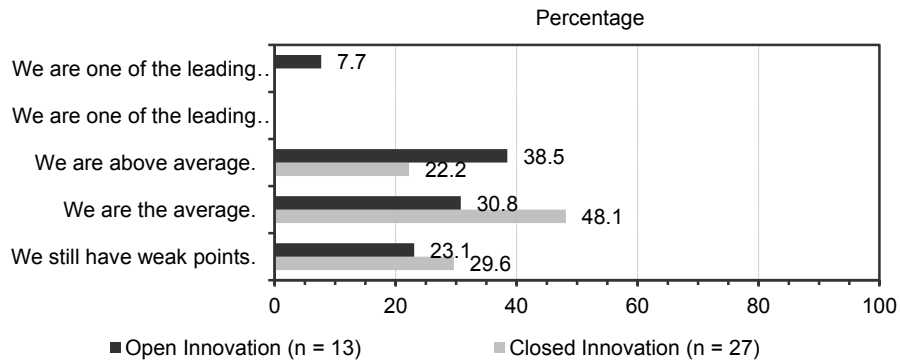


Figure 6: Index Innovation Strategy (Q3) & Q8 - How would you evaluate the state of development of your organizations knowledge sharing in innovation management in comparison to other organizations of the regional cluster Silicon Saxony?

5.3 Typology of organizational knowledge transfer in RIC

With the results of the indices “cluster participation” and “understanding of knowledge transfer” four different types of organizations were identified: Champions, Single Player, Potentials and Traditionalists (see fig. 7)

Champions: Champions have high cluster participation and a wide understanding of knowledge transfer. These organizations relatively tend to an open innovation strategy (41.7%) and have a high innovation culture (75.0%). The state of development of their own knowledge transfer is evaluated critically (“average or worse” = 70.0%).

Single Player: The second type has a wide understanding of knowledge transfer but its participation within the cluster is low. These organizations have a closed innovation strategy (77.8%) and a high innovation culture (77.8%). The state of development of their own knowledge transfer is seen critically.

Potentials: Organizations with limited understanding of knowledge transfer and high cluster participation belong to the third type. They have a closed innovation strategy (75.0%) and a high innovation culture (62.5%). The state of development of their own knowledge transfer is seen positive (“above-average or better” = 71.4%).

Traditionalists: The last group of identified organization types have a limited understanding of knowledge transfer and the participation in the cluster is low. These

organizations have a closed innovation strategy (71.7%) and a low innovation culture (53.3%). The state of development of their own knowledge transfer is seen critically (“average or worse” = 86.6%).

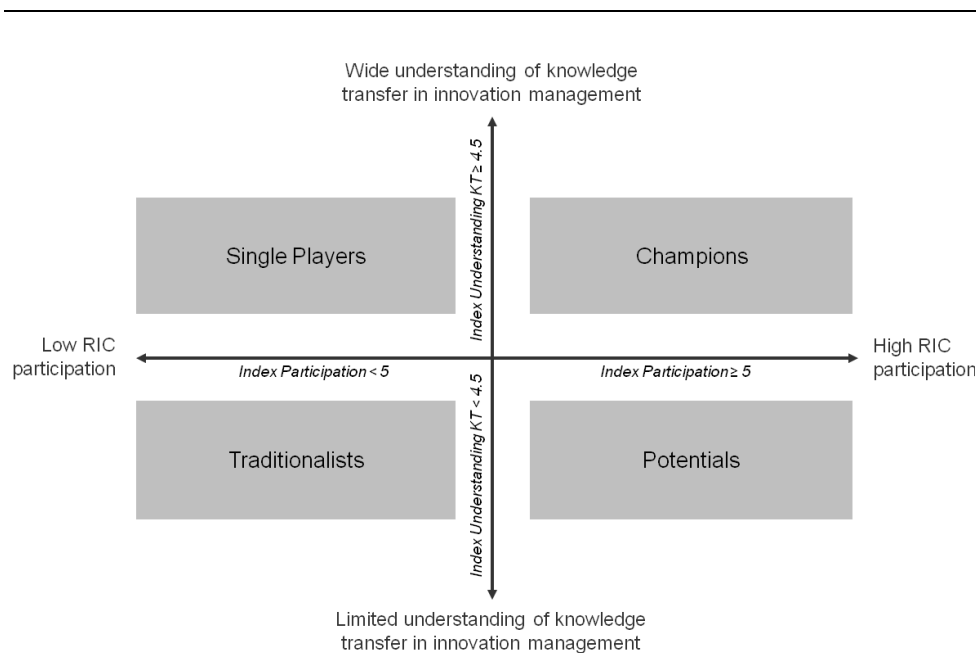


Figure 7: Types of organizations in RIC

6 Discussion

6.1 Implications

The results show that innovation managers expect an increasing importance of knowledge transfer in RICs. It is expected that the capability to support and actively design knowledge transfer is getting part of the future roles of innovation managers. In addition, personal communication will still be the most used channel to exchange knowledge. New media will although be used but more as additional channels. Thus, innovations managers in RICs have to keep their rhetorical skills and should also animate employees to prefer face-to-face communication instead of the most time saving, comfortable, but in these cases inefficient channels.

The current study has proved that innovation culture is one of the central factors for successful knowledge transfer in RICs. With the results of hypothesis 1 and 2 it was shown that the involvement of professional communication management in innovation processes increases the innovation culture. Thus, innovation managers should consult communication professionals from time to time checking if the internal and external knowledge transfer processes are efficient, because this, in turn, affects the environment for knowledge transfer. The second factor that influences innovation culture is the spent time for innovation management. Managers should keep in mind that the more time on innovation management is spent the more the innovation culture grows. At least a small work-share for appointments connected to knowledge sharing should be implemented in the schedules of every employee.

The findings of hypothesis 3 and 4 show that with time and the integration of departments the innovation culture increases. A high innovation culture in turn causes a higher participation in the RIC and a wider understanding of the potentials of knowledge transfer. In the light of the results of hypothesis 5 and 6, innovation culture should not only be seen as an internal strength but also as an enabler for external bidirectional knowledge transfer in RICs that offers possibilities far beyond financial aspects. As mentioned above this is the basement for building up organizational and cluster resilience. Organizations management should be aware of that in future.

Four different organization-types considering the knowledge transfer in clusters could be identified with the data:

- The *Single Players* are organizations that have a highly developed innovation culture but seem to have prejudices to share their knowledge. Further investigations should identify the reasons of their reservation (i.e. protection of IP, missing trust, perceived superiority) so that these barriers can be removed.
- The *Traditionalists* have a to learn the possibilities of knowledge transfer first. They are stuck in old structures. It is the task of other organizations and the cluster association to explain the advantages of being part of a RIC.
- The *Potentials* are very active in the cluster but they still not have developed a wide understanding for knowledge transfer. Consequently, they are not using they full potential.

- The *Champions* have understood the advantages of knowledge transfer in RIC and make actively use of it.

6.2 Limitations and future research

The current study has an explorative character, which in turn offers many starting points for future research. In the following the central limitations are explained in short:

The small sample limits the statistical analysis and also decreases statistical power. Nevertheless some statistically correlations and differences were observed. This argues in favour of the quality of the used instruments and the strength of effects between the identified factors. Because of the few quantitative studies in this research field the questions in the survey had partly no proven background and were transformed from statements in literature. For example in the analysis of hypothesis 7 and 8 a visible trend could be observed but was not statistically confirmed. This could be an indicator for a non-valid instrument.

In general the object of interest is a very complex one and even in literature there are many different perceptions of the understanding of e.g. knowledge transfer or innovation culture. In addition to that, the respondents had no possibility for check-backs. Personal interviews were not possible because of personnel and financial restrictions. These circumstance effect the quality of answers.

Another limitation is that the respondents selected themselves. This has the effect that probably mostly innovation managers completed the survey that were familiar with the topic. Furthermore, it could not be checked if the target persons actually filled out the online questionnaire. Furthermore, the answers provide only the view on the organization of the representative.

The current study was analysing only one RIC. Future research should identify possible differences in correlations between different clusters, add an isolated control group of organizations, and use greater samples to increase the statistical power of the results. Before that, the instruments measuring the factors should be improved. In additional studies the different cluster types should be analysed more in detail. Also a long-term investigation on their business performance could be tracked to strengthen the identified roles.

7 Conclusions

The paper analysis the central factors for inter-organizational knowledge transfer in RICs connected to resilience approaches. It could be shown that the importance of this topic will increase in future and that face-to-face communication is the central channel for transferring knowledge in RIC. Innovation culture was identified as an important success factor for knowledge transfer. It is depending on the work-share of innovation managers that is spent on supporting innovation processes and the involvement of other departments - especially professional communication managers. The analyses prove that innovation culture has, in turn, a positive effect on the participation in RICs and creates a wide understanding of the aim and potentials of knowledge transfer. It can be concluded that organizations should support employees to actively share their knowledge in innovation processes, that the management should offer attractive incentive systems, and that innovations should be seen as a central part of the organizations' mission. All these factors increase the benefits from being part of a cluster. This improves not only the resilience of the organization but also of the whole cluster.

The paper includes instruments measuring the success factors for inter-organizational knowledge transfer and provides an argumentation to let employees spend more time in knowledge sharing. With the typology of organizations in RIC the specific roles of organizations can be identified. By knowing the type of organization and its' characteristics the starting point for improvement is identified. Future research should reproduce these results with additional factors, bigger samples, and different clusters. Investigations on the used instruments could also improve the quality of data.

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Appendix - Questionnaire

Q1 Types of innovations

“Innovation” is a broad term: what kinds of innovations are mainly focused in your organization. Please sort the following types of innovation. Start with the most important.

Items (randomized)	Mean value (n = 45 to 51)
01 Products / Services	1.59
02 Processes / Methods	2.27
03 Strategies / Business Models	2.61
04 Organizational Structures	3.85
05 Social Innovations	4.42

Q2 Innovation structure

Please think of all innovation processes in your organization: how much are representatives of the following departments involved in innovation processes? Please use a scale from 1 “not involved” to 6 “highly involved”.

Items (randomized)	Mean value (n = 21 to 47)
01 Research & Development	5,55
02 Production	4,21
03 Human Resources	3,37
04 Marketing	4,64
05 Communication Management	3,62
06 Legal	2,52
07 Finance	3,83

Q3 Innovation strategy

When you think of your organization strategic view in innovation management: how strong would you agree to the following statements? Please use a scale from 1 “totally disagree” to 6 “totally agree”.

Items (randomized)	Mean value (n = 44 to 46)
01 The company that gets an innovation to the market first will win.	4.76
02 We should control our IP, so that our competitors don't profit from our ideas.	4.87
03 To profit from R&D, we must discover it, develop it, and ship it ourselves.	4.22
04 The smart people in the field work for us.	4.62
05 Not all the smart people in the field work for us. We need to work with smart people inside and outside the company.	4.61

06 Building a better business model is better than getting to the market first.	4.55
07 We should profit from others' use of our IP, and we should buy others' IP whenever it advances our business model.	2.62
08 External R&D can create significant value: internal R&D is needed to claim some portion of that value.	3.38

Q4 Innovation culture

The importance of innovation differs from organization to organization: how about your organization? Please evaluate the following statements. Please use a scale from 1 "totally disagree" to 6 "totally agree".

Items	Mean value (n = 48)
01 All employees are called upon to actively share their knowledge in innovation processes regardless of their position or hierarchical level.	5.04
02 There are regulated incentive systems for all employees that support idea creation.	3.04
03 The success of the organization depends on on-going innovations	5.10

Q5 Understanding of knowledge transfer

How would you evaluate the following aim of internal and external knowledge sharing? Please use a scale from 1 "unimportant" to 6 "very important".

Items (randomized)	Mean value (n = 44 to 45)
01 Overcoming barriers against change processes	3.50
02 Activating other employees to share knowledge	4.53
03 Acquisition of new customers	5.45
04 Positioning as an innovative organization	5.16
05 Building trust and confidence in crisis	4.23
06 Building networks / find new cooperation partners	4.71
07 Application for funding	3.70
08 Attraction of new employees	3.89
09 Increasing sales	5.05

Q6 Participation I

Is your organization next to the membership in Silicon Saxony an active member of a working group (i.e. equipment, software, photonics) or of a sub-cluster (i.e. Cool Silicon)?

Items	% (n = 55)
01 Yes, working group and sub-cluster	32.7
02 Yes, only working group	36.4

03 Yes, only sub-cluster	5.5
04 Neither nor	21.8
05 I don't know	3.6
99 No answer	0.0

Q7 Participation II

Please think of activities in the cluster Silicon Saxony. How strong is the interest of your organisation to participate in the following activities? Please use the scale from 1 "no interest" to 6 "very high interest".

Items	Mean value (n = 53 to 54)
01 Fairs / exhibitions	3.81
02 Information events	3.08
03 Presentation of products or processes	3.19
04 Campus events	3.34
05 Reports / Documentaries	3.47
06 Congresses / Meetings / Presentations	4.43
07 Shared Online-Platform	3.72

Q8 State of Development in Knowledge Transfer

How would you evaluate the state of development of your organizations knowledge sharing in innovation management in comparison to other organizations of the regional cluster Silicon Saxony?

Items	% (n = 42)
01 We are one of the leading organizations in Germany.	2.4
02 We are one of the leading organizations in the cluster.	2.4
03 We are above average.	26.2
04 We are the average.	42.9
05 We still have weak points.	26.2
99 No answer	0.0

Q9 Average work-share

When you think of a normal week: what is your average work-share (circa) for innovation management?

Items	Mean value % (n = 42)
01 --_%	21.98

Q10 Knowledge transfer channel

When you think of the internal and external communication: how are the following channels used for knowledge sharing in innovation management. Please specify if these channels are used "internal" or "external within Silicon Saxony".

Items	In % (n = 42)	
	Internal	External within the RIC
01 Print-Media (i.e. mails, info-sheets)	40.5	23.8
02 Face-to-Face (i.e. meetings, workshops)	59.5	47.6
03 Email (i.e. personal email, newsletter)	59.5	28.6
04 Internet-Platforms	45.2	38.1
05 Blogs	21.4	7.1
06 Wikis	40.5	4.8
07 Social Media	11.9	9.5
08 Instant-Messaging / Video-Chats	42.9	9.5

Q11 Future prediction

What is your prediction of the future role of knowledge sharing in innovation management between organizations in regional industry clusters? Knowledge sharing ...

Items	% (n = 42)
01 ... gains in importance.	76.2
02 ... remains the same.	19.0
03 ... becomes less important.	4.8
99 No answer	0.0

Why Innovative Entrepreneurs Love Art 1)

Han van der Meer

Technical University Delft, Faculty of Industrial Design Engineering,
Department Product Innovation Management
Saxion University for Applied science, Knowledge Centre for Innovation and
Entrepreneurship.M.H. Tromplaan 28, 7513 AB Enschede, the Netherlands

Structured Abstract

Purpose: As is commonly known the bond between the wealthy powerful elite and artists is having long lasting roots. Although it seems to be a very old phenomenon it is still rather actual. Once aware of it an unavoidable observation seems to be: entrepreneurs love art. But why? And if we can find an answer to this first question will this answer help us understand the act of business creation in entrepreneurship? The paper will address these questions.

Design/methodology/approach The starting point of the paper is an overview of the major literature on the phenomenon of art appreciation in business. In literature we found 5 major motives. With the use of the 5 motives as sensitizing concepts, a rather open interview protocol was developed. In long interviews with 10 CEO/owners of innovative Dutch companies these concepts were explored. Based on the first results of the study a field experiment was carved out to provide a rich source of data.

Originality/value The experiment provided the data presented in the paper. Based on a quantitative analyses of the profile of the participants versus non participants the paper will address the question of the relation between innovativeness and art appreciation. This is a first step in unravelling our major research question.

Practical implications The results of the study so far indicate there is much more in harnessing the bond between the Arts and Entrepreneurship than an occasional visit to the concert hall or a museum. Organizing a fruitful dialogue between Arts and Entrepreneurs needs further research and designs based on the outcome of our research.

Keywords Arts-based initiatives, innovation, entrepreneurship

Paper type. The author wished it could have been a Practical Paper but it is still a rather Academic Research Paper.

1 Introduction

It is believed Plato was the first to define the three basic questions in philosophy (Störig 1979):

1. is it true? (logica)
2. is it just? (ethica)
3. is it beautiful? (aesthetica)

Like the path of the debate and development of philosophy administrative sciences seem to follow a sequence of a first and heavy debate on the first question (for instance Taylor 1856-1915 or in our days Osterwalder 2010) followed by some input from the side of (business) ethics (for instance Braungart 2002). Neither in philosophy nor in business much scholarly attention is given to the last question. Nevertheless it seems of high importance for the development of humanity in general and particularly the development of business.

So why not ignite the debate on the nature of aesthetics in business and start an inquiry in beauty and the role of beauty in business creation?

2 Starting the journey: A first inquiry

Looking at the connection of art appreciation and innovative entrepreneurs the author has been fascinated by this phenomenon for years. As is commonly known the bond between the wealthy powerful elite and artists is having long lasting roots. For example the word meceanas (in Dutch a well known word for the benefactor of arts) stems from the Roman knight Gaius Cilnius Maecenas (65 till 8 bC). So it is a very old phenomenon but still rather actual. Once aware of it, it seems an unavoidable observation: innovative entrepreneurs love art. But why?

In the rather scarce literature on the subject (Antal 2009; Buswick, Craemer and Pinard 2004; Taylor, Hansen and Hansen 2005; Styre & Eriksson 2007; Barry and Meisiek 2010; Darsø 2004 and Schiuma 2011) several possible motives for the appreciation of art by business are given. Although Richard Greene (Greene 2004) claims there are “64 Purposes of All Arts” in the uor research in 1995 we limited ourselves to 5 major motives found in literature:

1. Investment
2. Borrowed plumage
3. Nice forms

4. Resemblance of the process
5. Pivot to the future

Some 15 years later these 5 motives show a remarkable overlap with the reasoning of Schiuma (2011) when he puts the relation between arts and business in the following matrix.

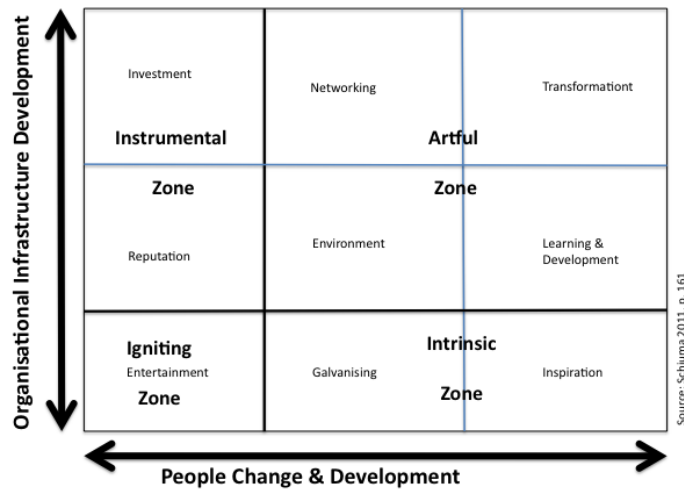


Figure 1 The Arts Value Matrix (Schiuma, 2011)

With the use of the 5 motives as sensitizing concepts, a rather open interview protocol was developed. In long interviews with 10 CEO/owners of innovative Dutch companies these concepts were explored. The interviews lasted from 1,5 hour till 4 hours and were held in the period August 1995 till April 1996. The transcriptions of the interviews are the basis of further detailed analyses leading to the following preliminary results.

The motive *Investment* means the possession of works of art as a good way of investing one's money and with the purpose of making profit on the longer term. Two CEO's gave this motive as their main reason of their interest in art "Aah, in old days I used to sell knickers now I sell Art".

To strut in Borrowed Plumage is a Dutch expression for the fact to be near someone with success others will find you successful as well. In our case will the beauty and prestige of a piece of art reflect on the perceived beauty, good taste and prestige of the owner of that piece. This reason shows an overlap with the term "Cultural Capital" as

introduced by the French sociologist Bourdieu (Bourdieu, 1986). For 3 of the CEO's in the research this seemed a very prominent reason behind their buying of art.

Nice forms is the motive of a CEO for hiring an artist in to better shape his product and make it thus more profitable. In two of the companies in the research this motive was a dominant factor why the arts were used. *"Each year we ask an artist to make a piece of work with the theme Sleep (the company is a pillow producer). It is attractive on the walls of our offices and it makes a nice new year's gift for our resellers. They really appreciate this and ask every year for it"*.

Resemblance of the process reflects the resemblance of the innovation process of an entrepreneur with the creative process of an artist. This motive is in literature also referred to as "workarts" (Barry and Meisiek, 2010). For 3 of the interviewed CEO's it was an important motive to enlarge their thinking with the world of artists. One of the interviewed CEO's did put it like this *"Whether you paint or model your company it is almost the same. It is never finished, it is never what you really meant it to be. Sometimes it goes well and sometimes you are drawn back for years, things simply did not work and you have to try again and again and again."*

Finally the last motive *"Pivot (or lookout) to the future"*. In this motive the artist is someone who is working on the border of what is and what will be. The artist gives form to "Zeitgeist" (spirit of the age) and is supposed to be years ahead of other more average people. Observing (contemporary) art can be helpful to understand "Zeitgeist" and by doing so providing inspiration or new paradigms (Barry and Meisiek, 2010) for the companies' translation of vision into form. Verganti (2010) tossed the term *Interpreter* for this mechanism. It is probably no coincidence Verganti devotes over 3 full pages text to Artist as being a key source for *Interpreters* followed by only a little more than one page for the second source *Participants in Pioneering Projects*. This motive is expected to be a very important one for our entrepreneurs, a real key motive. But our first inquiry showed differently: only one out of our 10 CEO's pointed out this was a major result of his love for art. *"Every time I visit a museum my notebook is filled with ideas. Last time in Groningen I wrote 12 down"*.

So we can conclude the motives we know from literature indeed can be observed in the cases and the interviews but none of them in a very convincing or prominent way.

However in the interviews a sixth motive came forward that was important for almost all the interviewed CEO's (9 out of 10) namely *"Arts give me energy"*. For many the arts

are a form or a source of energy and this seems the major motive why entrepreneurship and arts join forces and lead to new developments. In a conversation the author had with a Pakistan cricket coach on the subject of this state of energy who put it in this way “*We have the same phenomenon in sports. We call it “being in the zone”.* Energy is also one of the prominent topics in the work of Antal (2009) when she discusses the reasons why individuals in her study like or use art. Barry and Meisiek (2010) refer to a specific form of energetic state that art provokes. For this form the term mindfulness was introduced earlier by Langer (1989).

3 Digging a bit deeper in the first results

It can be argued that this type of research brings us eventually to the topic of consciously looking for inspiration in a consciously created state of astonishment. The state of astonishment that occurs when we are actively aware of what we know and what we do not know. In the words of Laozi “To know you don't know is best” (Henricks 1989). It is this state of astonishment that will provide both the employee as well as the entrepreneur the ability to give form to what not yet (completely) is there. Art can bring us in this state of astonishment. Or as one of our CEO's did put it “an almost limitless state of energy”.

But what does this bring us? Is this useful? Probably it is. Consciously nurturing the relation between entrepreneurship, companies and art means looking for times and places where we can exploit the combination of arts with entrepreneurship and see whether this helps entrepreneurs in creating new business.

4 Implications for further research

However, the contact between artists and companies is not at all obvious and further research is needed. Based on the research so far at least three major research topics can be distinguished :

1. Need for review and operationalization
2. What separates arts from other energizing interventions
3. Not all arts are the same

5 Need for review and operationalisation

Looking at the literature until now we see a seemingly repetition of arguments and hardly any reference to earlier work . Although Antal (Antal 2009) starts with some overview of literature but she is missing rather important work too (for instant Darsø, 2004) and although Schiuma did publish a good study on the value of arts his literature base is more business orientated than arts (Schiuma 2011). We seem in need for some thorough review of all literature to provide a solid starting point for further scientific research in the field of the relation between art (appreciation, interventions) and business.

Since the topic is one that provokes romantic pondering the need for scientific rigidity is even more needed and we should try to find good instruments to measure what we hypothesize. So far the field is lacking any form of validated instruments for research (see also Barry and Meisiek 2010).

6 What separates arts from other energizing events

One of the basic questions in our research is Why do you want to use art/do you like art? Why not simply go to football match if you want to find energy. Has this to do with the specific nature of Beauty? Is this Esthetical like the third basic question of Plato? Although one can hypothesize arts is a deep personal experience that provokes all different kind of responses from one and the same stimulus whereas sports are far more one-dimensional in experience it is indeed a hypothesis. Can we define Beauty? To find academic evidence still a lot of work has to be done.

7 Not all arts are the same

In the work so far we treated all arts and all art interventions alike. This “one size fits all” approach is a not to be accepted oversimplification of the nature of art and the use of arts in business. We should see what type will contribute to the ‘almost limitless state of energy’ and in what ways.

So before we can answer the obvious question “in what ways can we organize the Bussiness Creation prospering from Art?” a lot of work still has to be done. The research so far proofs to us that there is more to it than the occasional visit to the museum, cinema or concert hall.

8 A first step in the evidence based research

Our inquiry gave us some theory, some literature but hardly any evidence based research so far.

Based on the first results of our inquiry an experiment was carved out to provide us a rich source of data. In the period 2012/2013 Saxion University of Applied Sciences performed a rather unique project named De Kunst van/en Ondernemen (loosely translated in *The Art of/and Entrepreneurship*). 9 Saxion student entrepreneurs were paired with 9 student artist of Artez (the Eastern Dutch Art School). Based on the dialogue of the entrepreneur with the artists the latter produced a work of art reflecting his findings during the dialogue. A third student in Communication Studies filmed the process and made a short video clip of it. The artworks were exhibited one per month over a period of 9 months in the Central Entrance Hall of the main building of the Saxion Enschede Campus. At the end of the cycle the works of art were exhibited at the Twentse Welle, the local Historical Museum. The works were then auctioned in a public auction open to all entrepreneurs in the region.

This experiment provided several possibilities for evidence based research. At least three experiments will be performed. The first when the 9 entrepreneurs were selected (are the applicants different from the non/applicants ?), the second is the in-depth analyses of the process with the entrepreneurs and artists and the last when the auction is held (are the visitors different from the non visitors?).

In the first experiment we selected the participating entrepreneurs from our database of Saxion entrepreneurs (n=368) by means of a non attractive simply fact stating letter. Eleven entrepreneurs showed interest in participation out of which the nine participants were selected by the organisers of the project. After the selection a small inventory was send the entrepreneurs that showed no interest (n=368-11=357) asking for the reason why they did not participate (categories of answer 1. I did not notice the letter; 2. I do not have the time for such a project; 3.I have no commitment to art: 4. Other reasons). The response to the small inventory was 123 being slightly more than 34%. We now compared the profile of the companies of the entrepreneurs as we have them in our database on the aspect of innovativeness over the group of our participants and the group "I have no commitment to art". In the table below the very first results are given.

Table 1 Participants and non-participants with no commitment to art divided in categories of innovativeness (N=123; N=16)

Innovativeness	Participation	No participation No commitment to art
Below average	0	2
Average	3	3
Above average	8	0
Market leader	0	0
Unique in the world	1	0

Looking at the first data the results seem promising. Although numbers are quite low significant differences between the answers of participants and non-participants feeling no commitment to art can be found ($\chi^2=9.8$; $df=3$; $p=0.02$). Thus providing us with a first hint to answer the question “Do *innovative* Entrepreneurs like Arts better than *non-innovative* Entrepreneurs? “. And the answer found in this small study is: Yes. But we are still left with the question Why? Further research in this matter is on its way.

9 To conclude

The field of Business Aesthetics seems to be on l’heure bleue, the French expression of the time of night between Dark and Dawn (04.00-till sunset). We should try to move onto the lighter zones and get some data.

Let us start the dialogue on how we can get a more evidence based type research. The Saxion experiment is one of these attempts. Let us join forces to mine and harness the relation between Business Creation and the Beauty of Art.

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A review of the theoretical foundations of research into arts-based interventions in organisations and management education, and their methodological implications

Mary Ann Kernan*

Department of Culture and Creative Industries
City University London
Northampton Square, London EC1V 0HB

Structured Abstract

This paper explores theoretical frameworks, drawn primarily from learning theory, which might inform future research into arts-based initiatives (ABIs) in organisations and HE, and both the analysis and dissemination of outcomes. The theoretical insights considered here include pedagogical and philosophical models (eg Buber 1937/2002; Heron 1992; and Gardner 2006, 2011); psychological and management frameworks in self-efficacy, social cognition, socio-constructive approaches and complexity theory (eg Bandura 1997; Hutchins 1995; Kolb and Kolb 2010; Mowles *et al.* 2008); and models applied to research in the creative arts, including metaphor, aesthetic distancing, embodiment, and threshold concepts (eg McGilchrist 2009; Pässilä and Vince 2012; Dreyfus 1996; Meyer and Land 2005). In the conference presentation, we will also review some of the more populist ideas, including emotional intelligence, presence and mindfulness (Boyatzis and McKee 2005; Senge *et al.* 2005; Goleman *et al.* 2002), which have become established in leadership and management development practice, aiming to consider whether their application to the analysis of research results may offer benefits in the dissemination and interpretation of arts-based research for practitioners. The paper concludes by considering potentially appropriate research methodologies and other recommendations for future research into ABIs, and by inviting debate and feedback.

Purpose - The aim of this paper is to inform future research in arts-based practises in organisational and management development by exploring potentially fruitful theoretical starting points, and relating those to applicable research methodologies.

Design/methodology/approach -The approach adopted here is both interdisciplinary and research-focused. The paper considers theoretical insights from the work of philosophers, psychologists and educational theorists, and considers for each the research disciplines that might effectively be applied to future research into the processes and impacts of arts-based practices in management development and education. By doing so, the hope is to encourage the future development and implementation of ABIs by identifying both their personal and their organisational impacts.

Originality/value - Evidence for the impact of ABIs is needed if the potential organisational and educational benefits of this evolving interdisciplinary field are to be realised. The theoretical toolkit that could be applied is of considerable intellectual breadth. The opportunity of this paper is to present, for debate, something of this breadth, to consider how these and other theoretical insights might inform research initiatives that

will benefit management practitioners as well as scholars and educators, and to present the results of a pilot study.

Practical implications - The outcomes of this proposal lie in its potential to support and inform the design of future research in arts-based practices in personal and organisational learning, as well as the effective dissemination and application of those research findings in organisational contexts and HE teaching.

Keywords - Arts-based management, Arts-based innovation, Theory of arts in management, Research and arts-based management

Paper type - Academic Research Paper

1 Introduction

This paper considers theoretical frameworks which could inform research into the impact of arts-based initiatives (ABIs) in management and programmes of study offered within higher education. The discussion both confirms and extends Schiuma's (2011) analysis, and supports his recommendations that the aims and process of such initiatives must be planned with care, are fundamentally cultural, and require the establishment of a climate of trust. This paper also identifies exemplar research processes; and concludes by offering recommendations to inform the planning and analysis of future ABIs in both organisational and HE settings.

2 Researching arts-based management practices

As Schiuma (2011) identifies, art-based initiatives (ABIs) in organisations can be implemented to address a people-centred issue (eg 'to engage people's dreams, emotions and energy to achieve challenging organisational objectives that require people's engagement and passion', p.212) or a strategic one (to 'build arts capital', p.213), though their potential is most fully experienced where these two aims combine in 'artful organisational development' (Schiuma 2011, p.213).

In this paper, the focus is on theoretical frameworks and previous research that might inform the design and analysis of future research into the potential personal and communal effects of ABIs, as distinct from their possible strategic outcomes. This represents a complex, interdisciplinary research challenge which is likely to benefit from mixed-method research and disciplinary collaborations.

3 Theoretical frameworks and potential research approaches

3.1 Pedagogical and philosophical models

Habitus: Bourdieu

The notion of *habitus* might usefully support the analysis of shifts between individuals in group interactions through an ABI. The concept was introduced by Bourdieu (1977, quoted in Becker 2001, p.137) in place of previous scholars' theoretical emphasis on 'culture':

'The structures constitutive of a particular type of environment (e.g. the material conditions of existence characteristic of a class condition) produce *habitus*, systems of durable, transposable *dispositions*...' (Bourdieu 1977, p.72)

His additional explanation of 'dispositions' relates to the embodiment theme outlined under a separate heading below:

'The word *disposition*... expresses first the *result of an organizing action*, with a meaning close to that of words such as structure; it also designates a *way of being, a habitual state* (especially of the body and, in particular, a *predisposition, tendency, propensity, or inclination*.' (Bourdieu 1977, p.214, f.1)

Artistic source: Buber

The work of the philosopher Buber (1937) relates both to the human artistic impulse, and to the experience of relatedness to life and between individuals. His work may therefore usefully inform both the planning of ABIs (including the depth of their potential impact, and the associated need to minimise emotional risks to the participants) and the analysis of qualitative findings relating to participants' experiences.

These quotations from his seminal work, *I and Thou*, relate to the human source of art; the human role in 'bodying forth' art; and his frequent theme of 'meeting' life, whether in the world or in one another:

'This is the eternal source of art: a man is faced by a form which desires to be made through him into a work. This form is no offspring of his soul, but is an appearance which steps up to it and demands of it the effective power. The man is concerned with an act of his being.' (Buber 1937, p.9)

'To produce is to draw forth, to invent is to find, to shape is to discover. In bodying forth I disclose. I lead the form across – into the world of *It*. The work

produced is a thing among things, able to be experienced and described as a sum of qualities. But from time to time it can face the receptive beholder in its whole embodied form.’ (Buber 1937, p.10)

‘All real living is meeting.’ (Buber 1937, p.11)

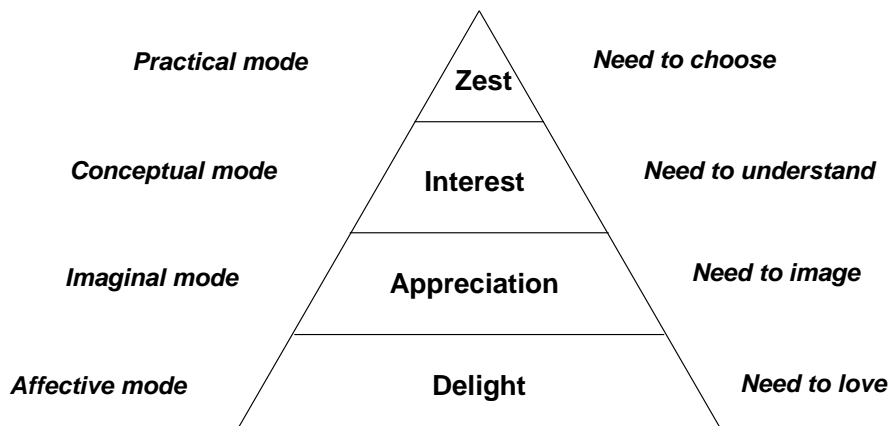
Basic Active Emotions: Heron

In his 1992 book *Feeling and Personhood*, Heron defines an ‘Up-Hierarchy of Basic Active Emotions’ below (1992, p.122) as one exploration of his proposed ‘model of personhood’. For Heron, spiritual and existential dimensions are core to being human: ‘a person is an embodied spiritual presence’ (Heron 2001b: 33). At the same time, action through ‘participation’ is implicit in his theory of the person:

‘From our felt participation in the world, we open intuitively to grasp a total situation, then discriminate thoughtfully in order to act within it.’ (Heron 1989: 17)

Heron defines these four modes of being:

- Delight** ‘Appreciation is a delight that springs from the love of aesthetic form; interest a delight that springs from the love of knowledge; zest a delight that springs from the love of action.’ (Heron, 1992, p. 123)
- Appreciation** ‘The emotions of a fulfilled imaginal sensibility are of a range and subtlety that outstrip the power of language to symbolize them. Hence they are conveyed by the non-discursive symbolism of drawing, painting, sculpture, music and dance.’ (Heron, 1992, pp. 122–3)
- Interest** ‘When the need to understand is realized, we experience interest, extending into curiosity and fascination, the passion for truth, excitement in intellectual discovery, pleasure in the clear communication of ideas.’ (Heron, 1992, p. 123)
- Zest** Heron uses the word ‘zest’ to encompass ‘the emotions involved in the fulfilment of free choice and effective action’, which he identifies as including ‘relish, gusto, exhilaration, achievement and work satisfaction’ (Heron, 1992, p. 123).



Heron’s identification of the ‘imaginal’ capacity, encompassing our inner potential, the imaginative and the artistic, might helpfully inform analyses of the experience and outcomes of participants in ABIs. ‘Entelechy needs’, he argues, also underpin the formative potential of the whole person:

‘... the spiritual life within harbours spiritseed, entelechy, the formative potential of my becoming.... entelechy guides the emergence of, and is progressively realized in, the actual entity.’ (Heron 1998, p.52)

Multiple Intelligences: Gardner

Gardner’s definitions of different forms of ‘intelligence’, and ways of identifying them in practice, could also support the analysis of the intrapersonal and organisational effects of ABIs.

Intelligences	Description
Linguistic	An ability to analyze information and create products involving oral and written language such as speeches, books, and memos.
Logical-Mathematical	An ability to develop equations and proofs, make calculations, and solve abstract problems.
Spatial	An ability to recognize and manipulate large-scale and fine-grained spatial images.
Musical	An ability to produce, remember, and make meaning of different patterns of sound.
Naturalist	An ability to identify and distinguish among different types of plants, animals, and weather formations that are found in the natural world.

Bodily-Kinesthetic	An ability to use one's own body to create products or solve problems.
Interpersonal	An ability to recognize and understand other people's moods, desires, motivations, and intentions
Intrapersonal	An ability to recognize and understand his or her own moods, desires, motivations, and intentions

Source: Davis *et al.* 2012, pp.6–7.

In addition to these eight intelligences which, Gardner argues, passed necessary 'tests' as distinct intelligences, he and his colleagues have speculated that there may be one more (which he calls '8½'): 'existential intelligence', an innate intelligence which inquires after broader purpose (as distinct from the labels 'spiritual' or 'religious') (Gardner 2012).

3.2 Psychological frameworks and complexity theory

Self-efficacy: Bandura

A well-established tradition of research in organisational psychology and educational studies has developed from Bandura *et al.*'s (1997) definition of self-efficacy, including:

- Efficacy expectancy: 'the conviction that one can successfully execute the behavior required to produce [a desired outcome]'
- Individuals' 'expectations of personal efficacy stem from...':
 - 'Performance accomplishments'
 - 'Vicarious experience'
 - 'Verbal persuasion'
 - 'Emotional arousal' (Bandura, Woods and Beyer 1997: p.126)

Self-efficacy research frequently defines questionnaires which participants complete before and after an event or intervention, with both standardised measures relating to their general levels of confidence that their actions will be effective and other questions relating to the specific intervention.

Distributed Cognition: Hutchins

Distributed cognition may also offer fruitful insights into the emergent, shared nature of group and individual learning through ABIs. Hutchins (1995) identified how skilled understandings operated across a naval crew in a crisis situation, an example of 'situated seeing' (Hutchins 2000). With research collaborators (Hollan *et al.* 2010), he recently defined the process of distributed cognition research:

‘Distributed cognition looks for cognitive processes, wherever they may occur, on the basis of the functional relationships of elements that participate together in the process.’ (Hollan *et al.* 2010, p.175)

Such research typically applies ethnographic research methods, including both observational and media analysis techniques. Through the analysis of language, Hutchins and his collaborators aim to identify shared representations that emerge within a group. They carry out their research ‘in the wild’ (as opposed to in research laboratories) (Hollan *et al.* 2010, p.176), and seek to identify how processes (especially expert practices) operate in groups. The context of such research also respects both the physical body and the physical environment:

‘... the organization of mind – both in development and in operation – is an emergent property of interactions among internal and external resources. In this view, the human body and the material world take on central rather than peripheral roles.’ (Hollan *et al.* 2010, p.175)

Like ABIs, this approach also focuses on practice and ‘events’:

‘Since the cognitive properties of systems that are larger than an individual play out in the activity of the people in them, a cognitive ethnography must be an event-centered ethnography.’ (Hollan *et al.* 2010, p.179)

System dynamics

Mowles *et al.* (2008) define the interrelatedness of organisations in terms which may also support the analysis of the impact of ABIs:

‘What systems theories have in common is the concept of an organisation as a whole with a boundary.... realigning the parts can influence the whole....’ (Mowles *et al.* 2008, p.807)

Quoting both Elias (1978) and Bourdieu, Mowles *et al.* endorse ‘the “art” of the *necessary improvisation* which defines excellence’ (Bourdieu, 1977, p.8) in effective management and organisational practice. They unfavourably contrast this improvisatory potential with processes of organisational target-setting – a tension which is also likely to apply to ABIs aligned to specific organisational outcomes. Bourdieu’s definition of ‘practical logic’ also confirms the need for both participative and reflexive processes, and the improvisational nature of such practices:

“‘The idea of a practical logic, a ‘logic in itself’, without the conscious reflexion of logical control, is a contradiction in terms, which defies logical logic. This

paradoxical logic is that of all practice, or rather of practical sense. Caught up in ‘the matter in hand’, totally present in the present and in the practical functions that it finds there in the form of objective potentialities they contact; it can only discover them by enacting them, unfolding them in time” (Bourdieu, 1990, p.92).’ (Mowles *et al.* 2008, p.814)

Mowles *et al.* also cite Taylor (2002) in arguing that the outcomes of such emergent experiences are, by definition, unpredictable:

‘We are drawing attention to the radical possibilities of responding to emergent phenomena which could genuinely transform our relationship with others and the work that we do together. This involves our acknowledging both intended and unintended consequences of acting together to bring about change and negotiating what we think it might mean.’ (Mowles *et al.* 2008, p.818)

3.3 Models applied to research in the creative arts

Aesthetic distancing

In order to analyse the content of ABIs that draw upon traditions of drama and theatre, including role playing, we must also consider aesthetic distancing (Brecht 1964). Brecht reconceptualised the illusion of theatre with what he called *Verfremdungseffekt*, the “alienation effect”, referring to the audience member’s role as observer and experiencer rather than one who is involved in the drama. Boal’s work (eg 1995), inspired by this idea, informs current practices in both acting and education therapy (see also Holtham *et al.* 2013; Pässilä and Vince 2012).

Threshold concepts and the role of boundary objects in pedagogy may also be helpful here:

- Threshold concepts are defined by Meyer and Land (2005) as including the concept of irony for students of literature, of pain for medical students, or entropy in physics. They act as major building blocks of knowledge or insight which enable a student to understand and therefore apply a theoretical concept:
 - ‘... such conceptual gateways... may be *transformative* (occasioning a significant shift in the perception of a subject), *irreversible* (unlikely to be forgotten, or unlearned only through considerable effort), and

integrative (exposing the previously hidden interrelatedness of something).’ (Meyer and Land 2005, p.373)

They also draw upon the theory of liminality (itself another potentially useful concept for the understanding of the impact of ABIs), citing the work of Turner (1969). Moving to an understanding of threshold concepts can, they argue, be a liminal experience of transition from one state of being or identity to another.

- Boundary objects can be ‘stuff and things, tools, artefacts and techniques, and ideas, stories and memories’ (Bowker and Star 2000, p.298) which can help to build understanding between different groups or ‘communities of practice’: ‘they enable co-ordination, but they can do so without actually creating a bridge between the perspective and the meanings of various communities’ (Wenger 1998, p.107). Edwards (2005) considers their role in ‘mediating’ learning: citing Tuomi-Gröhn and Engeström (2003), she reviews their function in participatory learning which promotes ‘boundary-crossing and border-crossing’ (Edwards 2005, p.5).

Embodiment: Merleau-Ponty

Embodiment is an important theoretical reference for future research into the process and impact of ABIs. Holtham *et al.* (2013) quote from the work of Merleau-Ponty and his definition of the intentional arc (1962, p.136) as a starting point for the analysis of ‘the interconnection of skillful action and perception’ (Dreyfus, 1996). A considerable body of research, related to the learning of physical skills and sport as well as arts-based practices such as dance and music, explores embodied experiences in the acquisition of skills. Standal and Engelsrud (2011), for example, analyse semi-structured interviews and observations (including of physical imitation) with the aim of understanding ‘the lived experience of the research participants, and the way their experiences are expressed through actions, speech and silences’ (p.156). They also quote Merleau-Ponty as an authority for the development of learned, automatic skills:

‘[Habit] is knowledge in the hands, which is forthcoming only when bodily effort is made, and cannot be formulated in detachment from that effort. The subject knows where the letters are on the typewriter as we know where one of our limbs is, through a knowledge bred of familiarity.’ (Merleau-Ponty 2002, p.166, quoted in Standal and Engelsrud 2011, p.157)

4 Research frameworks

These are some of the research methodologies and data types identified through this initial study which might inform future ABI research:

Topics/type of research	Data sources / methodologies
Creativity in UK schools: pilot study	A ‘collaborative, inquiry-led approach’ to define and pilot a ‘creativity’ self-assessment tool for use in the classroom. Data sources: ‘Portfolios/passports Diaries/journals/blogs Learning stories/journeys Teacher observations Testimony from others Evidence from “products” [of the pilot research] Reports Reflective interviews Progress reviews Other’ (Spencer <i>et al.</i> 2012, p.117)
Human interaction research	Video of interactions, inviting participants to support the coding process, including identification of key incidents (eg Gottman and Levenson, 1985; Levenson and Gottman, 1983)
Emotional response research, applying repertory grid techniques	Asking respondents to compare and categorise emotional terms or scenarios; can produce a range of data with some consensus as well as individual responses (eg Parkinson and Lea 1991; Reizenzein and Hofmann 1990)
‘In the wild’ cognitive ethnography	Interviewing, surveys, participant observation, and video and audio recording – especially ‘the analysis of recordings of events’ (Hollan <i>et al.</i> 2010, p.179) (eg Goodwin and Goodwin 1996; Suchman 1987); other research projects have also analysed automated recordings in digital technology contexts (eg Hill <i>et al.</i> 1992)
Pedagogical research related to disciplinary integration in an HE programme	Thematic analysis of teaching content, marked assignments (including an oral presentation) and student notebooks (Nowacek 2011)

5 Conclusions

This paper offers an initial review of theoretical frameworks which may offer analytical insights into ABIs. Further promising theoretical underpinnings might include: threshold concepts (Meyer and Land 2003); metaphor and narrative theory (McGilchrist 2009 and Goodson 2013); the potential application of Bateson’s (1979) definition of ‘levels of learning’ (Tosey *et al.* 2008); ludic play (Kolb and Kolb 2010); storytelling (McDrury and Alterio 2003; Moon 1999), and neurophysiological models that relate to artistic experiences as well as organisational behaviour (eg Rock 2008 and Rock and Cox 2012; Oatley 2011; Lieberman 2014), especially towards research to explores

physiological and entrainment effects in music and other artistic experiences (Becker 2001). The associated conference presentation will also consider how the concepts developed by some of the more populist theorists, including emotional intelligence, presence and (Boyatzis and McKee 2005; Senge *et al.* 2005; Goleman *et al.* 2002), might support the dissemination of research findings associated with ABIs.

The concepts and research reviewed here begin to indicate both the breadth and depth related to researching the processes and impacts of ABIs on both individuals and organisations – and of the potential impacts on the participants. To quote from Wenger (1998):

‘Because learning transforms who we are and what we can do, it is an experience of identity. It is not just an accumulation of skills and information, but a process of becoming – to become a certain person or, conversely, to avoid becoming a certain person.... To support learning is not only to support the process of acquiring knowledge, but also to offer a place where new ways of knowing can be realized in the form of such an identity.’ (Wenger 1998, p.215)

For both practitioners and researchers of ABIs, my concluding recommendations are therefore that:

- We should integrate both reflective practices and a reflexive, critical stance in our research planning and processes, with the aim of both exploring the emergent, active experience of the participants (including the researchers) while also seeking to surface and critique assumptions, as they emerge, such as expectations of predictable, specific or even benevolent outcomes from ABIs.
- In planning our interventions and associated research, we prioritise the establishment of supportive learning and research cultures after the period of the intervention, to acknowledge the depth of potential impact on both the learners’ and the researchers’ identities.

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Clay workshop as a research method. Research – design - discussion

Päivimaria Seppänen*

LUT School of Industrial Engineering and Management
Lappeenranta University of Technology, Lahti School of Innovation
FI-15140 Lahti, Finland

Structured Abstract

Purpose – The aim of this paper is to examine an arts-based research method in practice and methodological issues related to it. To test the method, a clay workshop will be organized during the 9th IFKAD Conference. Testing is important, because clay workshop has rarely used as a research method before, and it will be used in my dissertation. The aim of my dissertation is to investigate institutionalizing arts in social and health care service strategies; especially the management of multiprofessional employees; how the manager recognizes employees who have many professionals and divergent knowing.

Approach – The approach to research is, that clay shaping will be inspiring and the participants will have rich discussions. First, because the shaping is multidimensional and will stir up a lot of thoughts and knowing. Secondly, shaping is a very old way to express oneself. Thirdly, the clay workshop has an embodied knowing dimension. It may give a space to express issues that one rarely do otherwise. The workshop will be filmed and recorded and the analysis will be done afterwards.

Value – The value of this arts-based method is multidimensionality. It has been noticed that by arts-based methods the researcher is able to get answers that are challenging to find with traditional qualitative inquiry methods, for example, interviews or empirical observation. The arts are likely to make people more sensitive and open, and give a possibility to express issues that cannot be expressed in other ways. The arts may also cause some unexpected reactions that the researcher is not prepared to encounter. The arts can raise the research onto another level and can give more value for the aim researched.

Practical implications – The clay workshop will be a participative method testing workshop. The aim is to find out how the clay workshop serves multiprofessional groups, and how it should be developed to be an effective research method which can be used in the social and health care services.

Keywords – Arts-based research method, management, multiprofessionality, knowing

Paper type – Academic Research Paper

1 Introduction – The map and the compass

This study is a part of the dissertation, which aim is arts in social and health care services. The main issue in the dissertation is to study what kind of multiprofessionality there is in social and health care and how it could be noticed and deployed. There can be employees with two or more professions; they have changed careers because of different reasons and have many skills and knowledge obtained and learned in schools, at work and in life (Küpers 2005). In this study, they are called as multiprofessional employees: they have wider readiness and more versatile know-how than those employees with one profession. The issue has not been sufficiently recognized or discussed in scientific research, although this kind of multiprofessionality is vitally important during and after organizational changes.

In social and health care services supervisors need tools to first recognize the multiprofessionality to be able to manage the multiprofessional diversity of their employees. To find and test instruments, this study deal with arts based research methods and methodological discussion. The background will be introduced and then some thoughts of practice-based innovations will be considered. The presentation at the 9th IFKAD conference is a practical clay workshop where participants will have a possibility to test the research method designated later in this article.

2 Terrain of the journey

There is growing criticism towards siloed structures, and after practice-based innovations the silos are usually broken into knowledge-based networks. “*Innovations emerge more and more often in practical leading to, for example, middle-ground innovations*” (Melkas, Harmaakorpi 2012.) In prevailing circumstances there should be space for practice-based innovations and for a new kind of multiprofessionality which strive for sustainability and the client’s needs. Also, there has been a demand for service-innovations in social- and health care (ibid.). The breaking of the silos has aroused from the client’s needs: they have different kind of problems like drug, mental health, money and social problems, and all of them have taken care in different clinics and by different specialist. The patient has had to spend a plenty of time crossing over services, it has been like a full time job when trying to get help, and unfortunately this organizational problem

has not solved yet. In the new model the process will attend to the client, whose problem will first be examined and then the employees of all clinics will be working together. It is essential to apply new aspects while treating clients who have not gotten better in conventional processes. It could be fruitful to deploy different knowing and multiprofessionality in the new kind of organizations. (Smith et al. 2012; DeArmond S et al. 2006.)

Next illustration draws a picture of what happens when the organizational silos are restructured. If the multiprofessionality as well as divergent knowing (Melkas, Harmaakopi 2008) are not noticed at the same time, all traditional borders between professions will stay as they are. If all professions like nursing, social work, mental health professions etc. stay as they are, what will change in the reality and at the operational level? It is not easy to break the silos at the level of grassroots if there are actors with the lack of innovation (Saunila et al. 2012) or people who won't allow change. Employees do have special skills they work with, they have a certain kind of roles and there are also rules in the orchestration; e.g. some images (Warren, Parker 2009, Banks 2001) are connected to professions.

Employees have divergent knowing (Saunila et al. 2012) which enable the organizations to go forward and increase their capability. On the other hand, if there are siloed thinking and constricted beliefs remaining, these issues are conflicting and complicating both development and innovative opportunities. Divergent knowing should be noticed, and managers do need tools for that. Inside the organizations, it is important to recognize the significance of values and wellbeing (Harmaakorpi, Melkas 2012; Smith et al. 2012) and effective divergency management may require that communicate models are renovated, too (Saunila et al. 2012.). The managers should help to break boundaries, create opportunities and new ways of cooperation. Also, employees have several knowing they have a certain space, role and working mode. Sometimes denying the divergence can also lead to overreactions: An employee who has different shoes at the pathway; will e.g. be excluded (Smith et al. 2012.) and closed outside.

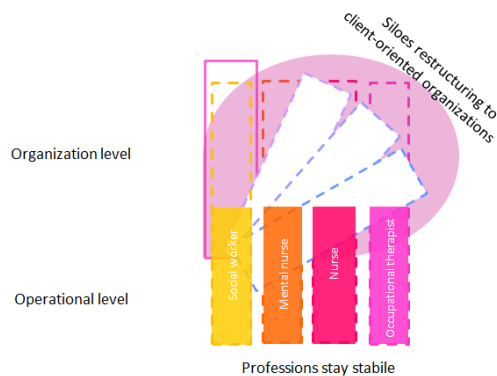


Illustration1 Organization's transformation

3 Sign posts

The journey of this study is based on theories of multiprofessionality and diversity management. As mentioned earlier, diversity is a challenging and multidimensional issue in management. It is obvious that operative managers are not always aware of employees' multiprofessional backgrounds. Focusing on possible solutions, clay workshop is designated as a method, as a management tool and as a discussion awakener, and it will also be tested in practice at the conference.

The main research questions in this article and the connected workshop are

1. what kind of phenomena rise up during the workshop and how can they been utilized in the research of multiprofessionality and organizational diversity, and
2. what kind of processes during the workshop lead to new attitudes or to a new kind of professional self-understanding.

4 The bridge

A polyphonic pattern of multiprofessional employees gives an option for practice-based innovations, which rise from the diverse multiprofessional networks or from the client oriented approaches (Melkas, Harmaakorpi 2012). Multiprofessionality make organizations diverse and challenging to lead. Sometimes there are strong beliefs and rebellions against transformation and employees acting intentionally differently. *“We recognize a cultural pattern and then look to see if the individual fits that pattern”* (Galanti 2001). Sometimes diverse attitudes or modes can be desired in organizations,

but in the opposite circumstances there is a risk for exclusivity against those who work differently. With weak leadership (Patrik, Kumar 2012; Smith et al. 2012.) diverse organization is ineffective, expensive and defective. Employees are conflict-oriented and are not doing well.

In social and health care, polarization between the multiprofessionality and the diversity makes it an interesting research phenomenon. Diversity management (Madera 2013; Patrik, Kumar 2012; Mallow 2010; Galanti 2001) has been used as a theoretical framework also earlier when researching multicultural employees, genders and so on. In this study diversity management will be applied to the multiprofessional employees. There can be found similarities in multiprofessionality and in multiculturality: Like employee (Patrik, Kumar 2012; Morrison et al. 2006) from another culture has a different stance to work as native a person, employee with two or three professions has different stance and knowledge e.g. to social work as an employee with one profession.

5 A pathway to the field

Managers need tools to become aware of their employee's multiprofessionalities and to lead to diversity. Diversity is not (Patrik, Kumar 2012; Morrison 2006) an easy task. Diversity creates a breeding ground for misunderstanding and tension in the organizations and potential for conflicts, too. On the other hand, diversity can be a value and add the human capital of the organization (Morrison 2006). Effectual multiprofessionality is adaptive and there is space for different actors. (DeArmond et al. 2006, Mallow 2010, Morrison et al. 2006) If the employee has two or several professions, his or her working mode is different and also working methods may differ, which can be another reason for misunderstandings and tension. In these kind of displeasing situations, people often see only negative aspects (Madera 2013; DeArmond et al. 2006.). It looks like there is a need to find space (Mallow 2010) for different ways to work. It is clear, that these kinds of situations are very worthy of research, although multiprofessionality has not widely discussed in scientific research yet.

I have three professions. In healthcare, a primary nurse, in cultural policy and in social work. Since the beginning I have been curious to find out the possibilities of arts-based approach in social and health care. Researching falling into this genre, interrogate the field of own profession is also a question of subjectivity and research position (Anttila

2003). It could be attractive to set autoethnographic position. Actually, it could make researcher in pressure where the organization was too close and then relevance of the study suffers. To avoid this researcher need distance to the research field, spiritually or physically. To realize ethical issues in research, it is important to avoid being too close at the research field. When the research question discusses of management and the researcher is working in management some kind of reflection is necessary. Researchers need to self-reflect and be aware the social construction, is researching in. Also to be open to the material, not own experiences, beliefs and presumptions. Also, there may be a pressure to act as a counselor or a listener, when the researcher is well-known and the research field is complex after organizational transformations. (Niiranen-Linkama 2005; Juhila1999.)

6 A road choice

Diversity defies standards. Researching the diversity of complex systems is an exploration to the unknown and this exciting journey will be done with an arts based research method. Arts based research is active, inspirational (Fraser, al Sayah 2011) and creative: it can confront emotions, create sensory experiences and, just like knowing, respond to the world in different ways (Finley 2008). Research can be posed entirely new ways (Finley 2008; Leavy 2008), questions can be asked and the answers can be found through experiences.

Arts based practices are particularly useful for research projects that aim to describe, explore, discover (Leavy 2008).

Finley (2008) points out that at the stage of flow, open dialogue and ideas are needed. Examinees go through multidimensional creative and epistemological process, that integrates artistic knowing and academic professionalism. Also, there is an aesthetic dimension which allows emotions, group dynamics and social constructions to be handled. Art is emotional, politically evocative, captivate and moving phenomenon. Although there are no right questions or answers or any single right way to go, art can grab attention in a powerful way. (Finley 2008; Leavy 2008.) As Finley (2008) describes, arts based research dive behind social science research methods. The catch is multidimensional, only one truth cannot be found, and the purpose is to advocate social transformation. Creativity, observationality, analysis, storytelling skills, symbolics and

metamorphisms are critical aspects in arts based research, like in all qualitative research, too. (Fraser, al Sayah 2011, Leavy 2008.)

There are several fields where to operate in divergent organization: by using metaphors, they have flora, fauna and earth. Finley (2008) points out that arts based research methods are able to shake ossified thoughts and give space to rising activism and criticism. The harvest is not reaped. The natural order is going to be reformed (Fraser, al Sayah 2011) and the plants will get new soil to grow. Eisner (2008) sees arts based research methods as flexible in divergent organizations; arts can be a shortcut to study the diversity. Artistic methods let the participants examine the transformation from several perspectives. They can have several soils where they can bed different plants with different lengths. (Warren, Parker 2009.) Pässilä (2012) points out that by using arts based research methods, participants are able to have opportunities to set themselves in different positions and discuss e.g. how does it feel, what does the organization look like from different positions, how do they imagine they could work there and what kind of outcome there could be. When the research is made by arts based method, there is a special place to the biodiversity: there are soils for embodied knowing, visual images, plants, landscapes and soundscapes, all of them created by doing, by hands, by feet and so on. Artistic methods have an inventive impact to get talk and think about new polymorphism of the whole organization. (Pässilä 2012; Warren, Parker 2009; Leavy 2008.)

6.1 The Field

Arts based research methods have been used in different variety of research. In management research Pässilä (2012) has created a model for research based theatre. The method is practice-based and makes a space for reflection in communities. Participants reflect their assumptions and learn together to break down assumptions that are old-fashioned or unnecessary. Research-based theatre session begins with photographs describing the situation or undesirable assumptions. There is able to rise (Fraser, al Sayah 2011) knowledge or already active knowledge can get new meanings and aspects. Photographs are being used as well as a research method and independently. Warren and Parker (2009) has researched organizations using photos. One photograph can include wide spectra of the organizational hierarchy and culture and the state of power. Also, the photographs (Byrone 2008) like all arts can draw a picture of professional identity and

impart one's self-esteem. It is possible to explore diverse (Fraser, al Sayah 2011) details using photographs, too, because all different artifacts tell something about the workplace and as scientific and artistic phenomena are essential issues to observe (Byrone 2008).

Personally, I am very interested to use clay and to see how does a clay workshop awake us; can the clay work as a catalyst, helping to formulate own experiences, imaginations, emotions and relationships. It is interesting to see how will participants discuss (Fraser, al Sayah 2011) and cooperate during the workshop, and how will the research theory (Byrone 2008) work when using the arts based material. Last November I had a short clay workshop at a conference in Tampere. The participants had ten minutes to formulate their opinions about the state of the management research in Finland. During the short while they discussed wildly and intensively and found also a way to act and discuss at the same time. The experiment made me to believe that this kind of workshops are good options and fruitful methods also in the field of diversity management.

Despite the rising use of arts-based methods in organizational development and change, clay is rarely used as an instrument to shape thoughts and innovations. It also appears that using clay has not been discussed in management research literature. Nevertheless, clay is eternal material and has always been utilized to increase surviving possibilities; it has been and still is an important building material and it is used for cooking pans, water tanks and preservation vats. In addition to that, it has always been an artistic artifact: people have e.g. painted their histories in clay pots, written their stories in clay tablets, etc. Historians have examined the prehistory of human colonization using small pieces of clay artifacts and findings. The clay has been always there where people have lived or worked. In the upcoming workshop and by the aid of the eternal clay it is now possible to take care of mental basic needs such as creativity and self-respect and enhance possibilities for innovative thinking. (Honor & Fleming 1994)

As a research material, artistic inquiry is multidimensional (Fraser, al Sayah 2011). Usually we observe issues and nuances which are important (Warren, Parker 2009) for ourselves and all the rest can stay unnoticed. However, those hidden things may contain issues which could be very crucial in research. Therefore, it is important to observe the phenomenon critically (Finley 2008b) and take account all processes, actions and ways how people behave and work. On the other hand, making art is usually inspiring journey and people have great fun at the time. When having a good time, it may be challenging to start discussion about unpleasing things or difficult topics. (Berthoin Antal 2009; Warren

2009). But the action-oriented and inspiring situation (Finley 2008b) can also force people to rise up both positive and negative things. The role of the researcher is observative, and because the seedlings in the gardens are sensitive, ethical awareness is very important. Researchers have to respect the openness and enthusiasm of the participants, too.

(Finley 2008b)

Sometimes the artistic project itself (Berthoin Antal 2009) has been successful for the organization, but artists have been unsatisfied to the quality of art or to the whole process. When using the arts based method in the research, it is relevant to notice that the outcome is not an artistic product; arts based research method (Fraser, al Sayah 2011) is precious and important *per se*, through itself. Other theoretic frames are sometimes weak and not helpful when modeling research questions or trying to be precise with the material. As Fraser and al Sayah (2011) have recognized, arts based research methods in health care research have been very useful because they do not include such limitations like the traditional frames of qualitative research. When researching the divergency, the research itself can also produce more dimensions when arts based methods are dealt with.

Also the impact of an artistic intervention for the organizational development is multidimensional. The experience can be powerful, but both in good and bad ways, and increasing cooperative work behavior is always a voluntary process (Fraser, al Savah 2011) where forcing statements are ineffectual. Concurrently, arts awake criticism of the so called normal behavior and order, like Finley (2008) writes.

7 A path choice

Using clay workshop as a research method in organizational management is an enthusiastic idea. At the workshop the group will have space enough to shape their own thoughts, i.e. opinions of the professionalities and feelings of the archetypes in their own workplaces, and to discuss about those themes. The main issue is to observe, how they do it. How do they shape the professions and how do they share the divergence when discussing with other group members. In the atmosphere of trust there is a space to share divergence and to find fresh knowing, which is relevant in their work or in their professions, but has not been unrecognized before.

To shape the clay, the artifacts must be looked from different perspectives all the time; the clay call for to use the body, it does not let sit down. It is fascinating to see, what can

the phenomenon called embodied knowing add into shaping. Embodied knowing is a mixture of “*bodily gestures and postures, facial mimic, tones of voice, and other forms of expression*” (Küpers 2013). Can art be a bridge between mind and body. “*Conceptualizing arts as embodied learning; thinking and knowing are not limited by words*” (Moore 2011). Because shaping is multidimensional and there are bodily gestures (Küpers 2013) included, could the shaper be like a dancer, who recreates his or her own experiences at the scene? (Blumenfeld-Jones 2008.) According to Küpers (2005) embodiedness is the spring where the streams come from, and there is no need for words.

In this study also the discussions are in important role. It is interesting to observe, how the language lives with the action. It is interesting to observe, how the language lives with the action, the clay. Things and questions which recur, coming up again during discussions, are remarkable and should be taken into account later, when developing management and leadership. (Küpers 2013). Recurrence also tells, is the terrain in the workplace fruitful for the divergency or not.

8 At the garden

As mentioned earlier, the clay workshop will be held during the IFKAD conference, in the historical town of Matera, in very inspiring atmosphere. The participants of the conference will come from different backgrounds and the group diversity will be high.

The workshop will be videoed, and before the session, participants will be asked to give their agreement for videoing. In the beginning of the clay session, participants will have an instruction to shape from clay “what they have learned during the day”. Artistic work will begin after the first chaos, and conversations will arise...

The research method is new, so the researcher is interested in how useful the method will be and how all the material (clay sculptures, discussions, embodies language) can best utilized. It is also good to see what kind of challenges will occur when finding suitable analyzing methods for the material.

8.1 The play

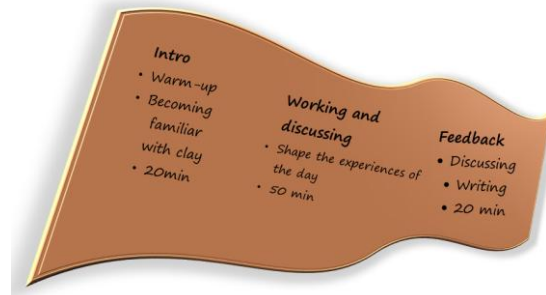


Illustration 2 The workshop plan

The workshop will be held in the garden, surrounded by inspiring eternity of the area. At the beginning the participants will be asked agreements to the research and videoing. Videod and written material will be analysed afterwards for the methodological discussion of the dissertation. The material will be used in this research only.

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Creating a creative space. A case Study of the artistic and participatory urban camping “Yes We Camp!”

Alena Siarheyeva

ISEN-Toulon, école d’ingénieur

Maison des Technologies, Place Georges Pompidou

Téluq – Université du Québec

Structured Abstract

Object – We describe the organizational design and the spatial characteristics of the artistic and participatory urban camping “Yes We Camp!”. It was designed on the occasion of Marseille Provence European Capital of Culture 2013, built on the banks of Estaque, Marseille Area, and open to all from May to September 2013. “YesWeCamp” is an experimental project, combining ecology and performative architecture, hosting artists in residence and offering an alternative cultural agenda for campers and visitors. It also had a strong social dimension. It hosted youth in process of professional and social (re)integration, and worked closely with local communities to sensitize poor, often migrant, populations to culture. It promoted such values as sharing, convivial atmosphere and mix of publics. The camping was mainly run on volunteer basis. The core collective which built, run and deconstructed the camping was approximately composed of 20-40 individuals, aged between 20 and 40 years old, constantly present and living at the camping place. Most of them had creative and artistic professions: architects, green and urban space designers... More than 200 volunteers contributed to the project at various stages of its existence. Yes We Camp hosted 11 artists in residence and organized more than 50 cultural events. During the summer time, on average, the camping hosted 130 campers per day and up to 800 visitors during cultural events and festivities.

Purpose – The purpose of the research is to describe how the organizational design and socio-material space characteristics of the camping enabled the creation of a particular atmosphere nurturing creativity, understood here as a collective outcome; and how the collective creativity was embedded into the physical space of the camping.

Theoretical framework – The case study bridges the organizational psychology literature stream on on creativity in organizations (Klijn & Tomic, 2010) (Zhou & Shalley, Handbook of Organizational Creativity, 2008) and workplace creativity (Baas, De Dreu, & Nijstad, 2008; George, 2007; Hennessey & Amabile, 2010; Runco, 2004; Shalley, Zhou, & Oldham, 2004) with the sociomateriality stream in organizational literature (Pickering, 1995, Dale 2005, Leonardi 2008, Orlikowski 2007, 2010).

Methodological approach - We used the grounded theory approach ((Glaser, 1992) and (Charmaz, 2006)) to derive a posteriori a theoretical framework from data systematically obtained from field observations. We chose this method to uncover processes, relationships and behaviors of individuals in an organizational context that has been little explored up to now. That enabled us to grasp the complex nature and to create a grounded understanding of the project under study.

We used overt participatory observation as data collection method ((DeWalt & DeWalt, 1998) and (DeWalt & DeWalt, 2002)). The decision to be embedded in the action and

context of the social setting of the camping is motivated by the opportunity to be accepted in the community of volunteers, to have access to their "backstage culture" and to view or to participate in unscheduled events (DeMunck & Sobo, 1998). To complement data obtained from the observation, we conducted a set of individual interviews.

Main results – Our main finding is that socio-material characteristics of the camping site encapsulated the root values on which the project was built and predetermined the camping's collective dynamics. Democratic participation and the quasi-absence of vertical hierarchic relations as the principle of the organizational structure favored free flow of ideas and interaction between volunteers. The implicit organizational work processes such as "participative assessment" and "functional legitimation" by peers contributed to consolidation of the project around a collective of highly dedicated volunteers; with a sense of initiative and willingness to participate. The created camping's creative atmosphere, understood as cognitive representations and interpretations of its organizational setting and of its socio-material space was "a place of realization of dreams of artists *bricoleurs* and performers" but also "a place where one feels good and where one stays, for a drink or for a long weekend", a "sort of summer 1936, where perfume of possible is floating in the air".

Keywords – Creative space, creative atmosphere, creativity, socio-materiality of space

1 Introduction

1.1. Description of the project Yes We Camp

The artistic and participatory urban camping "Yes We Camp!" was designed on the occasion of Marseille Provence European Capital of Culture 2013, built on the banks of Estaque, Marseille Area, and open to visitors from May to September 2013. "YesWeCamp" is an experimental project, combining ecology and performative architecture, hosting artists in residence and offering an alternative cultural agenda for campers and visitors. It also had a strong social dimension. It hosted youth in process of professional and social (re)integration, and worked closely with local communities to sensitize poor, often migrant, populations to culture. It promoted such values as sharing, convivial atmosphere and mix of publics.

The camping was conceived as an ephemeral space. Its purpose was to recycle and to promote a deserted space and then to give it back to its inhabitants. Many objects and elements for constructions were collected from Emmaus, an international charitable movement to combat poverty and homelessness. At the same time, it served as a test bed for innovative enterprises offering dry toilets and water recovery systems. At the end of the summer period, the camping was dismantled and pieces of constructions, objects and equipment were sold out at a big garage sale.

The camping was mainly run on volunteer basis. The core team which built, run and deconstructed the camping was approximately composed of 20-40 individuals, aged between 20 and 40 years old, constantly present and living at the camping place. More than 200 volunteers contributed to the project at various stages of its existence.

Yes We Camp hosted 11 artists in residence and organized more than 50 cultural events. During the summer time, on average, the camping hosted 130 campers per day and up to 800 visitors during cultural events and festivities.

1.2 Creativity and innovation at workplace

Creativity can be defined as the ability to produce work that is novel (original, unexpected) and appropriate, (i.e. useful, adaptive concerning task constraints) (Sternberg & Lubart, 1999) or as a “mental process that allows people to think up new and useful ideas.

Drawing on the definition and findings in psychological literature, organizational research stream places individual creativity into social context, opening the venue to investigations on creativity in organizations (Klijn & Tomic, 2010) (Zhou & Shalley, Handbook of Organizational Creativity, 2008). The definition, initially proposed by (Woodman et al. (1993)) seems to be widely accepted: “creation of a valuable, useful new product, service, idea, procedure, or process by individuals working together in a complex social system” (p.293). Amabile et al. (1996) point that such definition is closely related to innovation, and delineate the line between them: “All innovation begins with creative ideas . . . We define innovation as the successful implementation of creative ideas within an organization. In this view, creativity by individuals and teams is a starting point for innovation; the first is necessary but not sufficient condition for the second” (p. 1154-1155). Montag et al. (2012) stress the difference between creative behavior or process, understood as sequence of thoughts and actions that lead to novel, adaptative productions” (p. 1366) and the outcomes of this process – that is, prototypes, products, business models, work methods or management processes. Based on reviewed literature, they also differentiate the creative behavior from innovative performance behavior, defined as “the development *and* implementation or application of a novel, useful idea” (p.1366). Woodman and his co-authors characterize creativity at three levels: individual, group and organization (Woodman, Sawyer, & Griffin, 1993).

Another stream of literature tend to use the term workplace creativity, see for instance reviews by (Baas, De Dreu, & Nijstad, 2008; George, 2007; Hennessey & Amabile, 2010; Runco, 2004; Shalley, Zhou, & Oldham, 2004). The definition adopted by its proponents seems to converge to that of organizational creativity.

Placing individual creativity into social contexts and constructs inherently raises the question about the set of factors that influence creativity, as a process and as an outcome, at various levels (Andriopoulos, 2001), (Montag, Maertz, & Baer, 2012), (Zhou & Hoever, 2014) . The latest trend is to consider multi-level interrelated factors affecting creativity (Hennessey & Amabile, 2010) and their nonaddictive effects (Zhou & Hoever, 2014). This interactionist perspective was already suggested in the early 1990s by Woodman and his colleagues. They proposed an analytical framework in which different types of influences interact with each other to affect creativity across various analysis levels and mutually shape each other. Besides significant advances in the organizational psychology, little attention has been drawn on the interplay between creativity and physical environment.

1.3 Physical space, creativity and social interactions

A recent review of psychological, organizational and facility management literature by (Martens, 2011) reveals knowledge gaps and fragmentation in research about the complex and plural connexions between creativity and physical workplace. In ergonomics discipline, new axis of research has recently emerged in designing work environments comprising personal, social-organizational and physical factors favoring creativity (Dul & Ceylan, 2011).

The influence of space on organizational dynamics is analyzed in organizational literature. It is built upon insights from sociology that space makes sense as a socially constructed material property (Simmel, 1908; Lefebvre, 1991; Giddens, 1981, 1984). The main postulate is that workplace and its configuration initiate and influences social behavior; organizational practices are embedded into organizational space. Clegg and Kornberger (2006) stipulate that “Human and non-human elements constitute the experience of space through their form of occupation, activity and movement such that they are constituted through those spaces that enable and restrict certain events” (p.144). Carr and Hancock examine how conceptions of time and space are “a symbolic order inter-related to themes of power and control” (p. 545). The sociomateriality stream goes

beyond discrete entities and emphasizes mutually constitutive relationship between social and material (Pickering, 1995, Dale 2005, Leonardi 2008, Orlikowski 2007, 2010). The affordance stream builds on the postulate that the properties of space and organizational culture can shape organizational practices. For example, Fayard and Weeks (2007, 2011) demonstrate how three social affordances – privacy, proximity and permission – can foster informal interaction within a workspace.

1.4 Purpose

Bridging both types of literature - organisational psychology and sociology of space - would open a new perspective for understanding creativity at workplace. This approach is applied to study the urban and artistic camping “Yes We Camp!”. More specifically, the purpose is to describe how the organizational design and the socio-material space characteristics of the camping enabled the creation of a particular atmosphere nurturing creativity, understood here as a collective outcome; and how the collective creativity was embedded into the physical space of the camping.

2 Methodological design

2.1. Research method

The relationship between creativity and space has been little explored up to now, even less in the organizational context of voluntary association. In this context, the grounded theory approach (Glaser, 1992) and (Charmaz, 2006)) seemed to be an appropriate method to start. Emerging concepts derived from data systematically obtained and analysed from field observations were confronted to theoretical and empirical findings documented in related literature. Such approach enabled to grasp the complex nature and to create a grounded understanding of the camping project and to position the results of the research with respect to previous contributions. To capture the subjective dimension of individual creativity in the specific context of the camping we opted for an empirical and interpretative qualitative research design (Paillé & Mucchielli, 2007). We chose an ethnographic approach to study spatial, organisational and work routine of the Yes We Camp (De Certeau, 1984). We joined the YWC initiative as volunteers, to engage into overt participatory observation as data collection method (DeWalt & DeWalt, 1998) and (DeWalt & DeWalt, 2002)). The decision to be embedded in the action and context of

the social setting of the camping is motivated by the opportunity to be accepted in the community of volunteers, to have access to their "backstage culture" and to view or to participate in unscheduled events (DeMunck & Sobo, 1998). To complement data obtained from the observation, we conducted a set of unstructured individual interviews. The motivation for choosing this format was to get participants to share stories, in line with the exploratory nature of the research project (Guillham, 2005) (Gubrium & Holstein, 2003).

2.2. Data Collection and Analysis

A variety of sources was used, including i) overt participant observation at the camping, ii) interviews with the volunteering workers and the project leaders; iii) secondary data, such as minutes of meetings from the YWC association meeting and articles in the press.

The investigation departed with volunteering work during 3 days at the camping space. It was a period of total immersion into the camping routine and space, of interaction (mainly in the context of doing a specific task) with various people: volunteers, project leaders, campers and visitors and of "feeling of the camping's atmosphere". Photos of the camping were taken and used as visual documentation. After that period we continued volunteering work on administrative tasks during one week, outside of the camping place. We were offered a possibility to attend the annual meeting of the association running YWC and produced the minutes of meeting. During the whole period of the camping functioning we also attended its flagship cultural events.

The ethnographic observation was complemented with a series of unstructured interviews with the volunteering workers. We informally interviewed 15 volunteers. Some of them joined the project from its early stages and were recognized its "pillars". Others were volunteering on a relatively short time span, up to 3 weeks. They were all aged between 20 and 36 year old, belonging to various professions: architects, an urban planner, a green urban designer, graphic designers, development economists, social animators, artists, an electrician, a construction worker, an apprentice cook.

Additional information about the camping was collected in press articles (about a dozen) and triangulated with information collected through the observation and the interviews.

A thematic content analysis of the collected information was conducted with NVivo (version 10). Following the grounded theory approach, representative concepts of the phenomenon from the field data were generated. They were confronted with those discussed in the related theoretical and empirical literature. At the end of this process, a grounded model of creative space was sketched.

3. Yes We Camp, a space for creativity

3.1. Socio-material characteristics of the camping

The socio-material characteristics of the camping encapsulate the root values on which the project was built and predetermine the camping's collective dynamics.

The site on which the camping was built is a deserted industrial site on the banks of Estaque. The adjacent areas are often characterized with a spread of poverty and insecurity. One of the ambitions of the project was to “recycle” and to revitalize the abandoned place and to propose a « real alternative to luxury hotels of Noailles »¹. The reference was made to ambitious urban construction and reconstruction projects initiated at the occasion of the European Capital of Culture, which were highly contrasting with the reality of some poor and deserted urban areas of Marseille and of neighboring towns and villages.

The camping was conceived as an « event-place ». That is, it was itself an artistic event, adding value to the place where it was run. The notion of event also implies that the camping constructions were designed as ephemeral, i.e. to serve for a limited period of time. At the same time, the camping was conceived as a place hosting cultural events and projects to bring socio-cultural dynamic to a place where nothing usually happens, “snubbed” by the official cultural events of the European Capital of Culture. The ambition was to change the negative image of the site, to show to neighbouring inhabitants the value of the place, to involve them into the collective dynamics and to bring culture (in a broad sense) closer to deprived citizens.

The place was initially completely unoccupied and empty, with no constructions and little facilities. The challenge and the charm of the camping project were to build

¹ <http://www.marsactu.fr/culture-2013/yes-we-camp-nous-sommes-encore-entre-utopie-et-la-realite-30420.html>

everything from scratch. The area is located between the city, the sea and the mountain, a sort of condensed Marseille.

The site is quite isolated, relatively far from urban life, with little public transportation from Marseille. By the time of opening of camping to tourists, a ferry boat linking Estaque to Marseille city center started circulating. Once arrived at the camping place, one was completely immersed into the camping life.

The camping was designed as a mini-village, of a radial shape with a central place, the “agora”, many places where one could isolate oneself, private spaces, artistic work and bricolage spaces, spaces for social life and a totem place, above all constructions, wearing the symbol of the camping.

The architectural approach used to design the main camping’s constructions is known as performativity. The main postulate is that additionally to aesthetic and functional aspects, “the actuality of the building consists largely in its acts, its performances” (Leatherbarrow, 2005).

The “design process reacts to external stimuli and transforms a situation through feedback between a subject and the environment and between architecture and its milieu. The material, organizational and cultural change that occurs as a result of this perpetual feedback and two-way transfer of information is performativity. [...] The mechanisms of performativity are nomadic and flexible instead of sedentary and rigid. Its spaces are networked and digital rather than enclosed, and its temporalities are polyrhythmic and non-linear. Performativity produces new subjects of knowledge, hyphenated identities, transgendered bodies and digital avatars.” (Rahim, 2005, p. 179) “Performativity influences the outcome of habitational, material and ambient effects perceived by users and the effects they have on their milieu by reconstituting our sensibility of architecture” (*ibid.*, p. 180)

Finally, the project was rooted in environmental values. For this reason, but also for the reason of scarcity of resources, many constructions were realized out of recycled or reusable materials.

3.2. Organizational design

From organizational theory perspective, organizational design can be understood in the meaning of structure: a set of rules defining roles, processes and relationships that

enable an organization to realize its goals. It is also a process of (re)shaping organization structure and roles (Nadler, Gerstein, & Shaw, 1992).

The project was initiated and run by a non-profit association. This legal form requires democratic and transparent decision making about the strategic developments of the project. The project mainly relied on volunteer work for financial reasons. Professionals were solicited only for specialized construction tasks where volunteers' amateur skills were insufficient and where security requirements were strong (constructions on scaffolding, electricity and plumbing). Volunteers who joined the project were running hard physical construction and site maintenance tasks outside of prescriptive employee relations. That is, the organizational rules and productive processes could not be imposed, only proposed by the project leaders; they needed to be explicitly or implicitly legitimized by the volunteers. A volunteer joining the camping is given the liberty to choose what he/she wants to do, out of the list of tasks that are communicated by the project leader during regular volunteer team meeting: *"There is no chief, no timetable, no one obliges you to do that if you do not want to."* (volunteer A, member of the core team). The negative side of such loose productive organization is *"too much of freedom also brings screwing around. People choose to do nothing, they do nothing. It happens."* (volunteer A, member of the core team).

At the same time, an implicit rule of admission to the team by peers was in place, serving as a motivating factor: *"There is an important group dynamic... We make fun of those who do not do anything, on purpose: hey, you don't do anything... we motivate ourselves"* (short-term volunteer E)

Those who were not willing to fully invest into the project had a feeling of not being part of the collective: *"There is a closed bubble mentality in here... people always do something... You feel like why you don't do anything, it is a kind of motivation"* (a short-term volunteer C)

The "management" team was limited, compared to the size and the amount of work required. In July, when the observation was conducted, it seemed to take the form of a core group of about 20 volunteers anchored around the camping director, identified as the project leader: *"There was only one guy who was holding everything before. Well now we know each other well. But [the project leader] is still the key person"*. (a volunteer A, member of the core team)

The members of the core group were highly dedicated volunteers who took the lead over organization and implementation of various functional tasks of the project: management of volunteers, camping reservations, camping desk, bricolage and realization of small constructions, safety maintenance, stage management, bar holding... Some of them were professionals in the area of their exercise, but many of them learned the profession by doing. One volunteer qualifies the tasks they execute as “false professions”.

The overall rolling of the volunteering team was relatively high, with departures of some volunteers and arrival of others. Its size was also variable depending on the season: it was expanded in July and August, the high touristic season and more reduced at the construction and deconstruction periods. In July, when the observation was made, the rule for joining the YWC team was to volunteer for 3 weeks or more. Although the functional roles were more or less explicitly defined for everyone, the operational process design implicitly agreed by the collective was open to opinions of everyone in every functional domain:

“Sometimes there are meetings where all problems are exposed [...] Everyone [...] expresses one’s discomfort about things going wrong, and there is a catalog of things going wrong [...] Everyone has his/her own piece of work and works on it [...] I do communication with [another volunteer] and there are problems in the kitchen. You see, I cannot give my opinion, it is useless... But it pisses me off to see there are problems in the kitchen. So, I do not want ... If I want to know, it is terrible because at the same time you feel you cannot do much excepting giving ideas, new concepts, processes. It’s fun, so everyone gives one’s opinion” (volunteer F, member of the core team)

The team is also open to new comers: any person joining the project could make propositions about implementation or improvement of specific areas of camping life-processes: *“Sometimes there are volunteers who have been here for two days and could give an idea ... it’s funny”* (volunteer F, member of the core team)

However, it is not sufficient to bring an idea; it needs to be implicitly approved by the others. When other volunteers see the value added of the initiative, they were progressively coming to help out and the initiator was recognized by the community as a task leader.

“Everyone has a small plot and everyone has his own ideas, there is no one person who holds things. Everyone has ideas ... and then there is an idea and when the idea

becomes interesting, everyone joins and then it goes in one direction, but it is not one person who will change things. That's how it works". (a short-term volunteer D)

The degree of implication is another important criterion to achieve the status of the task leader: *"I think when there are people who want to share but not enough, really giving little, it does not work. You really have to give fully here to make things work"* (a short-term volunteer D)

Broadly speaking, personal self-motivation and implication are the key requirements to be fully integrated into the dynamic of the collective:

"It really depends on you ... You get what you bring ... The more you invest, the more you try to understand, the more you'll understand. The less you do, the less you'll get the hang of everything. It's like everywhere in life situations ... the more you'll understand, the more you'll be comfortable". (a short-term volunteer E)

In sum, the camping's organizational structure is characterized by the absence of hierarchic relations in the sense of standard employee-employer relationship. The organizational process is democratic and open to idea expression. The recognition of being part of the volunteering team and the position of a task leader is acquired through "participative assessment" and "functional legitimation" by peers. As a result, the project consolidated around a collective of highly dedicated volunteers; with a sense of initiative and willingness to participate. The core team members completely appropriated the camping project collectively shared the responsibility about the project outcome: *"There is responsibility, we are all responsible [...] Everyone wants that the project works out. This is crazy, this is a project that belongs to no one, we are all concerned"* (volunteer F, member of the core team)

The personality of the project leader undeniably contributed to project realization. Many members of the core team joined and stayed at the project thanks to his charismatic personality, his ability to enroll into the project he leads:

"And then there is [the project leader], he is nice. I'm still working for [his previous employer] but I came to Marseille. Because he talked to us about the project as it was advancing... So [...] I knew there was work and I was here". (volunteer B, member of the core team)

Some volunteers have even expressed emotional affect:

“It is the heart! I've always liked this guy, when I saw him for the first time I thought I've known him longtime before [...] He is adorable [...] I am still here is thanks to him.”
(volunteer A, member of the core team)

4. Shaping a creative atmosphere

Based on the contribution of (James et al.,1978), (Scott & Bruce, 1994) define climate as individual cognitive representations of the organizational setting "expressed in terms that reflect psychologically meaningful interpretations of the situation" (p. 581). Physical space is subject to perceptions and interpretations by users. Many experiences and emotions are attributed to physical space. Building on works on embodied cognition, (Kristensen, 2004) describes the process of “scaffolding”, that is any cognitive process happens within a mediating cultural and physical context. According to him, “the scaffolded environment is part of the creative brain and is an implicit factor”. (Kelley & Littman, 2001) highlight that any studio or laboratory scaffolds its specific activities to their work style. Based on these contributions, the camping creative atmosphere can be then understood as cognitive representations and interpretations of its organizational setting and of its socio-material space.

4.1. Combination of organizational and spatial characteristics favoring creativity

It is possible to disentangle some particular combinations of organizational and spatial characteristics favoring the collective creativity of the camping out of a rich mix of ingredients.

The combination of the ephemeral nature of the constructions with the democratic organizational design is interpreted as an encouragement for risk-taking, experimentation and initiating original solutions:

“For the ephemeral [nature], there are several things at once, but one important thing is that it opens a venue for testing, experimentations. It is less risk-taking compared to long-term projects, you learn things without leaving traces too long”. [...] The project confirmed what I wanted to do: to be free in what I do, to be able to lead projects rapidly... Waiting for 20 years in an architectural agency in order to build a building is of a lesser interest to me ... so, to initiate small things that are within reach of someone young, like me” (volunteer G, a core team member)

The teams diversity, in terms of professional occupations of volunteers, its size flexibility and openness to new comers, combined with large needs for construction, maintenance and animation of the camping site provided with unlimited opportunities exchange of ideas and collective experimentation.

“Everyone feeds with the vision of another. This happens when sharing around a table, or at a construction site. “Look, I see it more like this” – “Yes, you’re right”. And we try. And if it does not work we undo and redo it differently, and if it works then we make it even better... and it’s true that it works well” (volunteer H, member of a core team)

Recycling as a ground philosophy and as a solution to scarcity of available means further nurtured the collective creativity and experimentation. Recycled materials and objects served as a raw material for realization of some camping’s constructions and furniture, realization of small objects - camping’s “goodies”, or equipment for specific events. For example, the Yew We Radio space for the camping’s radio broadcasts, equipped with relooked old radio stations; realization of costumes out of a recycled tissue and of a giant grill out of old cycles for the festive event “Marseille, European Culture of Merguez”.

4.2. Creativity embedded in the camping space²

During the project period, 11 mini-housing constructions were realized. The flagship constructions included “les Cabanons perchés” (Perched huts) - 2-level perched and shady platforms for tents built on scaffolds (photo 7); “Moisseuneuses” (“Combines”) and “Semeuses” (“Sowers”) – dorms and small rooms built on scaffolds out of wooden materials and recycled pallets (photos 4 and 5); la “Gygagone” – version 3.0 of Moissonneuses, a dorm for 16 people; “Hameau de caravans” (hamlet of caravans) – caravans perched on scaffolds on two levels (photo 7); “Valcoucou SDF-hotel” (Valcoucou, a hotel for homeliness); la “Maison bulle” (“Bubble house”) (photo 6). Moreover, nine old caravans and one boat were customized by artists and exterior designers (photo 2)

Numerous landscape constructions and “bounty spaces” were created: Big stares and the agora of the camping; the garden – experimentation with aboveground permacultures

² http://issuu.com/camping2013/docs/ywc_bilanmarseille2013#

adapted for urban life that made the camping green (photo 10); a hive Be-Pass equipped with a smokestack of 2.5 meters high that allows bees to live in proximity with humans; “Passage au frais” – a system of water spray constructed out of plastic boxes; an open kitchen with barbecues (photo 2); Ranch Poney – a two level construction of scaffolds out of recycled wood for a bar at zero-level and a terrace on the floor (photo 9); a reception desk – the caravan YWC perched onto a container augmented with a construction out of recycled pallets (photo 8); la gastonette – a customized caravan for “currency exchange” (the YWC had a local currency in circulation, Gastons); “Chéri, j’ai agrandi la cuisine” – an extension of the caravan for serving breakfast and snack, realized with recycled wood, concrete, with a phytoremediation system.

A 3-level shower systems was realized on scaffoldings, with a solar energy water heating system on the top, showers in the middle and a water recycling system on the ground. Dry toilets were also constructed on scaffoldings with recovery tanks located on the ground and toilet cabins on the top.

Four stages for artistic performances were constructed: “La Caravane Spectaculaire” (Spectacular caravan) a caravan transformed into a stage, “C60” – a stage structure of an O-shape composed of a central hexagon with connected structured of C-shape; “Scène DJ” – a steel cab covered with wood and raised floor; “Scène et Bar-plage” (stage and bar beach) – a stage realized with sand.

The initial ambition of the project founders was to create a “multifunctional space, with different equipment and activities that make it attractive for various reasons and by their mutual proximity and by their organization on the site enable a mix of uses and of publics”³; “a place of realization of dreams of artists *bricoleurs* and performers”⁴ but also “a place where one feels good and where one stays, for a drink or for a long weekend”⁵, a “sort of summer 1936, where perfume of possible is floating in the air”⁶.

The ambition was successfully realized, as attested by some volunteers.

“At the beginning, I came as a camper, I stayed for one week and after that I never wanted to leave. I became a volunteer, I’ve being here for two and a half weeks. [...] I fell in love with the project” (Short-term volunteer D)

³ *Ibid.*

⁴ *Ibid.*

⁵ *Ibid.*

⁶ http://www.apeas.fr/IMG/pdf/Projet_YesWeCamp_8janv.pdf

“ I just came to see my buddy [...] He talked me about volunteering quickly. I said hey, I was on vacations, I planned to go on holiday and in fact I found myself doing everything and anything. [...] And it's good, it changes the normal life, it is a bit like rush, that's cool. [...] Yes, there is a good atmosphere” (Short-term volunteer E)

The architectural and artistic realizations coupled with the human dynamic impelled by the camping stimulated collective creativity and transformed the understanding about the way public spaces can be shaped:

“I think projects as YWC bring a lot of different elements, that it is people who come by curiosity, people who do not have a lot of means and want to live at low cost rate during the summer season, people traveling through or any other ... but also volunteers who are here, who know the site [...] there are so many things I think it feeds the project and the way to design spaces created either for housing and for other activities” (volunteer H, member of a core team)

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Figure 1 The camping overall spatial organization scheme



Figure 2 View in the camping from the Ranch Poney



Figure 3. The camping's barbecue and some of customized caravans



Figure 4. "Moissonneuses" (Combines)



Figure 5. "Semeuses" (Sowers)



Figure 6. Interior of the bubble house



Figure 7 “Hameau de caravanes” (Hamlet of caravans)



Figure 8. The camping reception desk



Figure 9. Ranch poney



Figure 10 The garden

Arts in Business – Why and What For? Phenomenological Approach to Creativity¹

Paulina Bednarz-Łuczewska

Kozminski University, Warsaw, Poland

Structures Abstract

Purpose - We aim to theorize about the selected aspects of the relationship between arts and business in the context of the recent proliferation of Art-Based Initiatives. The popularity of ABIs urges us to ask some fundamental questions about the nature of such interventions: What is really happening when arts is brought into the business context? Why does it “affect value-creation capacity”. Develop employees and infrastructure?

Methodology - The paper has theoretical and speculative character. It is based analysis of literature and implementing a classical, widely recognized theory into the new field.

Value- By extrapolating the theory of the phenomenologist Roman Ingarden from the field of aesthetics into management the paper provides a new framework for analysis of the process of creativity and innovation. The framework differentiates between three moments of the creation process: material basis, act of consciousness of the creator and concretization performed by the recipient. Each category requires different research methodology and plays a different role in the value-creating process.

Practical Implications - By providing deeper understanding of the relation between art and business, which underlie any Art-Based Initiative, the paper contributes to more efficient and more precise application of such procedures. The findings will shed the light on the questions of “when?”, “where?” and “how?” to use ABIs.

Key words: Arts-Based Initiatives, phenomenology, innovation, creativity, aesthetics

Paper type: Academic research paper. First draft.

1 Introduction

Art is in the air, at least in the air that business people breath nowadays. In the recent decade, we have observed a of growing interest in the world of art among management scholars and practitioners. The world of business reaches for artists and artistic projects in the hope of acquiring knowledge and inspiration (Nissley 2010; Daum 2005)(as opposed to interest in arts as sheer source of pleasure, CSR-opportunity or financial investment).

¹ *Work in progress. Do not cite without author's permission*

Probably the most intensive manifestation of that interest are various forms of the so-called Arts-Based Initiatives (ABIs) defined as “planned managerial use of art forms to address management challenges and business problems with the aim of developing employees and infrastructure that affect the organisational value-creation capacity”. (Schiuma 2011: 2)

The literature on the issue grows, yet it is scattered and lacks universal, unifying concepts and language. There is a consensus that performing arts is correlated with increased creativity and innovativeness (the terms are sometimes used interchangeably). (Pässilä, Oikarinen, Parjanen & Harmaakorpi 2013; Pässilä 2012; Styhre & Eriksson 2007) Yet despite of many reports that it actually is the case, the process of art positively affecting business remains a black-box, the quasi-magical area of non-theorizing. This situation might be partially traced back to the bad reputation that theorizing has among researchers dealing with creativity who have been all too often criticized from strictly positivistic position for lack of rigor and unscientific reasoning.

We aim to theorize about the selected aspects of the relationship between arts and business. The recent proliferation of Art-Based Initiatives urges us to ask some fundamental questions about the nature of artistic interventions: What is really happening when arts is brought into the business context? Why does it “affect value-creation capacity”? How can art help “develop employees and infrastructure”?

Further we claim by theoretical extension (Snow, Morrill, Anderson 2003) of the aesthetic theory of the 20th century phenomenologist Roman Ingarden we might (1) develop framework for systematizing and unifying the scattered body of knowledge about artistic interventions into business; (2) enrich our methodological tool-set with phenomenological analysis akin to the one used by Ingarden; (3) gain some non-trivial, contentious insights about how the creative process takes place and how it is linked to value creation.

2 Ingarden’s original contribution

Roman Ingarden was a prominent Polish philosopher of the twentieth century. At the early stage of his career he became a student of the founding father of phenomenology – Edmund Husserl. Ingarden shared Husserl’s passion for phenomenological analysis, the need for systematic reflection upon the experience of phenomena as they appear in human consciousness. He was an important and influential member of the phenomenological

circle collaborating with thinkers such as Max Scheller or Edith Stein. However, despite of his deep appreciations for Husserl's work, Ingarden developed his own position and distanced himself from Husserl's transcendental idealism. (Mitscherling 1997; Thomasson 2012)

Large portion of Ingarden's work – including his magnum opus *The Controversy over the Existence of the World* (1960) revolves around the basic questions of ontology. Ingarden understood ontology as based solely on *a priori* inference and “concerned not with what actually exists, but with what could possibly exist (which concepts are non-contradictory), and with what (according to the contents of the relevant ideas) it would take for objects of various kinds to exist, or entail if they existed. He thus contrasts ontology with metaphysics, which is concerned with answering factual questions about what sorts of things actually exist and what they are like.” (Thomasson 2012) By examining essential features of any experience connected to the objects under inquiry, Ingarden could determine what the ontological structure and status of these objects must be.

By conducting systematic ontological reflection, he contributed significantly to aesthetics. The work that has gained him international reputation was *The Literary Work of Art*, first published in 1931 (in German, first English edition in 1973). Ingarden applied there the method of phenomenological analysis to the notion of literary work. He followed later with similar scrutiny of music, visual arts and architecture. (1973; 1986) Thus Ingarden created a systematic and coherent understanding of what works of art are, how they exist and how can they be judged. This part of his reflection, as we claim further, provides insights valuable for management academics and business practitioners.

According to the Polish philosopher, works of art are “purely intentional objects” i.e. they owe their existence and nature to acts of consciousness of a subject. The mode of existence of the artworks is totally dependent on intentional acts of their makers. (Ingarden 1973; 1986) Having said that, one can distinguish between three different moments of the process of existence of an artwork.

First, artwork is embedded in some physical object – physical copy of a book, musical score, piece of architecture or a canvass covered with paint. This is the realistic ontic base upon which the proper artwork is built. It would be absurd and contrary to human experience to claim that an artwork equals its physical base. Such a claim would entail that the difference between, say, “Hamlet” and “King Lear” lies in chemical composition

of the copies of both literary works. On the other hand, it is important to note that Ingarden recognizes the fact that even such purely intentional objects as works of art of various kinds are founded not exclusively in consciousness, but also on real spatio-temporal objects. (Ingarden 1973; 1986; Mitscherling 1997; Thomasson 2012)

Second moment is the artwork as such. Its “mode of existence” cannot be classified as “ideal” (in the platonic sense), since one cannot claim that it has always existed and has been merely discovered by the creator. To the contrary, it has been called to existence by the creative act of consciousness of an artist. As it was explained above, artwork cannot be identified with its physical base and thus classified as ‘real’ in the ontological sense. The recognition of existence of the works of art require us to accept the existence of things in a category distinct from either of the real/ideal dichotomy, namely that of purely intentional objects. . (Ingarden 1973; 1986; Mitscherling 1997; Thomasson 2012)

The third moment of the artwork seems to be particularly interesting. Works of arts regardless of their particular genre (literary work, visual art, music etc.) remain open, full of gaps and indeterminacies. The “aesthetic object” arises through “concretization (concretion) of the artwork” and it is a common enterprise of the author and the receiver. In the act of perception the latter reconstructs the work of art created by the former. On the top of that, the receiver fleshes out the skeleton of the work of art with his own, idiosyncratic content. By the same token, the receiver brings out the potential value inhered in the work of art itself. In other words, the process of concretization of the work of art has a form of a quasi-dialogue, a dynamic and exchange between the creator and the recipient. The concretization always takes place in concrete, defined spatial and temporal settings. Therefore one work of art can have a plethora of unique concretizations. (Ingarden 1973; 1986; Mitscherling 1997; Thomasson 2012)

The three-fold distinction between physical object, work of art, and aesthetic object is mirrored with three different ways of having or not having value. Every work of art, according to Ingarden, has moments that are “axiologically indifferent” and some that are “axiologically significant”. Physical foundation of the work of art is axiologically neutral. Ingarden claims every artwork has a set of axiologically neutral moments that together form an “axiologically neutral skeleton of the work of art”. The significant moment (artistic and aesthetic values) appear on the basis of this skeleton but only in connection with intentionality of the author (artistic value) or concretization of the art form performed together by the artist and the perceiver. Applying different language to

Ingarden's framework one can say that value emerges only insofar as human intentionality and agency is involved. (Ingarden 1973; 1986; Thomasson 2012)

3 Bringing Ingarden to a firm

Ingarden's theory might be useful with regard to the analysis of the relationship between arts and business in at least three distinct ways: by providing a unifying framework for the extant body of knowledge; by pointing to a potentially fruitful method of inquiry, namely that of phenomenological reduction, that could be used within the field of management; by extrapolation of his findings, Ingarden thought is full of unique, non-trivial insights into the process of creativity and innovativeness leading to value-creation.

3.1 Framework

The first way that Ingarden's thought can be applicable within the field of management science is by providing a coherent framework for analysis of the process of creativity and innovation, the very core of any artistic endeavor. We claim that Ingarden's phenomenological description of the artistic process can be extrapolated to any creative process, above all to the one taking place in a value-creating firm. Thanks to its coherence and relevance, Ingarden's set of concepts might serve as a unifying framework for the whole emergent field of "arts in management". On the one hand, the framework distinguishes between three ontologically and epistemologically different moments of creation that require different methods of inquiry and different language of description. On the other hand, the framework helps us see interconnections and various other relations between the three separate moments.

The first moment, the physical foundation of the creative act corresponds with everything that is necessary yet not sufficient for the act of creation. First of all we might include here a reflection on the resources a firm has at its disposal or might acquire. Here we might also analyze the whole ontogeny and phylogeny of creativity - the context in which a conscious, creative act takes place both on the level of creative individual as well as on the level of the whole creative community. This category could encapsulate: psychological insights into the creative process, material resources, ways of managing the team etc. Ontologically speaking, this moment belongs to the realm of the "real" therefore - epistemologically speaking - the scientific, positivistic methods are the best match for the research within this realm.

The second moment, the intentional act of the author (individual or collective) corresponds with the unique, idiosyncratic way a firm consciously projects its imagination into the realm of the real world marked by Knightian Uncertainty (cf. Spender 2014). Under this umbrella one may gather various analysis of the imaginative and intentional components of innovation, i.e. the necessity of human consciousness and agency in any value-creating act. As this is a realm of “phenomena”, the traditional scientific methods could be of no use – as long as we analyze what determines creativity, its “structure”, we remain within the first moment, the real basis upon which the actual creation takes place. If we, however, apply the method based on causality to the realm of creativity (its agentic component) we fall prone to a common methodological mistake that Margaret Archer would call “downward conflation” (2000) i.e. denying causal autonomy of human agency. In order to inquire into the creative process one has to look for methodologies provided by humanities, among which phenomenological analysis might play a significant role. The epistemology of creative act is in itself a vast problematic that cuts across cleavages between disciplines. It definitely requires serious methodological reflection, above all within management science.

The third moment, the concretization of the work of art when the recipient supplements the “schematic formation” might provide heuristics for understanding the all too often omitted part of the value creative process – i.e. the interaction with the final recipient of a good or a service. The real value is actualized only when it finds a beholder. Moreover, the recipient might play a quite concrete and non-metaphorical role in the creative process as it is the case in participatory design, crowd design and participatory creation process that involves the recipient of the created good. Thanks to Ingarden’s framework we can incorporate all the robust literature about the participatory aspects of innovativeness into one roughly coherent body of knowledge. Methodologically speaking, this part of the process can be researched with the help of both scientific as well as interpretative method, depending on the particular aspect of the inquiry.

3.2 Phenomenological method of investigation

Ingarden’s reflection on arts could be also inspiring methodologically. After some modifications, the method of phenomenological analysis could be successfully implemented into management research.

Ingarden perceived phenomenology as a descriptive domain – in this respect he opposed the transcendental dimension of Husserl’s thought. Ingarden was one of the

phenomenologists – like Alfred Schutz or Max Scheller – who believed philosophy can gain a new momentum thanks to thorough analysis of objects as they are given to a subject, as they are being experienced in their core, independently of any contingencies.

Phenomenological method also called phenomenological reduction consists in bracketing all theories about the object, all pre-existing meanings attached, even the belief in what is real. All these issues are left aside for different methods of cognition such as the scientific one. Phenomenological reduction's aim is to evoke a concrete, living meaning of a phenomenon as it is present in a person's consciousness. In practice, such analysis included a lot of reflection on the language, the concepts that we use, as they reveal hidden assumption and true nature of our cognitions and experience. The phenomenological method is based on the assumption that there are essential correlations between kinds of objects and the modes of cognition by means of which they can be known.

The method of phenomenological analysis of the concepts applied to the field of innovation management could provide us with a lot of valuable self-knowledge as well as potentially open new spheres for inquiry.

3.3 Contentious insights

One important yet controversial insight from the extrapolation of Ingarden's framework into the field of innovativeness and creativity in business context concerns the relationship between resources and value creation. Just like no physical object can provide artistic value so no resource as such or combination thereof can bring about value. Value is created only insofar as human consciousness and intentionality are involved in an act. (cf. Spender 2014) Resources are necessary, yet secondary component of the creative process. With the help of intentionality, one can often compensate the lack of a particular type of resource. No resource, however, provides means to by-pass human imagination in the value-creation, unless we use the term "resource" in reference to human agency making thus the term either internally contradictory or tautological. Value creation does not happen by the virtue of combining resources but by intention of the author concretized in spacio-temporal act of reception.

Since creativity is primarily about intentional acts of consciousness that cannot be reduced to resources used in the "production" or to the context in which the creative act took place, we might rethink the metaphors we use to describe that context. Creative act might be facilitated by various contextual factors, yet they are not determined by them,

agency might be “constrained” but never “caused” in the proper sense of the term – it possesses its causal autonomy. The source of innovation is the creator: his imagination and agency. Therefore various organic metaphors that depict the context of innovation as “ecology” or a “system” might be misleading exactly because they exclude any external causality such as “deus ex machina” of human agency. Since metaphors are very powerful heuristics, an inadequate metaphor can seriously hinder our understanding and praxis. Following this insight, there is a need for developing new metaphors, free of the pitfalls described above. It is important to note, that the process of developing a metaphor might in itself be an act of artistic creation.

Third, Ingarden’s framework draws our attention to the sphere that has been only marginally linked with the process of innovation, namely the moment of concretization. One way to extrapolate this part of Ingarden’s aesthetics onto the field of management is to consider all the instances of clients co-creating the product or service they receive. However, following Ingarden’s intuition that the “aesthetic value” in the proper sense emerges only through the process of concretization, we should scrutinize all the value that is being produced at the final stage of the economic exchange. These values might be of different nature and could include socially-beneficial imponderabilia such as trust, joy or friendship, but could also close the feedback loop and affect to potentiality of value creation of the firm by providing knowledge, skills or even eagerness to innovate among the people who have been involved in the creative process in the first place.

4 Conclusions: Practical Implications

The practice of introducing arts into the business context has already turned out to be fruitful. It is our claim that the more we understand why and how arts could enrich practice the more precisely can we apply the artistic tools such as the ABIs. The three-fold distinction of the creative process might turn out to be a particularly useful heuristics for the business practice for several reasons.

First, it differentiates between the structural and the agentic component of the creative process thus enabling a manager to know what can be expected from each of them. For instance, it becomes clear that the investment in infrastructure might but does not necessarily have to trigger innovation; on the other hand, sometimes creativity takes place despite of very limited resources.

The framework humanizes a firm, reinstalls people as the source of value the firm produces. Such act of placing people in the center of our thinking of the firm (and not as “human resources” but - to the contrary – as human agents) could have far-reaching consequences in various dimensions: ethical, financial, strategic and political.

Moreover, the third moment, that of concretization of the artwork should draw the attention of management to the final, interactional stage of the creative process that is often not even considered to be linked to innovativeness. Perhaps this underexplored field might turn out to be of crucial importance for as it is able to generate values that cannot emerge otherwise.(see also: Dell’Era & Landoni 2014)

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Arcade in the old Centre as an Instrument of the creative Milieu on Aspect of Knowledge Processes

Chih-Hung Chen *, Woan-Shiuan Lin

Department of Urban Planning
National Cheng Kung University
No.1, University Rd., East Dist., Tainan City 70101, TAIWAN, R.O.C.

** Corresponding author*

Structured Abstract

Purpose – The street-building with “arcade” as frontage was one of the particular image in the old Asian city centres. However, by the urban alteration, the commercial function was moved out. Arcades don’t have to support the activity for trading and exchanging any longer and become the fresh “lost spaces”; moreover, this new kind of “non-places” stop the urban development. Yet, are arcades merely negative in the “new age” entitled of knowledge economy? For the interrogation, the space character of arcade, its potential for the knowledge production and the opportunity for urban regeneration with knowledge activity (various dialogs) were tried to illuminate.

Design/methodology/approach – For knowing this, an approach to combine two perspectives was proposed. (1) Cities as knowledge tools: social and physical set-up of urban environments determines human communication, information exchange, and collective thinking (Edvinsson, 2006). (2) Cities as diagrams of knowledge: knowledge is regarded as a major force shaping cities into specific patterns (Alexander, 1972). Arcade provides an intensive interaction of private commercial territory and public access atmosphere. Its public sphere (Habermas, 1989) and “soft boundary” (Hertzberger, 2005) encourage communications, interactions and divergent territorial claims. Arcade offers people the heterogeneous and flexible possibility of gathering, intensive communication and appropriate atmosphere: creative milieu.

Originality/value – The interrelation between knowledge and space can be realized through a matrix with the two-dimensional array to identify the physical and social environment set-up: “heterogeneity” and “flexibility”. Four kinds of spatial patterns are recognized by four quadrants and directly reflect in urban configuration. Space structure of arcade is classified in the high heterogeneity and high flexibility quadrant in this methodology. It offers the safety sense of meeting and the spatial condition for the intensive dialogue: more property for knowledge economic production. As the study result, different types of arcades are classified by the density of knowledge activity and space structure.

Practical implications – It is explained by the Model, that the “knowledge activity” - various dialogs - could be coming back to the “ruins” in the city centre. This phenomenon is beginning to be observed in the arcades in Minguan Road, the past business street in

Tainan with ca. 400 years history. If the spaces of arcade could be identified as one of the potential place for knowledge production, the importance of arcade in the old city centre had therefore a chance to be revalued. It might be one of the demonstrations of the strategical application for knowledge based urban development and regeneration.

Keywords – Arcade, Creative Milieu, Knowledge based Urban Regeneration, Soft Boundary, Tainan.

Paper type – Academic Research Paper

1 Introduction

Old city centre, which was developed by commercial gathering in the past years, became a place for trading and information exchange. Nowadays, however, through the urban expansion, the old city centre loses its advantage of commercial location and becomes “a shell” which hinders the urban development. In this condition, could the pattern of the location and space characteristics in old city centre become a new resource of the knowledge based urban (re-)development?

There are two perspectives on knowledge production and city:

- 1) Cities as knowledge tools support intellectual capital (Edvinsson, 2006).
- 2) Cities as diagram of knowledge (Alexander, 1972).

The perspectives above shows that the existence of “knowledge” is represented by the cities and it is a major force for shaping cities into specific pattern.

Based on these two perspectives, the relation between knowledge and space patterns can be realized through a matrix with two-dimensional array to identify the physical and social environment set-up which depend on its very resources of relational and structural capital. Through this model, we can clarify the interrelation between knowledge and space in four different kinds of spatial patterns, which can support knowledge production and those patterns which directly reflect in urban configuration.

However, not all of the place (Norberg-Schulz, 1980) for knowledge production can go through the knowledge process (Bose, 2003). To make the conversion and creation of knowledge, knowledge spiral (Nonaka and Takeuchi, eng.1995, ger.1997) could be expressed by continuous dialogue, organization, implementation and cooperation for leading knowledge production to a higher level.

Therefore, the place for intensive interaction and dialogue needs “catalysis” (Oswalt et al., 2013) to inspire the reaction and “creative milieu”, a place that contains the necessary requirements in terms of hard and soft infrastructure to generate a flow of ideas and inventions, can be such “catalysis” to motivate process into knowledge spiral. This kind of space have three characteristics as following:

- 1) Public sphere which stimulates communication (Habermas, 1962, 1990, 2013).
- 2) The intermediary space provided by “in-between” (Hertzberger, 1991).
- 3) Cluster of space unit (Frey, 2009).

As an unit, arcade, a general image and space pattern in old city centre, could provide characteristics of creative milieu as above. As a corridor to string the units, which embedded in a continuous wall-adjacent building for public accession, has one-sided colonnade separating the street and the other side for commercial purpose. By its heterogeneous space unit clustering together and variety type of territorial claims, arcade provide a half in-close and safety place for public communication and dialogue (Jacobs, 1984) which highly accelerate the reaction of knowledge process.

With the features of creative milieu, arcade might also play a valuable role - such as the “second hand spaces” (Ziehl et al., 2012) - in urban regeneration in old city centre. Especially under the location conditions with low land price, arcade can be regarded as opportunities in arising creative milieu in large scale. Moreover, by combining series units of arcades, it can become the urban knowledge corridor. This research would take Minquan Road in Tainan City, which went through from depression to retrieval, as an example, and it can be proved that the activity has gradually revived by its creative milieu and the arcades in Minquan Road become instruments for knowledge production.

2 Knowledge based urban (re-)development

Subject to development spindle of the intellectual capital in recent years, we must start with how knowledge is produced in the city and what kind of specific pattern carry the knowledge, to prove that a particular pattern of old city centre with possibility to produce knowledge and provide creative milieu.

2.1 Knowledge cities

There are several of attempts to interpret the functions of cities. From the perspective of knowledge economics, cities might be seen in the context of more or less good city

regime to support the value creation from and for the knowledge workers. Therefore, there are two views should be concerned. Cities can be viewed as knowledge tools and diagrams of knowledge.

City, the place for people exchange intensively, can be viewed as knowledge tools which support intellectual capital. Depending on its very resources of relational and structural capital, social and physical set-up of urban environments determines human communication, information exchange, and collective thinking (Edvinsson, 2006). In the case, the place which encourage and nourish knowledge process do have significant impact on knowledge production.

Besides, cities can also be viewed as diagrams of knowledge. Knowledge is regard as a major force shaping cities in to specific patterns, a powerful urban driver which directly reflects in urban configuration (Alexander, 1979). Thus, in knowledge society, the city should have some specific pattern to support the process of knowledge production.

2.2 Space patterns: a model for knowledge production

To clarify the interrelation between knowledge and space, it can be realized thorough a matrix with the two-dimensional array, concerning “heterogeneity” and “flexibility” to identify the physical and social environment set-up which depending on its very resources of relational and structural capital. The dimension of value about heterogeneity is the characteristics of physical environment of urban spaces, which could be multiple or single. Meanwhile, the dimension of value about flexibility is the characteristic of social environment of urban spaces, which indicates the number of different kinds of activities.

Through this model (fig.1), four different kinds of spatial patterns, which can support knowledge production, could be recognised. In addition, when different kinds of thoughts or perspectives gather in a space, there is a great chance to “encourage and nourish the collective knowledge.”

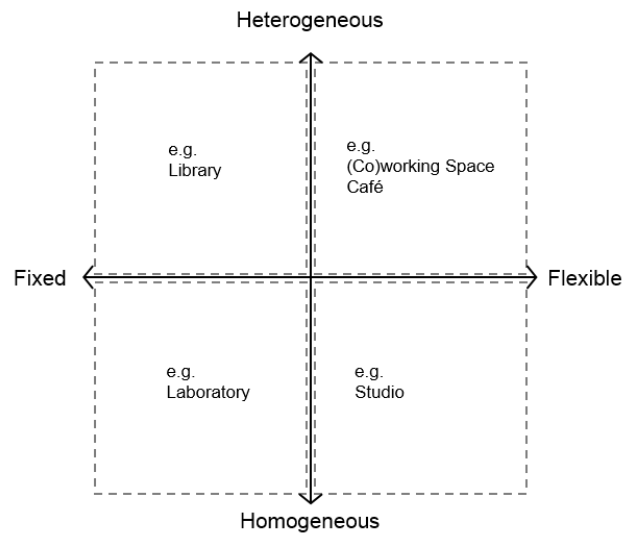


Fig. 1. Matrix of four kinds of places for knowledge production

Flex-Hetero-Quadrant, which is in first quadrant, contains different kinds of space patterns and there is no specific activity within, which means there is no specific kind of knowledge production or discussion and the capacity is unpredictable as well.

The activities provided by the place in the second quadrant are various characteristics or physical environment, but these multiple spaces only provide one particular activity. Therefore, the aim of knowledge production in “Fixed-Hetero Space” is fairly clear.

The aim of knowledge production in “Fixed-Homo Space”, which is in third quadrant, is also fairly clear and the knowledge and perspectives which produced by activities within these spaces focus on particular field with high capacity.

In the last stage, the place in the fourth quadrant contains the relatively complex activities compared to the space in other quadrants. Moreover, the knowledge and perspectives which produced by the activities within these spaces generally focus on particular field while the capacity is unpredictable.

It’s evident that the activities in the place of Fixed-Homo-Quadrant, Fixed-Hetero-Quadrant and Flex-Homo-Quadrant are defined clearly that the space arrangement and management within these places support particular activities. However, in Flex-Hetero Quadrant, two of spatial dimension of values are unstable. Hence, social and physical environment set-up cannot describe or even identify the characteristic of “In-Between” (Hertzberger, 1991) which actually is an indispensable factor to attract people to stay.

2.3 Knowledge process

Knowledge process is usually explicated by the “knowledge spiral” (Nonaka and Takeuchi, 1995), which is a dynamic model illustrates the transformation of implicit knowledge to explicit knowledge, and demonstrates the process of knowledge creation.

In this model, there are four phases of knowledge process cycle. First, humans get implicit knowledge from social groups. Through their comprehension, the implicit knowledge transits into explicit knowledge by dialogue, and then externalize. Then, the explicit knowledge links to another explicit knowledge and have a combination to become a new knowledge. The previous results of the last state turn into new implicit knowledge through continual learning and doing, finally become a common sense. The knowledge spiral repeats on and on by "externalization", "combination", "internalization" and "socialization", this continue transformation process urge the knowledge into higher level of personal knowledge.

In addition, the knowledge transfer and related changes can occur at the level of the individual or organization, which represents the transition from individual knowledge into collective knowledge.

2.4 Creative milieu: a place on knowledge process

When different kinds of thoughts or perspectives gather in a space, there is a great chance to “encourage and nourish the collective knowledge” (Edvinsson, 2006). For this purpose, there may be some of space pattern can give the chances to more communication. The space with “creative milieu”, as a catalyst, is an indispensable element to inspire the interaction and go into knowledge spiral. Creative milieu typically contains the following three features: public sphere, in-between and cluster (Frey, 2009). The following are the perspectives of these feature:

- **Public Sphere:** The public sphere (ger. Öffentlichkeit) is an area where individuals can come together to discuss freely and identify societal problems, and the political action would be influenced through the discussion. Therefore, the space with the public sphere can induce interaction, and promote knowledge renovation, such as courtyard (ger. “Hof”), with its harboured shape, make people feel safe that people would be willing to stay in space and discuss.
- **In-Between:** *“The in-between concept is the key to eliminating the sharp division between areas with different territorial claims.”* (Hertzberger, 1991:40)

This kind of “soft boundary” characterised by “In-Between” doesn’t only provide a place to communicate for the customers and the shops but also plays as the key role to the transition and connection between areas with divergent territorial claims. Moreover, *“concretization of threshold as an in-between means, first and foremost, creating a setting for welcomes and farewells, and is therefore the translation into architectonic terms of hospitality.”* (Hertzberger, 1991:35) Hence, the space with “in-between” is one of important space character of creative milieu.

- Cluster: The concept of cluster could usually be defined as units such as firms in similar and related industries. With this concept, the benefits in terms of innovation and learning might grow from close geographic proximity (Malmberg and Maskell, 2002). Mostly, the greater opportunities for specialization could drive the innovativeness in industrial clusters – especially while the role of knowledge spill overs has likely been overstated (Caniëls and Romijn, 2005). Cluster could be one of the most important space patterns for knowledge production and innovation (Landry, 2000).

3 Spatial character of arcade

The street buildings with arcades is a common “image” (Lynch, 1960) of the old city centre in Taiwan. It appears from buildings on private land with public access embedded, and the colonnades separate the streets and internal pedestrian space (fig. 2). Due to the cover from three surfaces, the semi-open space makes people feel free, content and deprived from the effect of outer transport. In addition, the passage arise opportunity to cotton to the shops. On account of the space is part of the private sphere of townhouse buildings, each building unit has authority to claim their right of territory and enables the space of arcade appear diverse complexions.

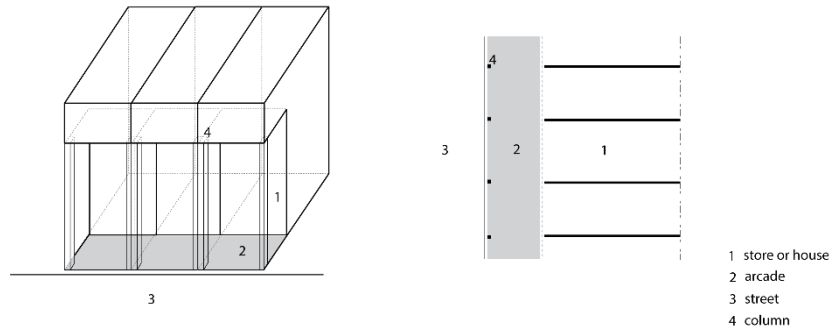


Fig. 2. Space structure of arcade

In the past, arcades in old city centre are generally accompanied with bustling commercial activities, but with the decentralization of commercial function, such semi-open space transferred into a lost space. The spatial pattern for exchange and dialogue are still maintained, which might provide chance to insert knowledge production, an industry which needs intensive interaction. On the premise of knowledge economics generation, can arcades turn out to be the space animates old city centre?

In order to prove whether arcade have the ability to produce knowledge and possess creative milieu, two methods are executed as following: (1) the space pattern of arcade in knowledge production through biaxial judgement, and 2) induct different pattern of arcade to find out the public sphere, in-between, and cluster space character.

3.1 Type of knowledge production space pattern of arcade

By identifying its physical and social environment set-up character can find out the types of knowledge production space which arcade belongs to in the matrix which defined by heterogeneity and flexibility.

On the aspect of physical environment, the space units are defined by the first floor ceiling, ground floor, storefront wall and two columns. The most special character of arcade is that it has three opened surface for access purpose and the margins between the space units are invisible. Because the depth from street to storefront are the same, which could also connect every unit together, this space has a function to allow public accession. On the other hand, due to the difference in landownership, the width of every store is different.

From the above characteristics, it can be summarized that the spatial shape is not easy to define and regulate, and it changes easily. Therefore, the physical environment set-up of arcade belongs to the heterogeneity space. And from the following survey, it can be found that the activities inside every arcade unit are very different. Thus, the social environment set-up of arcade belongs to the flexibility place.

In conclusion, arcade belongs to “Flex-Hetero place”, which the transformation is difficult to classify and describe. Hence, it is necessary to identify the characteristics and in-between space through a more detailed observation method.

3.2 Arcade and creative milieu

To prove that arcade can provide creative milieu, its spatial characteristics must include the public sphere, in-between and clustering. In this study, architectural transformation and typology are used as analysis method to identify the spatial rules of arcade.

3.2.1 Public sphere and cluster

A space with public sphere can induce more dialogue, and its spatial qualities usually make people a sense of security. For example, the void space of courtyard (ger. “Hof”), which Jürgen Habermas views as a kind of space pattern which expresses public sphere, surrounded by the covered building inspire people to communicate and discuss.

However, by turning this space (architectural transformation) into different direction like arcade, the void change to open horizontally and transparently (fig. 3). The special space character of arcade is that it shapes the spatial extent by the invisible boundaries and its openings are for people to access and gather. The difference between arcade and courtyard is that arcade has more openings than courtyard, but doesn't change its pedestrian safety (Jacobs, 1984) given by shelter atmosphere (Böhme, 1995). Thus, the space pattern of arcade includes public sphere which is proved by the structure of courtyard.

Whether arcade has the space characteristics of “cluster” can be observed from physical and social environment set-up. For the physical set-up, arcade is meaningful only through the combination of numerous spatial units, because a single arcade unit cannot combine void to an apparent corridor. Through this combination of process, it can be confirmed that arcade has the space characteristics of “cluster”. And for social

environment set-up, due to the mutual corridor in the front of the stores, the activities in store may extend in arcade and made the variety of activities in this corridor, which can be concluded that arcade also has the activities characteristics of “cluster”.

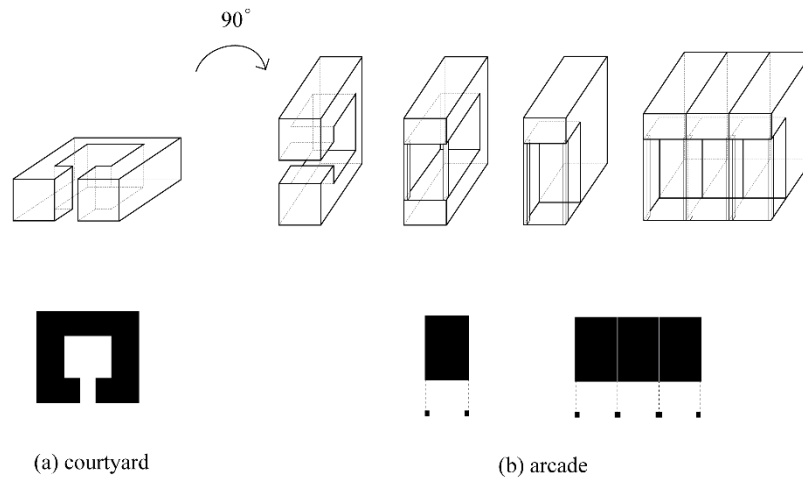


Fig. 3. An architectural transformation from courtyard to arcade

3.2.2 In-between and territorial claim

Arcade has both public access and private territorial claim and such “in-between” qualities evoke more dialogue which means arcade plays an important role as catalytic in knowledge spiral. In order to prove the characteristics of in-between, the study would summarize the public and private claim pattern in arcade by defining the boundaries of every unit and typology.

For the access purpose, each spatial unit does not have clear boundaries, but the extent can be defined by extending the virtual line from column to the wall, which formed an invisible boundary for private sphere unit. And because there is no clear boundary for spatial extent, the activities in public and private areas appear diversity.

To know the extension of public and private territory, the study separate arcade unit into nine part based on each person walking scope ,1.2m-1.5m, as cutting standards (fig. 4). Because an open area, room or space may be conceived either as a more or less private place or as a public area, depending on the degree of accessibility, the form of supervision, who use it, who takes care of it and their respective responsibilities

(Hertzberger, 1991). Therefore, we can know the territory claim by recording their access possibilities and visual permeability in this nine grid space unit. Accessibility in arcade depends on the occupation of private sphere. For example, snack shops extend the space by putting the seat into the arcade, and clothing stores put out the hanger to the arcade. However, for more access, the occupation usually doesn't completely block the passage of the arcade. Therefore, this study records the occupation of arcade space. As the following chart, we can find that there are various territorial claims which can be proved the character of in-between in arcade.

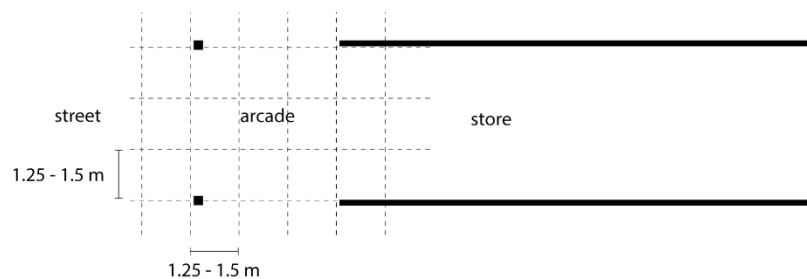


Fig. 4. Method to measure public and private territory

4 Case study : Minquan Road in Tainan City

Arcades in Tainan City, the very first reclaimed region in Taiwan, is a typical case regarded as potential places for knowledge production. Minquan Road was one of the most prosperous street which has variety of traditional industries gathered since initial stages of Tainan. After automobile oriented development occurred, arcades become a safe and comfortable commercial exchanging places for pedestrians and stores at Minquan Road. However, with urban sprawl, the commercial location condition of city centre had changed; Minquan Road was no longer a thriving road in the old city centre, which get void and become the lost space.

In recent years, the knowledge-based economy becomes the new opportunity for urban (re-)development. In order to make the product have more chance to interact with people –either residents or tourists, this kind of industry look forward to centre location, this owns place with low using price and creative milieu for more innovative thinking. According to the survey, the phenomenon began to appear in Minquan Road and have returned the activities back to old city centre; many new industries start to incubate.

Therefore, in order to realize the space characteristics of Minquan Road as the case for the knowledge production in old city centre, this study will go through actual investigation and type analysis to find out the following prototype of arcade.

Through fieldwork, the current situation of arcade in Minquan Road is being comprehended, which has 136 arcade units on the north side and 145 on the south included. According to the analysis, there are about 63% arcade units for commercial using, 32% for residential. To mention the circumstances of the commercial development, there are 41% of the stores have grown, 36 % stay same and other 22 % are declined. On the basis of the ratio of development, we can declare that the commercial condition gradually recovered in recent years.

Then, through the research methods we have mentioned above, keep track of the occupied space and activities in the arcades. In the light of accessibility for passenger and stores of 281 arcade units, six prototypes (fig. 5) are summarized as following:

Prototype 1: two-way flow.

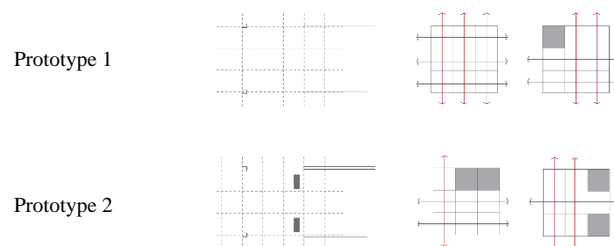
Prototype 2: two-way flow, several spaces are occupied then reduced the area of passage.

Prototype 3: one-way flow, leaving only one passage in arcade, the entrance from store to street was blocked.

Prototype 4: one-way flow, leaving only narrow passage in the arcade, the entrance from store to street was blocked.

Prototype 5: one-way flow, leaving only the passage from store to street, but the passage for passenger was blocked.

Prototype 6: impassable, blocked by multiple items, arcade is unable to pass smoothly.



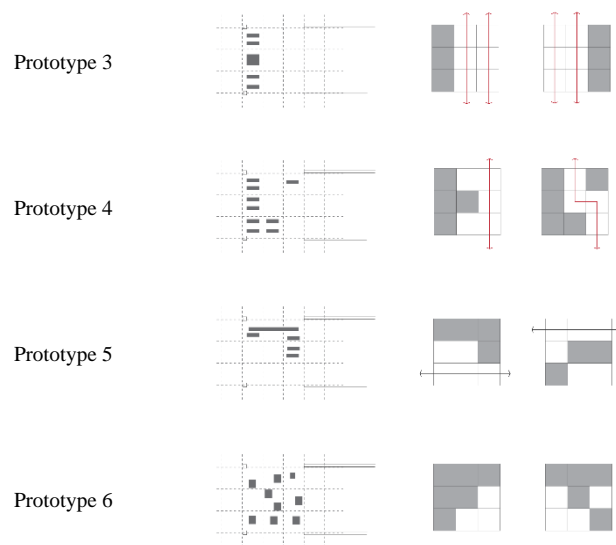


Fig. 5. The prototypes of arcade

Then, connected all record of arcade unit in Minquan Road, can find out the diversity of passage width in arcade and the extension of private sphere that made by the space occupation. (fig 6)

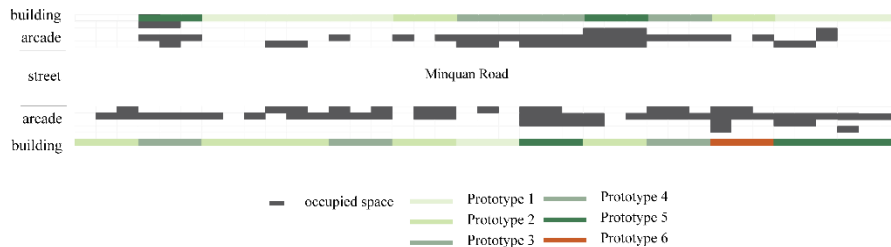


Fig. 6. The distribution of prototypes in Minquan Road

From the above characteristics, can attribute that the arcade in Minquan Road has properties of public sphere, in-between and cluster. Comply with the conditions of the space pattern, which means that it has the ability for knowledge production and given the opportunities to induce a knowledge spiral. In recent years, the store categories both sides gather more and more knowledge production-related industries which extent their private

sphere for communication and to attract the customers. Arcade can provide the creative milieu for all the possibility any dialogue and interaction.

5 Conclusions

The street-building with “arcade” as frontage was one of the particular image in the old Asian city centres. As the space patterns and the stringed units, arcades can viewed as corridors which embedded in a continuous wall-adjacent building for public accession, which has one-sided colonnade separating the street and the other side for commercial purpose.

With this open space structure, it provides an intensive interaction of private commercial territory and public access atmosphere by alignment column corridor. This public sphere which excessive between the private and public might encourage communications and interactions. Besides, the “soft boundary” characterised by “In-Between” doesn’t only provide a place to communicate for the customers and the shops but also plays as the key role to the transition and connection between areas with divergent territorial claims. Due to this significance, arcade offers people the heterogeneous and flexible possibility of gathering, intensive communication and appropriate atmosphere: the creative milieu.

In our methodology, the open space structure of arcade can be classify in the high heterogeneity and high flexibility quadrant, in which intensive dialogue causes the knowledge production process. In this case, the old city centre could offer the sense of safety meeting and the spatial condition for the dialogue between areas of different orders: more property for the new knowledge economic production. As the perceptive and experimental result, different types of arcades were classified by the density of knowledge activity and space structure. It demonstrates that arcade could provide creative milieu on aspect of knowledge process in the old city centre. In the “new age” entitled of knowledge economy, arcade is not merely negative spaces. Even more, it could be one of the most potential places for knowledge production. The reasons are as following:

1. The space units of arcade could be diverse from the arrangement of private claims and the way of public using. For this flexibility and heterogenetic character of arcades, the space belongs to the “Flex-Hetero-Quadrant” in knowledge-based urban (re-)development model.

2. On the basis of architectural transformation and combination, arcade provides public sphere and gather lots of activities by clustering arcade units. This kind of space pattern provide a good voids to accommodate the diverse interaction and knowledge purification.
3. As a public accessibility of private space, arcade gives rise to the “in-between” and inspire the intensive dialogue. The creative milieu of arcade urges the knowledge process to knowledge production.
4. Minquan Road, the oldest streets in Tainan, passing from the prosperity to deterioration, recently gradually recover with the base of knowledge economy. There are more and more knowledge activity presence in the arcade, such as cafés, private galleries and lounge bars and the other “great good places” (Oldenburg, 1989).

Through the explanation of the Model, the “knowledge activity” - various dialogs - could be coming back to the “ruins” in the city centre which left behind in the recession. It could also be observed in Minquan Road in Tainan City, one of the oldest business streets in Taiwan with ca. 400 years history and currently by the process of de-urbanisation. This phenomenon might be explained by the theory of knowledge processes and as the demonstrations of the strategical application for knowledge based urban (re-)development.

Under the background of knowledge economy, the importance of arcades had a chance to be revalued, caused by the spatial condition, might regain their vitality. Facing the situation of shrinking cities, this essay identified a new way: forward to knowledge based urban (re-)development. Taking lost spaces as potential - or even necessary - places for knowledge production could develop into strategy of urban regeneration.

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Investigation of Interdisciplinary Collaboration through Cognitive Style

Jing Lu *, Joerg R. Noennig

Faculty of Architecture
Dresden University of Technology
University Address: Pressestelle 01062 Dresden, Germany

** Corresponding author*

Structured Abstract

Purpose – Study the effects of cognitive style on interdisciplinary scientific collaborative group performance and group satisfaction.

Methodology– We propose an approach of measuring group cognitive style to investigate the relationships between group cognitive style, demographic factors, group performance and predictors of group satisfaction. Group cognitive style will be measured by five psychometric instruments: the Cognitive Style Assessment (CSA), the Kirton Adaption-Innovation Index (KAI), the Herrmann Brain Dominance Instrument (HBDI) and the NEO-Five Factor Personality Inventory (NEO-FFI). Group performance will be measured through authors from different institutions, either as co-authors in a scientific publication or as colleagues within a research project. A ten-items questionnaire will be administered for the measure of group satisfaction.

Value –This methodology puts in evidence that group cognitive diversity may have significant effects on the effectiveness of interdisciplinary scientific collaboration.

Practical implications – The outcomes of the application could optimize the resource sharing and knowledge transfer within the interdisciplinary collaborative groups, and improve the effectiveness of interdisciplinary scientific collaboration. It can be extended in large scale with no limit in academia. Our study could help practitioners, managers and designers make right decision when they design their own collaborative work group.

Keywords – Cognitive style, collaboration, group diversity, interdisciplinary, knowledge work

Paper type – Academic Research Paper

1 Introduction

Knowledge work and knowledge worker are emerging and developing with the novel knowledge economy. The notion of knowledge work and knowledge worker are emerging and developing with the novel knowledge economy, which affect the interpretations, evaluations and practices in different organizations. One paper (Rylander, 2008) argues that knowledge work and design thinking are two different solution-based methodologies. They are different from epistemologies. The former is intellectual or so called analytic approach; the later is an interpretive, emergent and practical embodied approach. However, they also have similarities: highly qualified people are engaging in creative problem solving in both knowledge work and design thinking, and they are having value creation logic base on intensive problem solving. Additional research, Rylander (2009) points out that it is difficult enough to understand design and thinking, so let alone design thinking. Therefore, there is no surprise that people who are trying to apply design thinking to business or more broadly to public service or solve social problem, facing trouble of expressing what it is exactly (Kimbell, 2008). Simon (1969) identified design as knowledge that is in the domain of professions for instance management, engineering or medicine, in his book *The Sciences of the Artificial*. He believed design as a rational set of procedure that response to well-defined problem. But he didn't consider design thinking in his work. Peter Rowe initiated one of the earliest discussions on the concept of design thinking base on his teaching of architects and urban planners (Rowe, 1998). Among huge amount of discussions, design thinking has been featured as what individual designers know, how they approach their work, and as well as how they actually conduct it (Kimbell, 2008). It can be described as a cognitive style (Cross, 1982, Schön, 1983, Dorst, 2006) toward to problem solving. According to this description, design capability of individuals was considered as a form of intelligence, reflection in action and adductive thinking to solve problems.

The growing complexity of products, services, and experiences has been transformed the myth of the solo creative work with the reality of the enthusiastic collaboration (Brown, 2011). Design thinking is a process that bringing integrative thinking, experimentalism, collaboration and empathy in a structured way¹. Collaboration as one of the four key components of design thinking process enables designers find out the interdisciplinary ideas to solve the complex problems and challenges. Collaboration

¹ YouTube: <http://www.youtube.com/watch?v=2-tQJ9RHKRw>

as well as known as one of the major trends of knowledge work, which attracts huge amount of research interest in management theories. It exists in nearly all of the projects-based education and industry, and within or beyond same field.

Many believe that diversity on work groups or teams allows for the richest learning experiences and innovative outcomes (Kress et al., 2012). Diversity is typically addressed as the differences between individuals on any attribute that may indicate that another person is different from self (Jackson, 1992; Triandis et al., 1994; Williams & O'Reilly, 1998). Therefore, it is not limited to race, ethnicity, gender, nationality, income and education level, and any other factors may lead to individual differences. Diversity can be divided into two categories: surface-level and deep-level (Harrison, Price, & Bell, 1998; Milliken & Martin, 1996; Moreland, Levine, & Wingert, 1996).

Group diversity has been found that provide desired effect of affording a variety of perspectives and problem solving approaches, encouraging creativity and performance. However, there is a conflict study indicating that diversity within team or group may have a negative impact on group performance because of creating social divisions (Mannix & Neale, 2005). Furthermore, the results of using demographic indicators to predict group performance have no effect or slightly negative effect on any of the group variable (Mannix & Neale, 2005), which were measured at surface-level in terms of race, gender, age etc. to explain differences in the outcomes of group performance.

Recent researches attempted to examine diversity by linking psychological and cognitive mechanism to group performances. Cognitive diversity in the group is associated to differences in deep-level, or non-visible level (Harrison, Price, & Bell, 1998; Milliken & Martins, 1996; Moreland, Levine, & Wingert, 1996). The characteristics of the group members comprise knowledge, perspective, and information-processing styles (Williams & O'Reilly, 1998).

Cognitive style offers a way to inspect the deep-rooted cognitive distinctions exist in functionally varied groups. A neurologist from Harvard stated that cognitive style is a relatively stable individual difference in which individual preferred organizing and processing information (Kozhevnikov, 2007). There are three types of cognitive style are particular interested: verbalization, spatial visualization, and object visualization. The people has highly potential in verbalization tend toward using verbal analytical strategies; those who has highly potential in visualization perform their cognitive tasks primarily depend on imagery; individuals with spatial visualization potential use analytic process,

and use spatial relations to arrange and analyze components; nevertheless, people with objective visualization attempt to use holistic processing on better tasks performance that require identifying global properties of shapes (Kozhevnikov et al., 2005). Researches indicated that cognitive style not only affect a person's performance on information processing, decision making, problem solving, and creative tasks (Chabris et al., 2006; Kozhevnikov et al., 2005; Woolley et al., 2007), but also differentiate individual's profession option and occupational areas (Blazenkova et al., 2006; Kozhevnikov et al., 2005).

Baer et al. used the Big Five personality type predictor (high extraversion, high openness, high emotional stability, low conscientiousness and low agreeableness) to identify individual characteristic related to group creativity (Baer et al., 2008). They indicated that high creative confidence could foster overall group creative performance. Researchers examined high and low spatial and object cognitive style capability. They revealed that when task assignments match to individual capabilities lead to better group performance (Woolley et al., 2008). Another relevant study revealed that cognitive-based social sensitivity or empathy factor, and the distribution of conversational turn-taking affect group performance (Woolley et al., 2010). Kress et al. proposed a model to measure group cognitive diversity through by aggregate from individual psychometric tests, such as Kirton Adaption-Innovation Index (KAI), the Big-Five Personality Index, the Herrmann Brain Dominance Instrument (HBDI) and the Wilde-Type Teamology (Kress & Schar, 2011). This study found the evidence that the presence of certain personal cognitive characteristics can affect group performance.

This paper concentrates on the interdisciplinary collaboration through cognitive style. We review relevant literatures regarding the concept of cognitive style and the available psychometrics instruments to test individual cognitive style. Riding (1994) suggested that cognitive styles affect the individuals' focus and types of activity.

2 Hypotheses

During the past decade or more, there has been a makeable shift toward scientific research that spans disciplines and organization boundaries conducted by groups rather than individuals. Science tends toward highly specialized but the complexity and scope of the huge challenges facing the world today is global problems like climate change, human disease and lack of natural resources, these pressures cannot be addressed by individual

scientists working alone within single disciplines.

Therefore, collaboration from various disciplinary to foster novel knowledge generating is highly required.

Interdisciplinary collaboration plays a critical role in fueling new discoveries and forging innovative solutions to global challenges. In academia, it can be achieved by promoting scientists, with different backgrounds or cross disciplines, work together. Interdisciplinary collaborative group contains both visible (or demographic) and non-visible (or deep-rooted) varieties. The visible variety is easy to see such as age, ethnic, sex; the non-visible variety involves education, personality difference, value, attitude, how they see the problem, and how they solve the problem.

We advanced two hypotheses to study the effects of group cognitive diversity on interdisciplinary collaboration.

Hypothesis 1 — Higher level of cognitive diversity obtain better outcomes of interdisciplinary scientific group performance.

Hypothesis 2 — Greater cognitive diversity associate with lower level of group satisfaction.

3 Measurement of cognitive style

Messick (1984) describe cognitive style as consistent individual differences preferred way in which processing information and experience. Sternberg and Grigorenko stated cognitive style as representing “a bridge between what might seem to be two fairly distinct areas of psychological investigation: cognition and personality” (Sternberg & Grigorenko, 1997: 701). Cognitive style includes plenty of constructs, for instance field articulation, extensiveness of scanning, cognitive complexity vs. simplicity, leveling vs. sharpening, category width, reflection vs. impulsivity, automation vs. restructuring, and converging vs. diverging (Lohman & Bosma, 2002). Within the framework of information processing, cognitive style was interpreted narrowly as consistencies in modes of perception, memory and thought (Messick, 1989).

Various psychometric tools are available to assess individual cognitive style. Messick (1984,1996) suggested cognitive style can be observed through bipolar scores and value differentiated, as well as performance and use ipsative or contrasted scores. For any given cognitive style measure contains 3 steps (Kress & Schar, 2011). The first measure is a group mean score. This is simply sum of the individual scores divide the

number of group members. The second measure is standard deviation (SD). It is the measure of the variance of scores within the group. The third measure is Cronbach's D (D).

In this study, the psychometric instruments we intend to use include the Cognitive Style Assessment (CSA), the Kirton Adaption-Innovation Index (KAI), the Herrmann Brain Dominance Instrument (HBDI) and the NEO-Five Factor Personality Inventory (the NEO-FFI also known as Big-Five Personality Index). These four instruments are selected from great number of potential psychometric instruments base on the relevancy of our construct of cognitive diversity and extended scientific support in the literature.

Cognitive Style Analysis — Riding's Cognitive Style Analysis (CSA) score has been used to test cognitive style in two dimensions: wholist-analytic (WA) and verbalizer-imager (VI). Wholists are those who process and organize information from a global viewpoint. Verbalizers are the individuals "consider information they read, see and listen to, in words or verbal associations" and experience "fluent spontaneous and frequent pictorial mental pictures" (Riding, 1994: 48). Riding (1994) has indicated that cognitive styles can affect the individuals' focus and types of activity. The verbalizers prefer a stimulating and social environment in which they can find themselves as an extension of themselves. While the wholists tend to be dependent and gregarious, they interact with the structure information and organization of the contents of instruction, and favorably by different cognitive style groups.

CSA is presented and scored by means of a PC. It is comprises of four sub-tests for measuring two dimensions. The first part of CSA is a test of the VI dimension describes a person's habitual mode of representing the information in memory during thinking. Subjects will be asked to judge whether a number of statements relate to visual experience are true or false; The second part is asking verbal-imagers to judge whether a number of statements relating to conceptual categorization are true or false; The third part is to measure WA dimension that describes the habitual way in which a person process and organize information. Subjects are required to judge the similarities of pairs of geometrical shapes are true or false; The last part is to measure WA dimension by requiring subjects to judge whether a simple shape is contained in a simultaneously presented complex geometrical shape is true or false.

Kirton Adaption-Innovation Index – Michael Kirton developed KAI in 1976 to explain cognitive tendencies and problem-solving styles. The KAI is a 32 items self-

reported instrument that requiring the respondents to indicate their ease or difficulty in presenting themselves, consistently, over a long period, in various situations (32-items). It returns a single preference score on a bi-polar scale ranging from “adaptor” to “innovator”.

Adaptors are the individuals tend to prefer the adaptive approach to problem solving, and desire to do things better. They like to solve problems within the existing framework (Kaufman, 2004), and concern with solving problems rather than finding them, seeking solutions to problems in tried and understood methods with habits of precision, reliability, efficiency, methodical, prudence, conformity (Kress & Schar, 2011). The adaptors also rarely challenge rules and sensitive to maintaining group cohesion.

While the innovators, prefer the reverse, seeking beyond the existed approaches to solve problems with an aid of innovative technologies. They would prefer to do things differently. Innovators seemingly undisciplined, approaching tasks from unsuspected angles, treating accepted means with little regard, providing dynamics to periodic revolutionary change and having low self-doubt in generating new ideas (Stum, 2009).

Kirton has adopted an orthogonal, one of the axis namely problem solving level that reflect the experience with problem solving (Kress & Schar, 2011). The high level adaptors understand adaptive technic best, and they can recognize when is valuable to break a rule. Also, the high level innovators understand when it's not wise to break a certain rule.

Herrmann Brain Dominance Instrument (HBDI) – The HBDI is accomplished through a 120-question survey, four different thinking quadrants and compares each to one another. This results in a four-quadrant profile of degree of thinking preference or cognitive style.

Quadrant A reflects a preference for solving problem in logical, analytical, quantitative, factual and critical solutions; Quadrant B shows a preference for sequential, organized, planned, detailed and structured reasons to solve problems; Quadrant C demonstrates a problem solving preference of emotional, interpersonal, sensory, symbolic and kinesthetic rules; Quadrant D indicates a preference of visual, holistic, innovative solutions to problems (Kress & Schar, 2011).

Herrmann states that around 60% of the human being have two dominate preferences toward problem solving; around 30% of the human being have three dominate problem-solving preferences. Results of Quadrant A analysis, and Quadrant B

methods and procedures, and Quadrant C (teamwork, communication) and Quadrant D (creative problem-solving, system thinking, synthesis and design) have positive correlations; Quadrant A and Quadrant C, Quadrant B and Quadrant D have negative correlations (Felder, 1996).

NEO-Five Factor Personality Inventory (NEO TIPI) – Costa and McCrae’s NEO Personality Inventory was developed with the aim of evaluating the five domain of the five-factor model (FFM) of personality: neuroticism (N) refers to the tendency of experiencing unpleasant emotions and psychological distress in response to stressors easily; extraversion (E) represents the degree of sociability, positive emotionality and general activity in the company of others, and talkativeness; openness to experience (O) reflects the levels of intellectual curiosity, independent judgment and conservativeness; agreeableness (A) indicates altruistic, sympathetic, and cooperative tendencies; conscientiousness (C) shows level of self-discipline, aim for achievement in planning and organization rather than spontaneous behavior (Rosellini & Brown, 2011).

NEO FFI is a 60-item self-report instrument to measure the five personality domains according to FFM. It includes self-descriptive statements of Likert-type scale 1 (strongly disagree) to 5 (strongly agree). The TIPI is a ten-item version of the NEO FFI. It was developed as a replacement where very short measures are desired, personality is not the primary research interest, or researchers can tolerate the diminished psychometric properties with very brief measures (Gosling et al. 2003).

4 Descriptive study

In order to examine the diversity of cognitive style in interdisciplinary scientific collaborative group, we plan to conductive an observational descriptive study in 15 interdisciplinary research groups, with around 200 individual scientists.

4.1 Subjects

This study will examine 15 independent research groups within the context of interdisciplinary collaboration in Dresden University of Technology and other independent research institutes in Dresden, Germany. Each of the participated group has to contain more than two disciplines. There is no specific limitation for group work context. In terms of the group size, the extremely large group may not be concerned in

present study because of statistic consideration.

4.2 Measures

4.2.1 Independent variables

We will administrate four psychometric instruments comprising the Cognitive Style Analysis (CSA), the Kirton Adaptation Innovation Index (KAI), the Herrmann Brain Dominance Inventory (HBDI), the NEO Five Factor Personality Inventory (NEO FFI) as evaluated by the Ten-Item Personality Instrument (NEO TIPI). All these four instruments are the self-reported survey. We will collect the standard demographic data (such as age, gender, group size etc.) simultaneously with psychometric instruments.

4.2.2 Dependent variables

We will examine performance of interdisciplinary collaboration and group satisfaction as dependent variables. Precedent researches suggested using scientometric and bibliometric to study interdisciplinary collaborations (Bordons et al., 1999). According to scientometric approach, such as co-word and co-classification analyses were initiated mapping a specific research field works as tool for cross-disciplinary study. Bibliometric approach is base on the analyses of documented references that include different disciplines (Porter & Chubin, 1985; Tomov & Murafov, 1996). An earlier study attempted to study interdisciplinary collaboration by analyzing the authors from different backgrounds like thematic designation of their institutions (Qiu, 1992). Some other researchers measured cross discipline collaboration by analyzing the number of disciplines cited in a given journal (Qin et al., 1997). Some other researchers (Qin et al., 1997) has combined the scientometric and bibliometric approaches and analyzed the relationship between research collaboration and interdisciplinarity. They measured interdisciplinarity by the number of disciplines cited in a given journal.

In present study, the performance of interdisciplinary research collaboration will be measured through authors from different institutions, either as co-authors in a scientific publication or as colleagues within a research project within research network in Dresden. The scientific publications will be selected from the year of 2012 to 2013 covered by Scientific Citation Index (SCI) and Social Science Citation Index (SSCI).

In terms of the measurement of group satisfaction, subjects will be asked to finish a satisfaction survey. It will investigate the conflicts and conflict resolution with the group,

sharing objectives, appreciating and closeness of group members, leadership, group work capabilities and overall satisfaction with group performance. This survey will be administered on a Likert-type scale.

4.3 Expected results

After data collection, factor analysis will be employed for data analysis. Our expected results including:

1. Relationship between demographic factors and group cognitive diversity;
2. Relationship between demographic factors and group performance;
3. Relationship between demographic factors and group satisfaction;
4. Relationship between the measurements of cognitive styles and group performance;
5. Relationship between the measurements of cognitive styles and indicators of group satisfaction.
6. Relationship between the group cognitive diversity and group performance.
7. Relationship between the group performance and group satisfaction.

5 Conclusion

This paper reviewed relevant literatures of the concept of cognitive style, available measurement of psychometric instruments, and described our proposed study in the context of interdisciplinary scientific collaboration.

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DIY: A Toolkit for designing knowledge sustainable campus

Neha Koul *

Department of Architecture and Planning
Indian Institute of Technology
Roorkee, Uttarakhand - 247667

Vikas Rawat

Department of Industrial Design
Indian Institute of Technology
New Delhi, Delhi - 110016

**Corresponding Author*

Structured Abstract

Purpose – Ever since it was argued that the process of knowledge creation can be modelled [Nonaka & Takeuchi 1995], the literature on designing spaces conducive to innovation and knowledge management has grown tremendously. While most of the theories and models are implemented at organisational level in the companies, the paper examines the applicability of theory to an educational campus. As much as the need for informal interaction has been emphasized upon by various knowledge creation and knowledge management models, as much has it been compromised upon in practice, more so, because of the limited knowledge on how to purposefully create such spaces.

Design/methodology/approach – The paper is based on the assumption that when users are responsible for the design of their environment, they connect better and as a result the spaces produced are used to their maximum potential. Besides creating diverse working environments, it also increases the probability of knowledge creation. It has been proven before that process of design of spaces intentionally for innovation can at times be too obstructive or imposing ^[2]. Hence, it's best to let the users shape their working environment as per their needs.

To support the argument, the paper evolves a toolkit, which may essentially act as a DIY-Space kit for the design of informal learning spaces. The insights from the research highlight the spatial requirements for innovation across cultures.

Originality/value – The paper challenges the traditional assumptions about learning spaces and rethinks over informal spaces as the torchbearers for knowledge creation. It also reviews the growing literature on knowledge architecture, critiques it, and develops some of the research questions that could be explored to contribute to campus planning and to the theoretical perspectives that underpin the literature.

As is said, failures are the best teachers. The paper reiterates that the spaces that support failure are the ones that support knowledge creation. Adaptability and flexibility (in terms of space, furniture and technology) have been demonstrated as the two overarching criteria which determine the usability of a space. DIY approach allows users to be the controllers of their environments and shape it to their needs.

Practical implications – While knowledge creation model in an organisation restricts the knowledge among the employees of a company or type of company (when the person switches job), the knowledge creation in a campus is all the more dynamic. As people from various disciplines use and shape the space as per their needs. Findings of the research will add to the knowledge and understanding of the subject of knowledge creation through informal interactions on educational campuses. This study should be significant in the sense that it will allow the identification of spatial characteristics of informal spaces in educational campuses, support and enrich campus planning theory and model of learning beyond classrooms. DIY Urbanism has been used as a manifestation of participatory design approach which connects the users to the space. As a user is more conscious of the spatial response generated, he attempts to deliver responsive spaces. The campus is a scaled down version of a city, where experiments are easy to implement and the results clearly visible. If this knowledge creation model can be effectively applied at campus level, strategies can be drawn from it to make the whole city as a knowledge hub.

Keywords – Campus Design, DIY Urbanism, Interaction, Knowledge architecture

Paper type – Academic Research Paper

1 Introduction

The world has always appreciated and acknowledged the revolutionary ideas. We also generally tend to appreciate the product more than the process. That may be a reason why we generally tend to neglect the inspiration behind the idea and the space which facilitates the development of the idea. The inspiration could be any object or phenomenon in the space or the space itself.

It is difficult to design a space that will not attract people. What is remarkable is how often this has been accomplished – William H Whyte

The words stand true particularly in the case of educational campuses which are witnessing drastic variations, many degrading over time. Issues of rising absenteeism and increased engagement among youth on social networking platforms bears a testimony to the fact that our spaces fail miserably in inviting and engaging students. Besides lacking any spatial and architectural definition, educational campuses are also failing as centers of knowledge creation.

However, students for the thick of their academic life are seen perpetually engaged in cafeterias and canteens, indulged not just in food but also in discussions and debates over topics that excite them or interest them. The “informal spaces” on educational campuses, as these are most frequented by the students for a “change of place”, “hanging-out”, interaction, and group activity and so on. These places are generally identifiable for the “gastronomical” delights they offer. But a closer observation reveals that it’s not just food that these places offer, but also “food for thought”(ideas) and spaces to facilitate the thought through communication (interaction). It’s not just coffee/tea brewing, but umpteen ideas as well. Knowledge is constantly being created and shared.

Famous Urbanist William H Whyte in his book, the social life of small urban spaces, states that

Food serves as people’s magnet

“What attracts people most, it would appear, is other people.”

Food attracts people who attract more people

The central idea of the paper is to identify the spaces that bear huge social potential and to develop a methodology to translate that immense social potential into knowledge potential.

2 Knowledge sustainable campus

2.1 Knowledge dynamics

While urbanism aims at addressing the issues of interaction of the inhabitants with the built environment to find solutions to issues like infrastructure, imageability, transportation, etc. The focus of knowledge urbanism lies on the campus (schools and universities) and its relation with the city. It attempts to develop spaces and strategies to maximise intellectual collisions, which further lead to knowledge creation. The SECI model [Nonaka & Takeuchi 1995] proposes knowledge as a continuous loop extending through the phases of socialisation, externalisation, combination and internalisation. We can decipher from it that Interaction is directly proportional to knowledge creation. The interaction may happen directly amongst people, or among people mediated through technology or among people and technology. The only places on campus which provide freedom for exchange/discourse, retreat and speculative experiment are the informal

spaces. Hence the potential of these informal spaces in creation, and sharing of formal knowledge cannot be undermined.

2.2 Knowledge sustainability

A knowledge society generates, processes, shares and makes available to all members of the society, knowledge that may be used to improve the human condition [Wikipedia]. The concept of knowledge society differs from the earlier concept of information society. While the information society was focussed in codifying the information to form a product which would ultimately reach larger audiences, knowledge society is more focussed on making raw knowledge available to the masses.

In order to promote the development of knowledge societies, platforms are needed for dissemination, transfer and utilisation of knowledge. The role of an educational campus hence is very critical as it is situated at the intersections of research, innovation and education and has much wider implications on knowledge economy and knowledge society. The educational campuses world over are dawning upon a new image of knowledge institutions or research institutions, because of the realisation of their significance for the development of knowledge societies.

Knowledge societies need to focus their attention on the development of the concept of sustainability as it can transform into a future strategy for its development. The term sustainability also needs to be looked into not just from an environmental perspective, but also from an economic and social perspective. The paper hence proposes the idea of designing informal learning spaces as an imperative to deliver knowledge sustainable campus. While the economic, social and environmental factors are already crucial and important for these informal spaces, addition of knowledge as the fourth dimension could help transform them into a learning space.

A knowledge sustainable campus, where knowledge is constantly created, shared and added to may sound like a utopian concept, but it essentially talks about a few things

- a. A symbiotic relation between the campus and the city where both benefit from the resources and infrastructures of each other.
- b. Where while newer forms of learning are introduced to students in formal learning spaces, they are experimented with in the informal learning spaces.
- c. The three key elements at play to achieve desired results are people, place and pedagogy and the interrelations amongst them.

3 Campus planning and Design

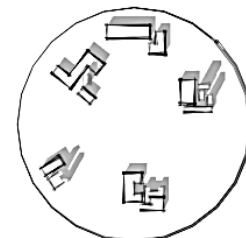
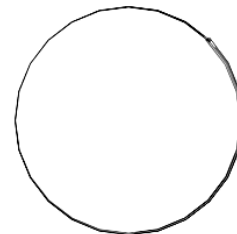
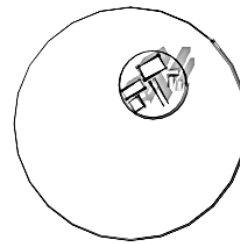
3.1 Campus spaces

A campus structurally and functionally resembles the model of a city albeit at a reduced scale. As it provides a much controlled and implementable scale, it can also be experimented with to address the issues and concerns for knowledge cities. The inferences drawn from the campus level experiments can be multiplied in magnitude and complexity to address concerns of a knowledge city.

Before we dwell into the details of campus spaces, it is critical here to understand the relation, a campus shares with the city. Based on observations, there are three types of campus-city relations.

- a. Campus in the city – A model which can be seen in many of the western universities, wherein the elements of a campus are scattered in the fabric of the city. These campuses do not have a boundary wall and hence allow for a symbiotic relation between the campus and the city. The campus benefits from the spaces and infrastructure provided by the city and the city benefits from the knowledge generated by the campus.
- b. Campus and the city – A model of campus which is common in India and a few Asian countries, wherein the campus in itself is a complete entity within the city. A boundary wall acts as an interface and segregates the two entities. The more porous the boundary, the better knowledge flow within the city.
- c. Campus as the city – Sometimes owing to the high density in the urban core the campuses emerge at the outskirts of the city. The campuses in such cases are an extension of the city.

Inferences drawn from various knowledge architecture models are being used to create workspace design for organizations to foster creativity and innovation. The paper attempts to draw the attention of the pedagogists, administrators and architects towards the benefits of implementation of such models for



educational campuses.

Firstly, In an organization, many initial concepts generated go through various stages of processing and refinements to develop into ideas and finally into design products which ultimately reach the market. While the finished product does reach wider audiences, the knowledge behind it does not. In contrast to it, in an educational campus it is the process and the knowledge about a product which reaches larger audiences. Secondly, every organization would generally be dealing with a similar knowledge base, while educational campuses on the other hand would be dealing with multiple disciplines which add to the possibility of interdisciplinary research.

Thirdly, employees of an organization, tend to settle in the same or similar organizations. It creates a possibility of knowledge stagnation, unlike an educational campus where knowledge is constantly shared and re-built. Lastly, as thousands of students enter and pass-out of college each year, it serves a large number of audiences and hence the knowledge impact is even more dynamic

3.2 Placemaking

There exists a dichotomy in the planning and design of informal learning spaces. While literature says that informal spaces must be designed to enhance the learning experience, it also has been proven before that process of design of spaces intentionally for innovation can at times be too obstructive or imposing.^[2] The issue of the design of informal learning space can be dealt by the concept of placemaking through “Power of 10” presented by PPS – Project for Public Spaces. Placemaking is a term that architects and planners use to describe the process of creating ‘Urban Spaces’ which attract people because they are pleasurable or interesting. Campus planning is one such niche where careful dynamics of formal and informal public spaces come into play to create activity- based environments conducive for healthy interaction and calibrated isolation

Based on a nine minute movie by Charles and Ray Eames, the “Power of 10” concept essentially states that a place should not be mono-functional. Every place should offer multiple activities to keep the user engaged with the space. The approach for the design of informal learning spaces should hence be an activity-based one. It would be a conscious approach to deliver contextual spaces. It would enable an architect to consciously think of the architectural design attributes essential to fulfil the requirements of a particular

activity. Besides promoting better usability and enhanced user experience, it would mark a transition from pretty architecture to serious urbanism.

Priming a concept presented by Nobel laureate Daniel Kahnemann in his book thinking fast and slow gives a cue on how to translate the casual conversations (informal activities) into meaningful discussions (informal learning activities). It can be seen as a subliminal effect wherein exposure to a stimulus causes impact to other. The easiest and the strongest impact is created by the activities that other people sharing the same space are engaged in. Hence the activity zoning is a crucial primer besides visual, audio, textual and interactive primers.

3.3 A review of architectural practices

Ocularcentrism has indeed failed to engage the sensibilities of vivid users, reducing the entire experience of architecture to two-dimensional thereby reducing the places to spaces. The restlessness and failure of sensory stimulation in spaces has translated into an “emotionally unstable architecture” which in its random forms, shapes and colours, violates the basic essence of socially responsive and interactive “places” and not just spaces.

The role of an architect is similar to that of a doctor; both can enable the disabled or disable the enabled. It is essential here to understand the role of an architect as a facilitator rather than a dictator for what happens within the space. This makes it critical to review the state of the art practices and trends for the design of campuses in general and informal learning spaces in particular. The review is essentially contrasts campus planning process in India and the west, based on intercepts from the interviews of architects.

While the concept of hybrid buildings, collabratories, etc. are gaining momentum in the west. In India Architects fancy the idea of distinctive zoning. Clearly defined and segregated zones, which essentially reduce the multifunctionality of a space, possibilities of interdisciplinary intellectual collisions or collaborations, are hence contradictory to the idea of knowledge urbanism.

Secondly a large part of the stakeholders, students, teachers, administrators and architects alike are stuck with the image of an informal space as one which can be used for socializing and eating. While it is true, but it has many more facets as well which have

not been experimented with and hence the idea of informal learning space has not been much explored.

4 Methodology

4.1 Design Approach

As witnessed through surveys and case studies Specificity and Formality determine the preference of the user for a particular place. While the user prefers spaces that are multipurpose instead of being specifically dedicated to one activity, there is also a greater affinity for spaces that are neither completely formal nor completely informal, but strike a balance.

Spaces are also re-moulding themselves to change to the needs of the new age societies. The active studio culture has been more effective than the classrooms. Libraries with café's and student interaction areas are more inviting than the traditional ones.

The design approach for designing informal learning spaces will hence be based on:

- a. Informal space indicators
- b. Design of multi-activity spaces

Informal space indicators: Mc Grawhill foundation defines informal spaces as spaces that are highly mobile and maybe changed quickly. The goal is to identify the indicators which determine the informality of a space, using them wisely to create a space that exhibits both formal and informal characters.

- Access to all: Informal spaces are “anyone, anywhere, anytime” spaces. They are used by all and should not be discriminatory on the basis of gender, occupation or disabilities. They can be found outside the building in the form of cafeteria's and parks, inside the building as lobby, foyer or courtyards and even as connecting spaces.
- Freedom of:
 - interaction
 - collaboration
 - physical movement
 - social engagement
- Retreat and Relaxation: Informal spaces are enable disconnecting from an engagement to re-connect better.


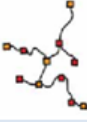

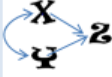

- No monitoring : Though keeping a vigil to ensure no wrong doing within the space is essential but direct monitoring and guiding the user through space can become to oppressive.
- Proxemics : Based on E.T. Hall's theory of proxemics, informal spaces should provide for both private space for personalised discussions and public space to address the gathering
- No time restrictions: As the work cultures are changing, provision of 24x7 spaces has become essential to facilitate the users
- Flexible spaces: They should be flexible in the face of changing needs of the varied user groups.
- Highly Interactive: Technological connectivity enhances the quality and extends the physicality of informal spaces.
- Collaborative layout: Besides, relaxation and interaction, these spaces need to accommodate the various learning styles

4.2 DIY Toolkit

The toolkit proposes a methodology for the design of informal learning spaces. Since the methodology focuses on an activity based design approach, it enables the stakeholders to evaluate their space.

An activity based design approach negates the idea of standardising design solutions based on dimensions, shapes and sizes. It instead figures out the activity/activities that the user/stakeholder wants to carry out in a space. Based on the nature of the activity, the qualities of spaces are listed. Further an architect consciously thinks of design attributes which will help deliver the qualities of the space required. As it does not use an extensive jargon of architectural and construction terms, it helps a user understand the design process and put forth his valuable suggestions. Further since every place would have a different activity requirement, it would help deliver place specific design solutions which would contextually be more relevant. Also instead of handing over all the power in the hands of the architects it enables the user also to evaluate and critique architect's work, the process may go on until a design solution acceptable to the user is arrived at. Further this toolkit particularly deals with existing educational campuses

-----QFD(House of Quality)-----

LOOK	OBSERVE	IDENTIFY	INTERPRET	CORRELATE	PROPOSAL	EVALUATE	DESIGN
			$1+2=3$				
... at campus as an informal learning community. Understand issues	...establish a typology of spaces. Choose target location	Identify users and activities associated with such spaces	The quality and design attributes of the space	The activities (user requirements) with design attributes	Summarize findings and create draft design proposal		An iterative process.

Look: The first stage would include walking around and looking through the campus, without formulating any prior definition about informal and formal spaces, so as to avoid missing out on any. This includes preliminary surveys, photographic surveys and site documentation

Observe: The second stage deals with organising the information gathered. The spaces documented and analysed are grouped to create a typology of informal spaces. A space from each typology is then chosen to analyse the design considerations and applicability of the toolkit.

Identify: conduct an activity based audit of the space to understand the specificity or multiplicity of space. It also helps understand whether the space is underutilised or lively. The users/stakeholders of the space need to be identified and questioned on the kind of activities they would want to happen within the space. This list of activities generated also needs to be prioritized based on the preference of the users.

Interpret: Every activity on the list would require a particular environment or a spatial quality. A list of spatial qualities and architectural design attributes important for delivering the desired quality within the space needs to be formulated.

Correlate: Using the Qualitative function deployment approach and House of quality as the tool, the activities can be correlated with the spatial qualities, to arrive at the prioritized qualities of a space. Further, the prioritized spatial qualities can be correlated with architectural design attributes to arrive at a list of prioritized design attributes.

Proposal: The prioritized list of design attributes is then used to create design proposals with required design interventions.

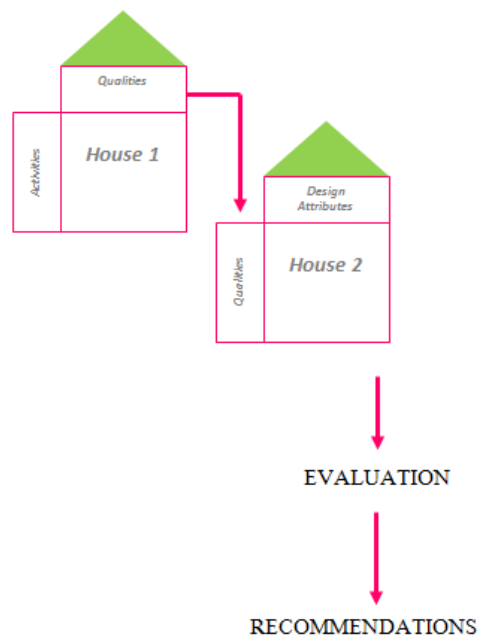
Evaluation: The architects would then be required to explain their design proposals to the users, who again using the Qualitative function deployment- house of quality tool will evaluate each design option against how well does it cater to each activity suggested.

Design: The evaluation and design process is an iterative one to ensure maximum user satisfaction.

7 Conclusions

As shown though the paper, the design of the process for creating informal learning spaces holds more potential than the design of an informal learning space in itself. Care has been taken to ensure context specificity in the design outcome arrived at through the given approach. The paper also attempts to clear the misconceptions about toolkit approach for design. Firstly, the idea that a toolkit for design would kill design creativity, the notion has been put to rest as the toolkit is not a design technique but a guide through the design process. It is a systemized process to present, correlate and ultimately evaluates design solutions through an iterative design process.

Secondly, the idea that a good design professional does not need QFD approach has been put to rest. As while the design carries the voice of an architect it needs to be in sync with the needs of the user. QFD is one such approach which carries the voice of the customer/user through various stages of the design process. It also empowers the customer/user to challenge the design of the architect on parameters understood by hi, i.e. the activities.



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Adaptation of the Control Theory to the management of urban development

Alina Liventceva

Department of Architecture

Voronezh State University of Architecture and Civil Engineering (Russia).

2006-2012 Voronezh, 20-letya Oktyabrya 84 str., postal code: 394006

Structured Abstract

Purpose – The goal of this research is to find an alternative theoretical and technical method of urban environment's management. This method should solve current town-planning problems connected with the coexistence of urban systems. The received method must be adaptable to the management of any urban object. It must be orientated both on the improvement of urban structure's sustainability and flexibility during its formation, functioning and development. The result of received method's application must be the improvement of urban environment's state due to any need of the modern society.

Design/methodology/approach – I propose the application of system principles in formation of urban objects and the Control Theory's methods in their cooperative formation, functioning and development. Both approaches, which are applied in different disciplines, should be adapted to the specific field of urban planning and urban management. However, the first step, that should precede two mentioned processes must be the analysis of current problems in interaction between any considered system and its external environment. This analysis has to be based on the particular features of systems' interaction.

Originality/value – This research puts in evidence that adapted Control Theory's methods and renovated synthesis of System's Theory's and Control Theory's methods can be applied to the modern tasks of urban planning and management. In addition, the uniform model of any urban object's development management will be received. This model will consider such properties of urban objects as self-organization and self-regulation during their cooperative formation, functioning and development. The realization of this control model should lead to the minimization of the indicated tendencies and of the urban environment's stochastic behaviour as a result.

Practical implications – Outcomes of the application lead to the increase of experts' work quality (minimization of the mistakes during the full cycle of any urban object's adjustments) in urban environment's management. The results of received control model's realization should become: quicker reaction of each urban object on the external factors – quicker improvement of considered object due to the needs of modern society and other urban systems; improvement of urban systems' coexistence; improvement of urban environment's sustainability and flexibility; and minimization of its stochastic behaviour.

Keywords – Urban management, urban development, urban systems, Control Theory, Systems' Theory.

Paper type – Academic Research Paper

1 Introduction

Urban environment is constantly in a state of functioning and development. Both processes are significant features of the city and all urban systems that make it up. Due to quick changes of modern cities, the increasing importance of urban objects' functioning and development monitoring becomes more evident.

Among different approaches of urban management, the one that is not used nowadays is – the Systems' Control Theory, even despite the fact that development of the Control Theory is directly connected with the development of cybernetics, which is actual today. Mainly, it is connected with the stagnation of system principles' application in the field of solving urban tasks. It should be noted, that this fact deprives experts of the Control Theory as an alternative method of urban environment's management. Certainly, before the application of this theory in urban objects' development management, it is necessary to identify all urban systems with their structural components, which need to be regulated during their development.

Adaptation of the Control Theory to urban objects' functioning and development management can become one of significant and perspective directions of research activity with integration of the received results in the everyday practice. Therefore, in this article both the features of urban objects' functioning and development and the Control Theory schemes with their adaptation to urban objects' functioning and development management are considered. As an example of town-planning objects existing urban hubs are used, the sum of which will construct urban environment's MPCKs'* system.

* MPCKs' - multicomponent production and communication knots (or hubs, or town-planning centers) of an urban environment, which are localized on the intersection of the transport communications, include in their spatial organization all elements of production and non-production spheres, and also objects of the transport sphere, and are characterized by the raised intensification of functional processes.

2 Features of urban objects' functioning and development

The first step of this research is the identification of distinctive features of urban objects' functioning and development that means the analysis of their behavior during short-term and long-term periods. This allows to focus on positive and negative tendencies of mentioned processes for their consideration in the process of objects' functional and spatial structure management.

2.1 Interaction between urban objects and their external environment

The external environment affects functional and spatial structure of any urban system, in turn; the urban system has an impact on its environment as well. In this case the external environment is – all other components of the city. The result of external environment's impact on the urban system's structure, and changes in the structure after this impact, is the system's adaptation to external conditions. Urban systems, which do not interact with other city's components, are deprived of: informational input signals from other urban systems (about necessary adjustments due to the modern conditions of artificial environment's functioning); input signals of changes in any urban system (which cause necessary adjustments in the other). Therefore, such systems cannot be harmonized in the aspect of their cooperative functioning.

Objective criteria of urban systems' coordinated functioning and development are: their capacity to interact and control of this interaction implemented by the experts. In case, when no control apparatus is included in the process of systems' interaction, the influence of one system on the functioning and development of another can lead to macroviolations of its structure, up to a total collapse of the system, and to microviolations – deterioration in functioning and development of some components.

Functional and spatial structure of existing urban hubs is in close and not regulated interaction with external environment. Non-use of system principles in formation of urban objects, associated with identification of urban objects' structure and all components related to it, cause difficulties in identification of functional and spatial boundaries between urban objects and their external environment. Thereby, determination of external environment's impact, as well as the results of this impact (transformations of object's functional and spatial structure), becomes impossible.

The interaction between existing urban hubs and their external environment is characterized by self-regulation, which leads to the stochastic behavior of hubs' functional and spatial structure. Therefore, the main problem of the objects' response on external influence is not the criteria of their structure's flexibility – ability to be transformed, but stochastic behavior and stochastic changes of their structure due to external impact.

Stochastic transformations of existing urban hubs may cause both: their development, and harmonization of cooperative functioning with other urban objects; as well as the regression of their state and deterioration of cooperative functioning and development with other urban objects. Regressive changes in the structure of urban hubs can start due to

numerous destructive external factors, such as: interaction with lagging in development urban objects (there is no need for urban hubs' improvement); ignoring some needs of the population (with the time urban hubs do not satisfy needs of the population), non-use of modern technologies, design solutions, scientific methods (creative possibilities and development of science exceed methods of urban hubs' formation and modernization), etc.

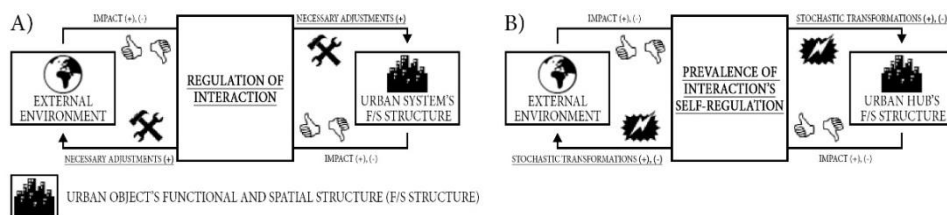


Fig. 1. Interaction between urban objects and their external environment:
 A) Regulated interaction; B) Self-regulated interaction (existing urban hubs)

For best understanding of system's transformations under the influence of external factors, it is necessary to analyze schemas of its interaction with other urban environment's systems. Interaction between the system and its external environment is shown in schemas of open and closed loop systems, offered by K.J. Astrom and R.M. Murray [1] (Fig. 2). In these schemas of systems' behavior models, one will always be the external environment for another. Authors insist that in interaction between two or several various systems, it is admissible, both existence of systems' feedback, and its absence.

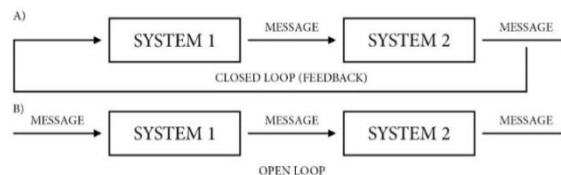


Fig. 2. Open and closed loop systems (Authors K.J. Astrom and R.M. Murray)
 A) The output of system 1 is used as the input of system 2, and the output of system 2 becomes the input of system 1, creating a closed loop system; B) the interconnection between system 2 and system 1 is removed, and the system is said to be open loop

In the scheme of connection between MPCKs' system and other urban system (Fig. 3), becomes obvious, how many cycles of systems' transformations can exist, caused by slightest changes in any of them, and properties of "final" functional and spatial structures can differ so strongly from properties of their "initial" state. In this scheme the level of sensitivity of system's functional and spatial structure to external influence is more detailed. The conclusion about need of numerous and, as a rule, continuous systems' ad-

justments for achievement their harmonious coexistence, increases the role of control apparatus. Addition of control apparatus in the interaction between any system and its environment accelerates stabilization of objects' coexistence.

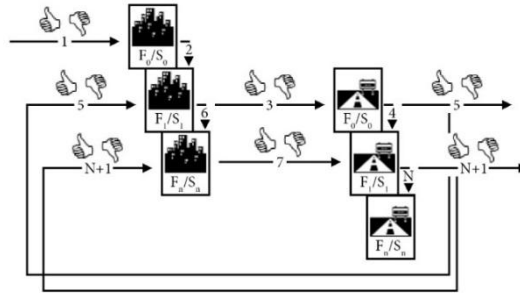


Fig. 3. Connection between MPCKs' system and other urban system (without their development management, but with their emergent property formation)

2.2 Transmission of urban objects' external interaction in their internal organization

Any external factors impacted on the system should cause the response of system's functional and spatial structure – its changes. If after external influences there are no structural changes, the considered system is a closed one – not capable for interaction and cooperative functioning and development with external environment. The regulation of transmission of external interaction in internal organization is the process of experts' work (designing adjustments of system's structure that are necessary due to problems and violations from external environment).

The lack of regulation algorithm in the interaction between existing urban hubs and their external environment is the reason why external factors cause uncontrolled chaotic transformations of urban hubs' structure. In this case, as a rule, specialists do not create adjustments for the object's structure (design decisions for its intensification/modernization). This tendency prevents the formation of the urban hubs' framework, which functional and spatial structure will meet the requirements of balance, proportionality and necessary localization of all components according to the population's needs.

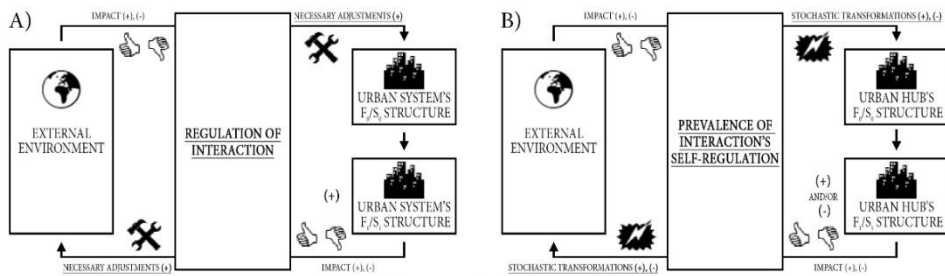


Fig. 4. Transmission of external interaction between urban objects in their internal organization:
 A) Regulated transmission; B) self-regulated transmission (existing urban hubs)

2.3 Reorganization of urban objects due to their internal functions

System functioning and development, regulation of these processes' coherence (not only between the system and its external environment, but also between components inside the system) leads to strengthening, quantitative increase and redistribution of internal components' connections – exchange of matter, energy and information. Urban system's structure, which is characterized by the presence of all necessary components, strong connections between these components, and which has qualitative and quantitative growth of the components and their connections, does not have the entropy tendencies.

Today, existing urban hubs do not have complete functional connections between their components. Both urban hubs' components and urban hubs by themselves in connection to each other function in most cases autonomously. This tendency is caused by the lack of their perception as integral parts of a single system, and each urban hub of this system will be responsible for such functions as: urban-forming, system-forming and connecting point of matter, energy and information exchange.

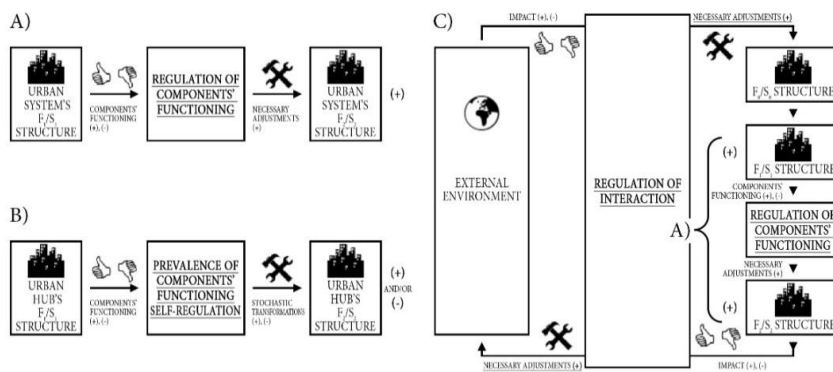


Fig. 5. Reorganization of urban objects due to their internal functions:
 A) Regulated reorganization; B) Self-regulated reorganization (existing urban hubs); C) Integration of regulated reorganization due to internal functions in the process of interaction with external environment

Urban hubs, that were formed without application of system principles, are characterized by entropy processes' intensity. The main reason of entropy processes are difficulties in determination of functional and spatial structure's components, and accordingly, difficulties in formation of their strong connections. No regulation of components' functioning, development and interaction makes possible the exchange of matter, energy and information between object's components and the dispersion of the functional processes in the external environment at the same time.

2.4 Coordinated interaction of urban object's components

Those systems and their subsystems, which represent the indivisible objects, are characterized by strong internal connections, coordinated functioning and development of their components. In addition, this means that the system retains its properties, despite external influences and internal changes. Information about the system's structure, the nature of external factors (which cause the necessity of system's transformation), methods of harmonizing component's functioning and development and the application of control theory – the presence of all listed points at the step of designing structure's adjustments makes possible to improve coordinated functioning and development of the system's components. The presence of strong connections between existing components allows new components to be integrated into the system without causing macroviolations in its structure.

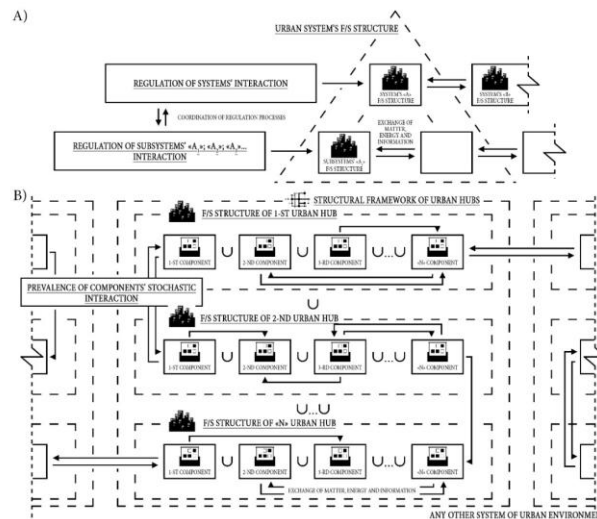


Fig. 6. Interaction between urban objects' components: A) Regulated interaction; B) Self-regulated interaction (existing urban hubs)

During modernization of any subsystem, for more coordinated system's functioning, it is better to improve all other subsystems. However, due to complexity of urban systems' functional and spatial structure, its multicomponent property, the realization of this condition is not feasible in reality. Regulation of system's functioning and development, allows to harmonize the interaction of modernized objects and objects left unchanged.

Today, only some components of urban hubs have coordinated functioning and development due to single regulations or spontaneous self-regulation of their interaction. Pre-dominance of urban hubs and their components, which are functioning and developing autonomously, is a consequence of system logic' non-application in the process of their formation. For existing urban hubs' components, like for most other planning components of the urban environment, asynchronous development is relevant. This tendency is caused in most cases both by interests of private investors in building profitable objects (which do not always meet the real needs of the population) and lack of financing during modernization of other urban hubs' components.

3 Adaptation of the Control Theory to the management of urban development

After the consideration of all these conditions for urban objects' functioning and development and identification of existing urban hubs' current state, it is necessary to focus attention on the importance of urban objects' regulation process during their evolutionary changes. «Here the relation of dynamical system theory to control and control theory becomes apparent: control essentially means that a system which is not asymptotically stable is made so by incorporating a controller counteracting motion of the system away from the stable state. For this reason the theory of stability in internal description or dynamical system theory converges with the theory of (linear) control or feedback systems in external description» [2, 92 p]. Control theory methods can be expedient in the regulation of urban hubs that are functioning and developing, changing their structure, and possessing dynamical properties. Regulation of urban hubs' (MPCKs') system formation, functioning and development leads to improved sustainability of structure and its properties. «Sustainability, however, is not just about the physical environment; it is about preserving and, indeed, enhancing the quality of life for future generations» [3, 161 p].

3.1 Adaptation of the classical control model

Scientific researches in the field of Control Theory use such definitions, as input, output, message, feedback, receptor, effector, control apparatus, etc. L. Von Bertalanffy was one of the first who mentioned the definitions stated above, and offered the scheme of simple feedback (Fig. 7).



Fig. 7. Simple feedback (Author L. von Bertalanffy)

“The system comprises, first, a receptor or “sense organ”, be it photoelectric cell, a radar screen, a thermometer, or a sense organ in the biological meaning. The message may be, in technological devices, a weak current, or in a living organism, represented by nerve conduction, etc. Then there is a center recombining the incoming messages and transmitting them to an effector, consisting of a machine like an electromotor, a heating coil or solenoid, or of a muscle which responds to the incoming message in such a way that there is power output of high energy. Finally, the functioning of the effector is monitored back to the receptor...” [2, 42 p].

Applying the scheme of simple feedback for modeling the scheme of MPCKs’ system’s development management (Fig. 8), the following changes of the prototype scheme’s blocks are made (with preservation of their initial author's sense). The input or stimulus is meant as impact of positive and/or negative external factors on the receptor, or in this case, on the existing system’s structure. Interaction of various external factors and receptor forms the message that is information about structure’s transformations and violations, this message arrives to the control apparatus. The control apparatus is the team of highly qualified specialists who produce design decisions (structure’s adjustments). Experts recombine received message in the message of information about necessary adjustments of system’s structure, then they implement the adjustments, forming by this way the effector. Effector in this case is the system’s structure after its adjustment. Information about state of the structure after its adjustments serves as the response of the scheme, and at the same time, it can be positive and/or negative input for another urban system. While the information about new state is producing, the feedback is happening as well; moreover in the considered scheme feedback is also the information about the new state. This information goes to external factors and forms new cycle of scheme.

After each cycle of regulated system's adjustments, which necessity is caused by impact of various external factors, the updated system's functional and spatial structure representing the improved version of the previous is formed. Each new system's structure in relation to previous has emergent property, at the same time, both structures are similar, but new one possesses some other characteristics. Differences of external system's functional and spatial structure from the "final" one depend on the quantity of the implemented cycles of adjustments and on "force" and "volumes" of external factors.

This way of management considers system's emergent property formation and the idea of repeated recurrence of functional and spatial structure's adjustments. Emergent property and the property of systems' complexity started being actively discussed by scientists only from 90th of the XX century.

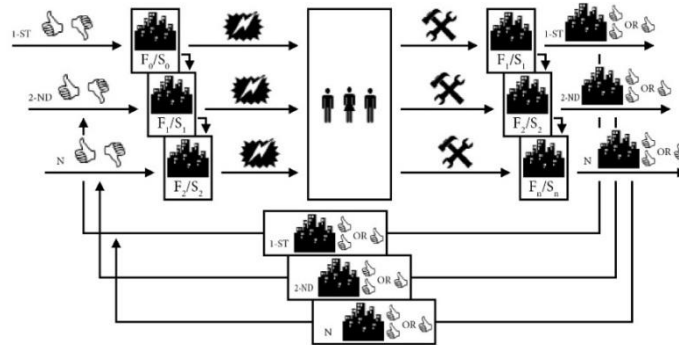


Fig. 8. Development management of MPCCKs' system (with its emergent property formation)

It is important to notice, that the meaning of such steps as the input and output, which appeared in the last scheme, matches with definitions of these steps, formulated by the founder of cybernetics N. Wiener [4]. He said that the output is understood as a change of environment made by the object, and the input is understood as an external event that changes this object.

3.2 Adaptation of the multilevel control model

The Control Theory consider splitting of system's management process into hierarchic levels, that allows to concretize tasks in drawing up design decisions, to reveal the priority of the adjustments' purposes and etc. Modeling of subsystems' management, mainly, increases efficiency of experts work.

In the scheme of multilevel multi-purpose system (Fig. 9), offered by M.D. Mesarovic, D. Macko and Y. Takahara [5], the process of control is directly connected with

subsystems of the lowest level by the signals of management arriving from subsystems to the block of the process and by signals of feedback from operated process. In turn, subsystems are connected by coordination signals from lower to higher and by informative communication from higher to lower.

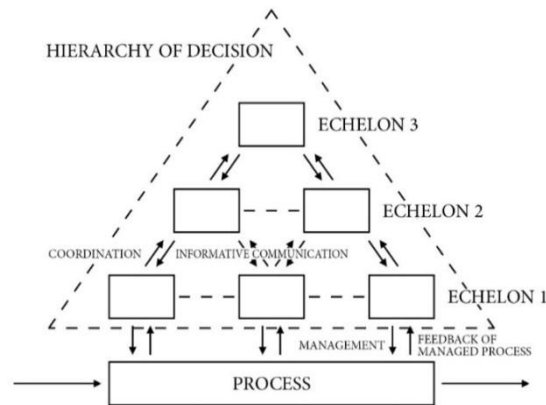


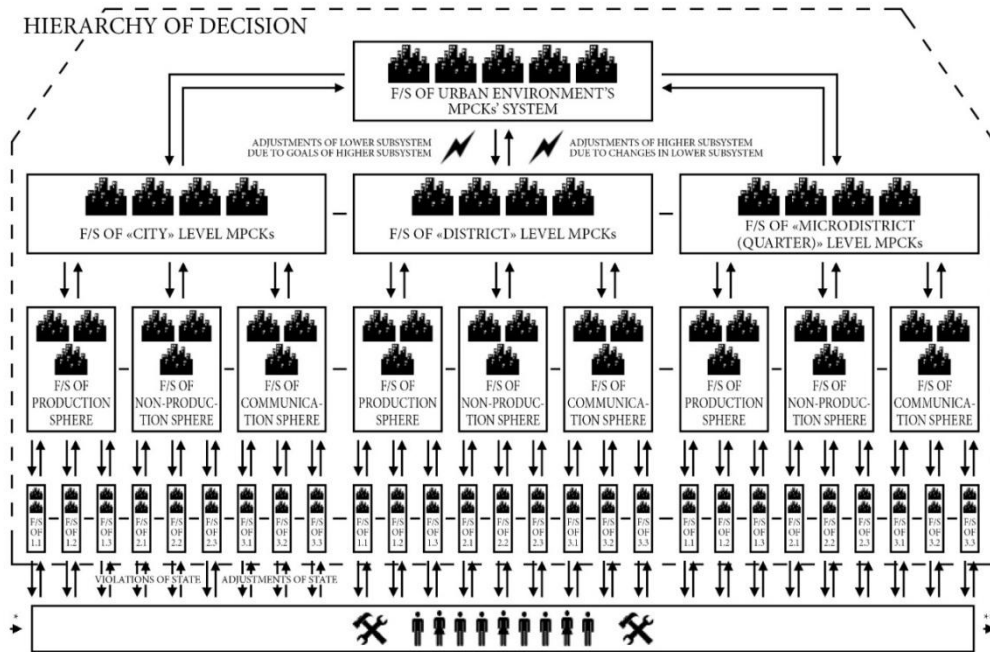
Fig. 9. Multilevel multi-purpose system (Authors M.D. Mesarovic, D. Macko and Y. Takahara)

The subsystems of MPCKs' system are presented by the following hierarchical levels (from higher to the lower): MPCKs of different hierarchical levels; various profile spheres of MPCKs; various components of MPCKs' profile spheres; various objects of profile spheres' components.

According to the scheme of design decisions hierarchy for MPCKs' system formation (Fig. 7), the block of process is meant like the management of development of system's structure. The input of this block is information about desired state of system's functional and spatial structure, the output of considered block is information about developed condition of the structure after implementation of the management process. The block of process is directly connected with subsystems of the lowest hierarchical level, namely components of profile spheres of MPCKs. Corrections of system's functional and spatial structure act as influence signals from operated process. Interrelations of subsystems are corrections of lower hierarchical level subsystem's structure according to the general purpose of higher subsystem functioning and information about necessary adjustments of higher hierarchical level subsystem's structure in connection with changes in the structure of lower hierarchical level subsystem.

Certainly, the nature of functioning or development of any subsystem is caused by the purposes of higher subsystem's functioning. Such impact of the purposes of higher sub-

system's functioning on the lower subsystem has binding character, in this case affects intervention, and in any determined system is shown in changes of lower hierarchical level subsystems.



Components: 1.1 "Material production"; 1.2 "Science and government"; 1.3 "Energetics"; 2.1 "Consumer service"; 2.2 "Culture and education"; 2.3 "Recreation"; 3.1 "Transport communications"; 3.2 "Pedestrian communications"; 3.3 "Communication connections"

*Desired state of system's functional and spatial structure

**State of system's functional and spatial structure formed after its development management realization

Fig. 10. Design decisions hierarchy for MPCKs' system formation (with realization of system's development management)

3.3 Adaptation of the modern control model

In the schemas of information structures, offered by J. Lunze [6] (Fig. 11), scientist suggests to implement management by uniform control apparatus that forms structure of system's centralized control or to break the uniform control apparatus into a set of devices.

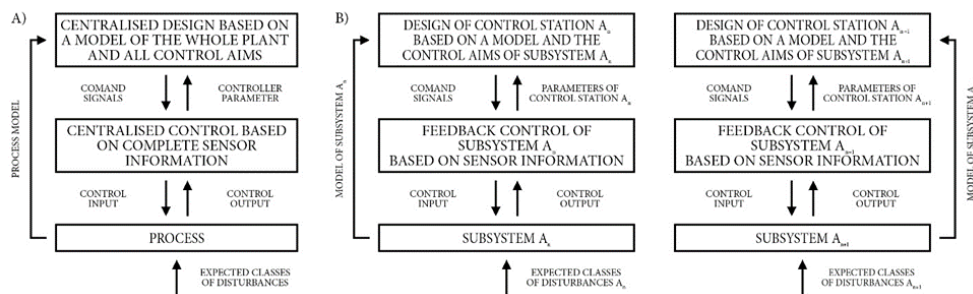


Fig. 11. Information structures (Author J. Lunze): A) Centralized control; B) Decentralized control

Modeling the scheme of development management of MPCKs' system (Fig. 12), in case of centralized control the uniform team of the experts, which is responsible for all adjustments in system's developed structure, is involved. In case of decentralized control, several teams of experts are engaged in management of subsystems. The number of such teams can be equal to number of subsystems or one team of experts can control several subsystems at the same time. The quantity of involved teams of experts depends on the condition of system's structure and amount of adjustments' goals of any subsystem, etc.

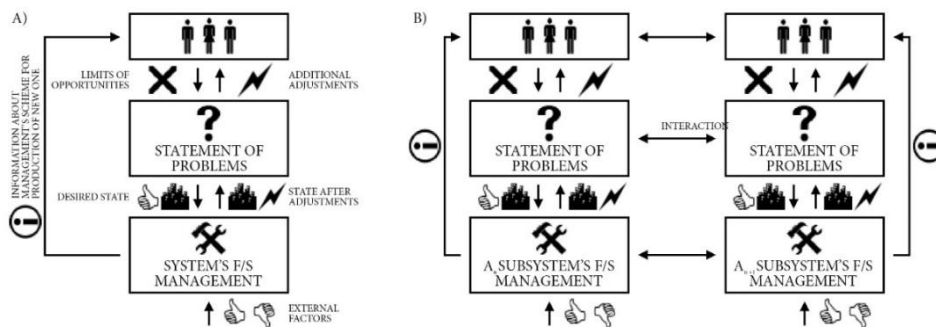


Fig. 12. Development management of MPCKs' system: A) Centralized control; B) Decentralized control

Along with methods of centralized and decentralized control, process of management can be carried out by the principle of long-term and short-term planning or combination of these two principles. The last way is displayed in the scheme of multilayer system, offered by J. Lunze (Fig. 13). Here system's management consists of several stages: strategic layer planning scheduling caused by a signal of long-term prediction, that arrived from environment; the layer of tactical optimization adaptation caused by short-term prediction, that also arrived from environment; layer of feedback control and layer of process.

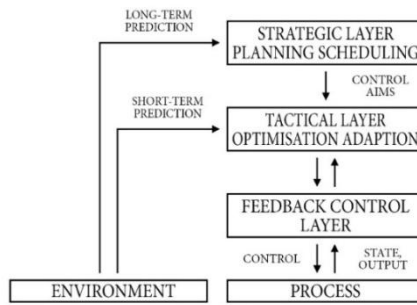


Fig. 13. Multilayer system (author J. Lunze)

The scheme of multilevel development management of MPCKs' system (Fig. 14) is an example of combination of long-term and short-term prediction. Therefore, the team of experts for long-term prediction forms the layer of strategic planning of system's functional and spatial structure, and for its short-term prediction forms the layer of its tactical optimization. Both layers are interconnected by necessary adjustments for achievement of compliance of their purposes and tasks. Thus, the layer of tactical optimization, which is more capable to fast reaction, is interconnected with the layer of control of system's feedback by a signal of a desired state of its structure and receive from feedback layer information about structure's developed state. The layer of feedback's control also sends the message about structure's desired state to the layer of management process, and receives information about structure's developed state, finishing thereby the cycle of system's management.

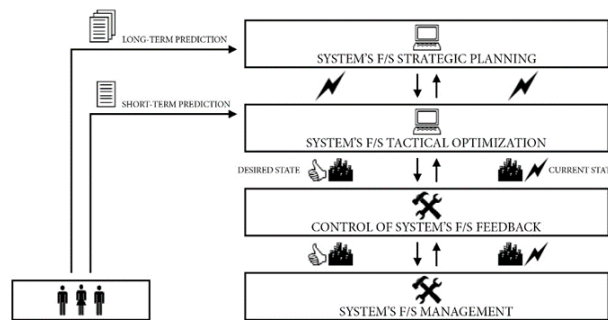


Fig. 14. Multilevel development management of MPCKs' system

3.4 Received model of urban objects' management

On the base of all considered schemes was created the General scheme of development management of subsystems of MPCKs' system (Fig. 14). Transition from the detailed description of the system's control to the detailed description of its subsystem's

control is more correct as splitting the whole into parts and regulation of each part minimizes risks of mistakes.

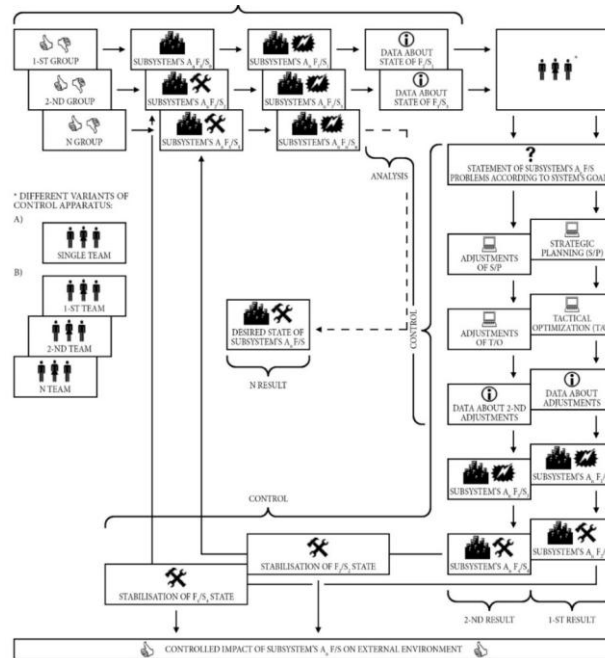


Fig. 14. Development management of subsystems of MPCKs' system (with system's emergent property formation)

Each cycle of this scheme contains four steps: “event”, “analysis”, “control” and “result”. The first step of transformations' cycle begins with the impact of external factors, positive and/or negative, on existing structure of subsystem An, that's how the third structural block of transformed subsystem's structure is formed. The result of the step “event”, and the first block of the step “analysis” is information about transformations and violations of the state. This block belongs to both steps as it is formed because of external factors' influence, but statement of this block is possible only at the step “analysis”, when in scheme's structure control apparatus is involved.

The step “analysis” consists of information about transformations and violations of a state, block of control apparatus, which forms four other blocks of analytical step. Therefore, as the third block of considered step is the statement of subsystem's problems according to the general purpose of whole system's functioning. The block is formed by experts during carrying out the first cycle of adjustments and, unlike others, does not change during the subsequent cycles. Constancy of the block is caused by invariance of the general purpose of system's existence, namely, satisfaction of various needs of the population

in the shortest terms with minimization of expenses. At the specified property of an invariance of this block, its existence is obligatory in structure of each cycle of control. This block forms the main task of control of any subsystem development. The following block of a considered step is strategic planning or long-term prediction of structure's state and prediction of necessary actions for its improvement. Based on the block of strategic planning the block of tactical optimization is formed, this block is the prediction of subsystem's A_n state after realization of one cycle of adjustments. The block that finishes the step is information about necessary adjustments. Four last blocks of the step "analysis" are the first blocks of the step "control". Interaction of the fourth block, the block of information about necessary adjustments, and the fifth block of the transformed functional and spatial structure forms the block of a new subsystem's structure, which is also a resultant step of the scheme (step "result"). The sixth block of the step "control" and feedback of the scheme is the stabilization of new structure's state. This block forms the beginning of the new control cycle, keeping gained during the management process state until the impact of new external factors' group. In addition, after the block of stabilization the block of controlled new structure's influence on its environment follows.

The considered model includes the idea of recurrence adjustments cycles, and also possibility of one experts' team involvement, or its replacements due to specific design tasks and other types of works.

It is necessary to notice the importance of interrelation between management processes of various hierarchical levels subsystems. So management of subsystem A_n is interconnected with sum of management processes of this subsystem's components, and with each process separately. Thus management of subsystem's A_n development is linked with management of subsystems of similar hierarchical level. Sum of all these processes and each of them separately consists is interacted with management of higher hierarchical level subsystem. It is important to note that stated example of subsystem's control model does not change depending on hierarchical level of any subsystem.

4 Conclusions

Based on analysis and synthesis of all noticed in the article schemes, their generalization, the uniform model of urban system's development management appeared. Created scheme is rational and effective interconnected sequence of necessary procedures, which

form reference model of management of any town-planning object's development. The main idea of received control model is its adaptability to any urban system's regulation.

Carried out adaptation of Control Theory to the process of town-planning objects' management, in particular, MPCKs' system's functional and spatial structure, plays an important role in searching of the way for increasing the efficiency of experts' work, for optimization of adjustments' implementation process and for minimization of risks during transformation of any urban environment's object. Application of system principles to urban objects' formation and involvement of Control theory's methods in their functioning and development lead to the regression of urban environment's tendencies of its self-organization, self-regulation, which are reasons of its stochastic and unpredictable transformations.

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Knowledge perspective to public management - managing public service provision with knowledge

Harri Laihonen*

Department of Information Management and Logistics
Tampere University of Technology
P.O. Box 541, 33101 Tampere, Finland

Sari Mäntylä

Planning Manager
City of Tampere

** Corresponding author*

Structured Abstract

Purpose – This paper describes how the city of Tampere in Finland developed its knowledge-based management, organized its strategic knowledge management and systemized its knowledge-based decision-support.

Design/methodology/approach – Theoretical background of the paper is on strategic knowledge management and public management. The main empirical data was gathered in an intense action research process, which was carried out between December 2013 and January 2014. This process included three development workshops and several preliminary and follow-up discussions where workshops were planned, analyzed and iterated. As secondary data, strategy documents, reports from previous development initiatives and the key findings of a maturity analysis on the state of knowledge-based management were used for mapping the starting point of the development work.

Originality/value – The paper contributes with its holistic perspective to public knowledge management and by providing empirical illustration on the strategic knowledge management at the city level. The literature has pointed out the narrow focus of earlier approaches. Their focus has been, for example, on the role technology and e-government or in some specific branches of public service provision.

Practical implications –The paper lays a foundation for developing a knowledge-based management culture in public organizations. Simultaneously, it puts in evidence the central role of the municipality and its knowledge management in fostering the vitality of the wider service ecosystem. Without proper knowledge and understanding about the efficiency and effectiveness of service operations, service providers and ways of organizing it is not possible to make informed decisions.

Keywords – knowledge management, public management, public services

Paper type – Academic Research Paper

1 Introduction

The Nordic welfare model is built on a strong role of the state and public service provision. In Finland, municipalities are responsible of providing many basic services (e.g., health and social services, transport and infrastructure services) and can therefore be considered as keystones of their local service ecosystems. This is followed by a responsibility of ensuring effective and efficient service provision as well as vitality of the service ecosystem. These tasks raise many managerial information needs. This paper addresses the gap in current understanding about the role of knowledge-based management of public service provision.

Public services are provided by a complex and integrated service system where individual organizations continuously interact and collaborate with each other to provide value for customers (e.g., Laihonon et al., 2014; Grönroos and Helle, 2010; Spohrer et al., 2007; Tucker and Pitt, 2009). Furthermore, a need for interaction is stressed also internally between functions and administrative sectors. Public management literature has responded to this change in management practice by introducing New Public Management approach (NPM) (Hood, 1995; Pollitt et al., 2007). Decentralization of decision-making, customer-orientation and management by results are some practical results of NPM (e.g., Sanderson 2001; van Helden et al., 2008).

More recently New Public Governance (NPG) approach has been introduced in public management domain (e.g., Billis, 2010; Kylänen et al., 2012; Vuori, 2011). The main strength of the NPG relates to its aim to understand the fragmented production and delivery of public services. In an environment of contradictory interpretations on the goals between public agencies severe problems may arise. However, both NPM and NPG pay only modest attention to information flows and knowledge process. Their main contribution relates to the recognition of knowledge as an important resource for public decision making and acknowledging that networked and systemic nature of public service provision increases the complexity of knowledge-based decision support and respective information and knowledge processes.

On the other hand, knowledge management literature states that “current examples of public sector knowledge management are narrowly focused and do not provide rich data on the strategies and experiences of those engaged in the process at the organizational level” (Edge, 2005, p. 45). Focus has been on the role of technology or e-government (Ling, 2002) or in some specific branch of public services, such as, police (Luen & Al-

Hawamdeh, 2001), education (Edge, 2005; Syysnummi & Laihonen, 2014), and health care (van Beveren, 2003; Laihonen, 2012; 2014).

Also the practical need for new understanding and solutions to support public decision-making at various levels of the system is high. Public managers need timely information for example, about the costs, customer needs, efficiency of operations, as well as quality and effectiveness of services. However, lack of understanding about knowledge management as a tool for supporting municipalities in attaining their goals seems to prevail. To bridge this gap, this paper describes how the city of Tampere in Finland approached managerial information needs, organized its strategic knowledge management and systemized its knowledge-based decision-support. The framework is intended for the use of the whole city in fostering the ‘managing with knowledge’ thinking, which has a high priority in strategic management of the city and is directed by one of central administration’s directors. Figure 1 summarizes the research design.

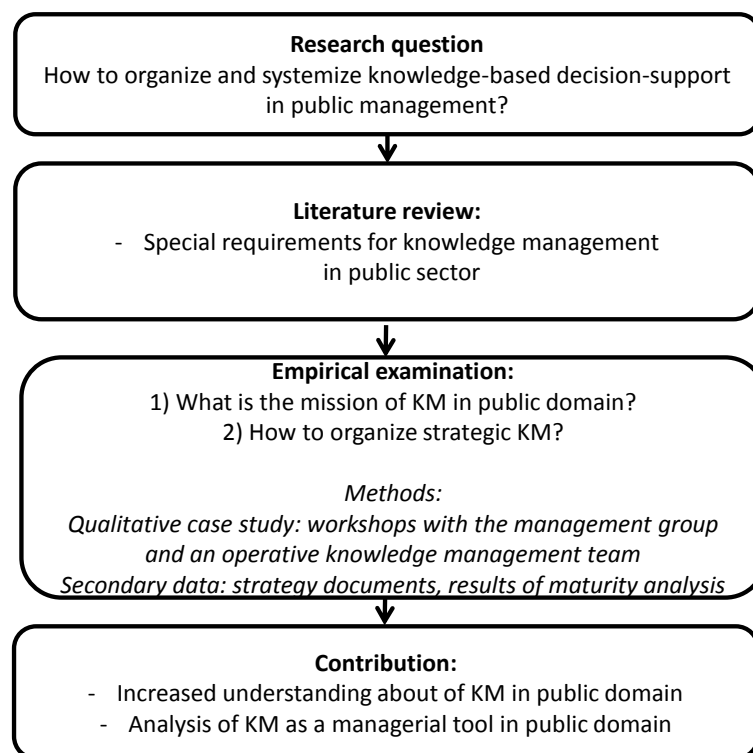


Figure 1. Research design.

The rest of the paper is organized according to the research design. Section 2 reviews the literature and presents the conceptual framework of the paper. Section 3 describes the

empirical research methods and the process of developing knowledge-based management in Tampere. Section 4 analyzes the empirical process from the viewpoint public knowledge management. The concluding section summarizes the key findings of the paper and suggests directions for further research.

2 Theoretical framework

2.1 Public management

Criticism towards efficiency and effectiveness of public services was raised in many OECD countries in 1980s (Hood, 1995; Pollitt et al., 2007). As a result, along with many other changes, new management techniques were applied as a part of the New Public management approach, which aimed to overcome the self-orientation of bureaucratic systems (Hood, 1995; Pollitt and Summa, 1997; Ongaro, 2004). Since then, the principles of NPM have been widely practiced with varying interpretations and implementations (Lane, 2000; Pollitt et al, 2007).

Although NPM changes its appearance and the practices vary (Pollitt et al, 2007), there are also common trends among different applications (Lane, 2000; Pollitt, 1993; Pollitt et al., 2007; Sanderson, 2001; van Helden, 2005). NPM introduced the decentralization of decision-making, which was followed by various outsourcing and privatization initiatives. It also increased customer-orientation and turned the whole public ‘business logic’ upside down by focusing on service operations instead of organizational functions and structures. Furthermore, an underlying theme in all NPM approaches concerns productivity awareness and management by results. Public organizations are expected to link costs to outputs and to demonstrate their value for money.

The most recent shape of public management is New Public Governance (NPG). NPG is an approach to understand the production and delivery of public services in a fragmented and pluralist society (e.g., Billis, 2010; Kylänen et al., 2012; Vuori, 2011). The conceptual framework of the NPG was introduced in 2006 and has thereafter gained increasing popularity among the methods of service delivery (Osborne, 2007; 2010). NPG can be defined as “the third wave” of the management reforms which have developed from the traditional Public Administration (PA) and the New Public Management (NPM) approaches (Klijn, 2008; Osborne 2007; Salamon 2002; Torfing & Triantfillou, 2012).

An essential feature of the new public governance is that it does not completely reject earlier administrative reforms, but rather complements them with new solutions. NPG is based on the view that the public administration is no longer able alone to control society, but the success of governance is based on the partnership with the private and third sectors as well as with the citizens (Peters, 2011; Salamon, 2002; Hakari, 2013). The most essential elements of the NPG are the crossing of all borders and the case-specific building of horizontal co-operation, partnership and network relations with various co-operating bodies (Haveri et al., 2009). It has been understood that instead of developing individual organizations and improving their results, the development should support cooperation and networking between different actors (Klijn, 2008). This demands leadership capacity that goes beyond a search for efficiency gains or a customer orientation to take on the challenge of working across boundaries and to take the goal of holistic working which has greater effectiveness in tackling the problems that the public must care about (cf. Sullivan & Skelcher, 2002).

Bovaird and Löffler (2002) argue that the shift from local government to new local governance entails moving from the development of organizations to the development of communities, changing the focus from defining customer needs to communal participation and shifting from differentiating politics and administration to interactive processes between them. Within the NPG framework one can, at least to some extent, identify three distinct trends. Discussion of the new public governance started in network governance. Next, the NPG was discussed from the perspective of democratic decision-making and public participation. The third emphasis seems to be on the new public governance as a development of customer-focused services and co-production (cf. Hakari, 2013).

2.2 Strategic knowledge management

Knowledge as a strategic resource and a source of competitive advantage has aroused a lot of academic interest since the first contributions of resource- and knowledge-based views of the firm (Barney, 1991; Grant, 1996; Spender, 1996). A knowledge management strategy defines which knowledge resources are valuable, unique and inimitable and how those resources support organization's business strategy (Hansen et al., 1999; Zack, 1999; Earl, 2001).

A review to strategic knowledge management literature reveals that three types of studies dominate the discussion. First, a predominant stream of literature categorizes knowledge management strategies based on their key characteristics (e.g., Hansen et al., 1999; Earl, 2001; Donate & Canales, 2012; Bierly & Chakrabarti, 1996). Second, a group of studies have focused on the impacts of knowledge management strategy on organizational performance (e.g. Yang, 2010; Hitt et al., 2000; Choi et al., 2008; Choi & Lee, 2002; 2003). Third, the most practice-oriented studies provide guidelines for developing, choosing and implementing a knowledge management strategy (Zack, 1999; Soliman and Spooner; 2000; Earl, 2001; Haggie and Kingston, 2003). Whereas the two previous approaches aim externally to categorize or evaluate knowledge management strategies, here the main driver is an internal need to understand how knowledge management can support value creation.

Earl (2001) and Zack (1999) focus on the recognition of performance gaps in discovering where firm's capabilities do not match the intended strategy. The next step in defining a knowledge strategy is to ask how knowledge can make a difference in filling these gaps. Zack uses knowledge-based SWOT analysis as a tool and states that every strategic decision has a profound influence on knowledge, skills, and core competencies. In parallel, what an organization does know limits the ways it can compete. Thus, an analysis of organizations' knowledge assets (Edvinsson & Malone, 1997; Sveiby, 1997; Lev, 2001; Seetharaman et al., 2002; Halawi et al., 2005) lays the foundation for recognizing knowledge gaps and constituting a knowledge management strategy. Finally, one of the most important reminders of the strategic knowledge management literature is that the identification and selection of the knowledge management initiatives and tools should always be a derivative of the business strategy, not the other way around.

For public management, knowledge management offers new options, capabilities, and practices to assist public administration in strengthening public service effectiveness and improving the society (Wiig, 2002). Wiig (2002) identifies four areas of public knowledge management: decision support, public participation; building of competitive societal intellectual capital and developing knowledge-competitive work force. Edge (2005) recognizes that the literature on public knowledge management has been approached mainly from the technological perspective and by concentrating predominantly on certain functional areas like police (Luen & Al-Hawamdeh, 2001),

education (Edge, 2005; Syysnummi & Laihonen, 2014) of health care (van Beveren, 2003; Laihonen, 2012; 2014).

The recognized cultural challenges in public knowledge management relate to resistance to change and hoarding of knowledge (Sveiby & Simons, 2002). Other challenges arise, for example, from incompatible information systems, hierarchical and bureaucratic organizations and multiple purposes for managerial information (Behn, 2003; Liebowitz & Chen, 2003).

2.3 Summary: Knowledge management in public management framework

The main task of this literature-based section was to recognize the main aspects of modern public management and to illustrate the complex environment where knowledge perspective could provide valuable contributions. Figure 2 summarizes the key notions of the literature review and constructs a conceptual framework and a basis for the empirical phase.

Public management and its particular knowledge-based management challenges as a phenomenon originate from the changes in public environment. NPM and NPG literatures have identified several aspects that need to be considered. These have changed also the role of knowledge management and expanded managerial knowledge needs. Empirical part of the paper studies how knowledge management could support public management at the city level. Analysis is based on the conceptual framework, which combines ideas from public management literature and strategic knowledge management. With this approach the paper provides valuable practical viewpoints for public managers to survive in multi-voiced society and contributes also to the literature by developing a basis for knowledge-based public management.

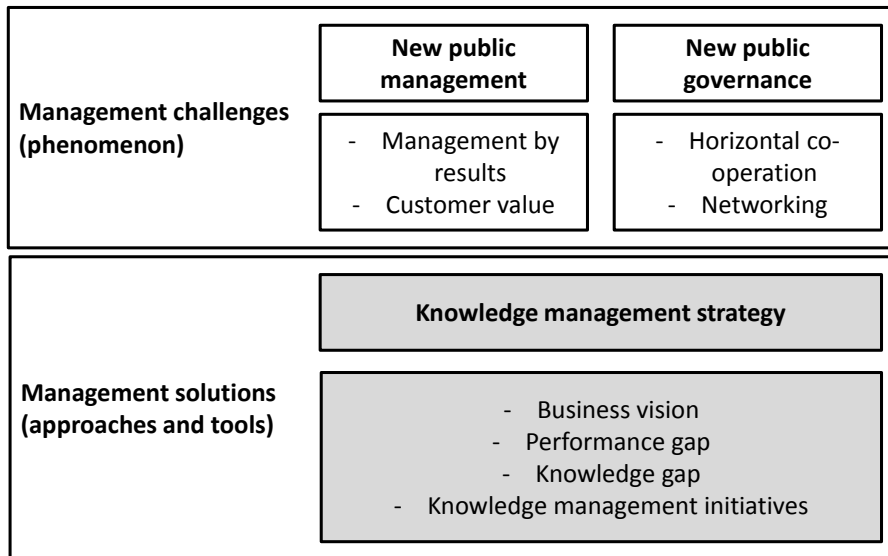


Figure 2. Public management and knowledge management – the conceptual framework.

The two empirical questions arising from the theoretical part are: 1) what should be the overall aim of the knowledge-based management initiatives at the city level? and 2) how to organize and share responsibilities between organizational functions in a complex organizational structure? Empirical part of the paper aims to provide answers to these difficult but essential questions of public management.

3 Research context and empirical data

3.1 City of Tampere as a research context

Tampere is a city in southern Finland. It is the most populous inland city in any of the Nordic countries. The city has a population of 220,609. Tampere is the second-largest urban area and third most-populous municipality in Finland. The city is also the largest employer in the area (15 152 employees) and annual expenditure of the services is € 1,380 million. Welfare services (health care, social care and education) is the biggest sector (76 % of employees) and 59% of these services is provided by city's own production.

The supreme decision-making body in the City of Tampere is the City Council with its 67 members. Council members and their deputies are elected in a municipal election

held every four years. Tampere made an administrative reform – which, in the context of Finnish municipalities, can be described as historic – at the beginning of 2007 by adopting a new model of leadership with a politically elected Mayor. The reform also implemented the multiple-provider model in all municipal operations and organized purchaser activities into customer-oriented process organization. The management reform laid strongly to New Public Management (business-logic, customer-orientation), but also recognized the weaknesses of the NPM model. Later on the management model has been developed more towards New Public Governance such as local democracy, participation, networks and transparency of government. (Hakari, 2013.)

The city ensures the availability and quality of services for which it is responsible, regardless of the manner in which they are produced. In this operational model purchaser activities have been organized into customer-oriented core processes supervised by purchasing committees (Figure 3). At the same time, the city's own service production has been decreased and organized in a customer-oriented way.

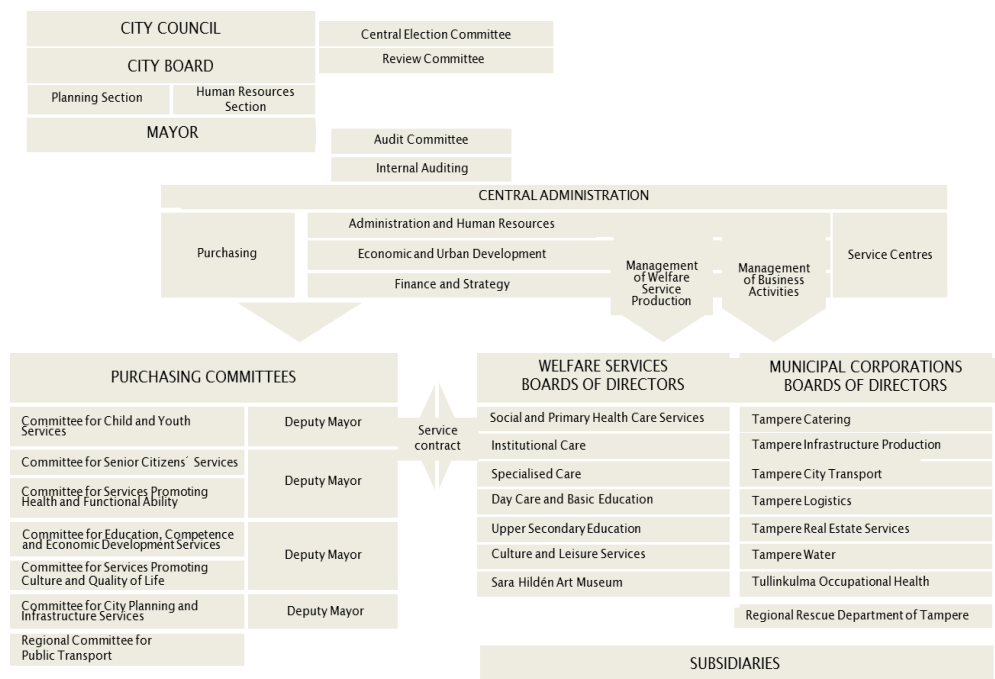


Figure 3. Operational model of the city of Tampere.

3.2 Empirical methods and data

The management reform and its process-based approach led the organization to focus on knowledge-based management of service provision. At the same time, a need to oversee service processes instead of administrative functions or organizational units was perceived. Outcomes and effectiveness of services were set as performance objectives and various projects were launched for developing measurement of cross-functional processes. The focus was transferred from organization units to services and customer benefits. Furthermore, the productivity of public services was concerned and the city launched a Productivity Program in 2009 and performance measurement was raised into central role in managing service efficiency and taking quality and effectiveness of services into account. These, and some other measurements projects/initiatives, have initiated new kind of managerial information needs and lead knowledge management into a new direction.

In 2013, the maturity of city's knowledge management was evaluated. Four main development areas were recognized:

- Operating model for knowledge management is needed to ensure reliable and timely decision support
- Communication and training plan (competence development)
- Harmonizing of the technical architecture
- Recognizing and modelling of the service processes

Results of the maturity analysis, earlier experiences on productivity program and performance measurement initiatives laid the foundation for the research project concerning knowledge-based management this paper focuses on. All these were used as secondary data for the analysis of this paper. The primary data for the paper was gathered in an intense action research process between December 2013 and January 2014. This process included three development workshops and several preliminary and follow-up discussions where the contents of the workshops were planned, analyzed and iterated.

Three workshops were arranged with two different groups, one for each and one joint gathering. The two groups were: management group of knowledge-based management (steering-group) and more operative group of key actors around knowledge-based management. Participants of both workshops represented general management,

information management, service management and administrative specialists. Each has their particular view to knowledge-based management, either as decision-makers or information producers. A dialogue between technical and service oriented officials was considered necessary.

The main aims of the process was to: 1) compose a shared understanding about knowledge-based management, 2) create a holistic view and rules for knowledge-based management within the city, and 3) specify the future steps for knowledge-based management. The focus of the first workshop with the management group was on the linkage of knowledge-based management and city strategy. This discussion acted as the starting point for the second workshop, which focused more on the concrete steps for advancing knowledge-based management. Two researchers participated to all workshops; while the other led the discussion, the other made detailed notes. The next section describes how the process was carried out in practice. The process reflects the new managing model, new strategic aims, customer-oriented approach and governance of fragmented service provision, which all call for new solutions also for knowledge-based management in public domain.

4 Knowledge management as a public management strategy

4.1 Positioning knowledge management strategically in Tampere

Knowledge-based management, or managing the city with knowledge, is a strategic development area within the city of Tampere and is directed by the director of Administration and Welfare services Group in central administration. City strategy is operationalized through four plans of action documents. One of these concerns organization's internal operations and management. This document highlights knowledge-based management as a concrete objective for the period of 2014-2017. The aim of this initiative is that the needed information is available to support decision-making and management. Operations should be based on the availability and application of accurate and timely information. Knowledge-based management also has a high priority on top10 list of structural changes accepted by the city executive board in 2013 for the period of 2013-2016. Balancing the city budget necessitates structural changes aiming for financial savings in the long run. Knowledge-based management is also a

binding target in the budget for 2014: “cost-efficiency and effectiveness of social and health services have improved through knowledge-based management”.

To support knowledge-based management various development tasks have been implemented during the last years. However, preliminary discussions with the city officials revealed that development work is scattered into unrelated projects and the overall picture is unclear. This interpretation was confirmed in workshops and has complicated both internal and external communication. Thus, it was considered important to connect knowledge-based management to wider, city-level objectives. This is expected to clarify the overall aim and meaning of knowledge-based management and ease the communication and building of a shared knowledge culture. The ultimate aim of knowledge-based management in Tampere is to improve performance of the city. Performance was considered widely to retain productivity, efficiency, quality and effectiveness of services. To concretize this overall aim it was divided into three sub-objectives, service provision, internal efficiency and new opportunities, as presented in Figure 4.

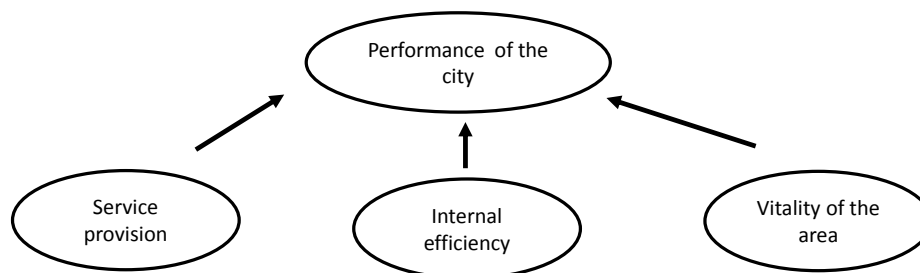


Figure 4. Knowledge-based management supports performance improvement.

Each sub-objective improves overall performance and was considered to encompass strategic focus areas (working together, preventive measures and narrowing disparities in well-being, vitality and competitiveness, sustainable community, balanced finances and innovative organization). In this way knowledge-based management becomes a central medium for implementing city strategy. Two main questions arise: “What are the specific tasks advancing these aims” and “What information and knowledge is needed in order to reach these aims?” answering these questions creates a basis for all knowledge-based development.

In addition to strategic aims, an important aspect of knowledge-based management is its connection to general management system of the city. It creates real knowledge needs,

which helps in resource allocation and prioritization of information requests. Naturally, there will simultaneously origin ad-hoc knowledge needs on a regular basis and requires efficient organization and handling of these needs as well. Without a linkage to a basic task of the city, information provision and knowledge-based management remain detached from the every-day management. Thus, a knowledge-based management culture requires a tight linkage between service operations and knowledge. Currently, this was considered too weak.

Workshops focused especially on service provision and the knowledge base that their intelligent purchasing requires. Tampere has been active in this area. For example, productivity measurement has been developed and management information needs mapped. Recently, the focus has been increasingly on integrating previous work. This integrative approach aims to recognize leading indicators and other managerial information that is needed in decision-making. In the context of service provision, the underlying question is: what knowledge is needed to manage the service provision. Figure 3 provides an example of this work from the home care unit (own production).

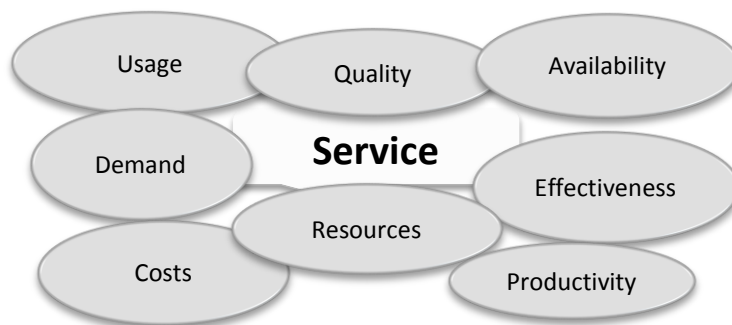


Figure 5. Leading indicators of service management in Tampere.

Steering group decided that it is reasonable to continue the work on leading indicators. However, the group stressed the importance of connecting these indicators to the wider aims of service provision. Provided information should guide towards management of cross-functional service provision and customer value, serve practical decision-making situations and support knowledge-based management more generally. The existing productivity measures need to be updated to serve this purpose and requires changing the focus from organization units to services and strategic aims. In practice this means that in addition to measuring home care as an organizational unit, the measurement

should also provide information about the success of the city in supporting elderly people to live at home (strategic objective).

4.2 Towards a knowledge strategy in Tampere

In workshop discussions, four essential tasks were recognized as the main development areas for knowledge-based management: 1) recognition of the leading indicators and other managerial information, 2) representing and modelling the information need, 3) gathering and presenting information, and 4) refining and analysing information. These are essential tasks of the support function enabling the actual knowledge-based management. Also the issues like reliability of the data (Master Data Management, Data Warehousing etc.) and definition of roles, responsibilities and tools were underlined in workshops. Currently, a clear juxtaposition between supply and demand for management information prevails. Information provision and strategic knowledge needs do not meet.

Refining and analyzing information is strongly dependent on the quality and reliability of the underlying data. Currently the quality of the data is not on a satisfying level. This problem is recognized and the city has already started a process for purchasing a master data management system, which should improve the quality of the data. This is not merely a technical process, it is important also to carefully design and implement a rigid process for guaranteeing the quality in the future. Again, these processes need to be developed and technological selections made in line with the managerial information needs and strategic aims. Managerial needs and service operations should guide the information provision and the related knowledge processes.

There is also work to be done on creating a shared language between actors. For example, in the joint workshop different interpretations between information management and service managers on the concept of 'service process' became evident. This relates and concretizes also a bigger change taking place in the public sector. When management focus is transferring to inter-organizational and cross-functional service processes a shared language depicts a crucial determinant enabling collaboration and knowledge sharing. Focusing on the leading indicators is expected not only to diminish the amount of knowledge requests received but also clarify where the management focus should be. Thus, it creates a common language for managers by defining key concepts and performance objectives. Further, this should help in resourcing and prioritizing. It is also

expected that this streamlines the flow of knowledge within the organization and brings ease to information overflow from the viewpoint of individual employees.

Overall, it is expected that recognition of the leading indicators creates a starting point for knowledge-based management. Both workshops recognized the need for special capabilities related to this task. In this role, a holistic and in-depth understanding of the city strategy and the various paths for implementing it plays a crucial role. Service architecture and strategic objectives need to be assimilated in order to recognize and prioritize knowledge needs. Only from these, a coherent knowledge strategy and the supporting infrastructure can be derived and designed. Thus, understanding of the information infrastructure, information modelling and a basic understanding about the technological possibilities are needed as well.

The first steps to produce and utilize the leading indicators were taken by launching a project, which aims to identify the clients who use many (high-cost) social- and health services and to map out the services and service chains they use. The objective is that the findings of the project can be used to improve the processes inefficiency and low effectiveness as well as cut down costs. This is set to concretize the defined target: “Cost-efficiency and effectiveness of social and health services have improved through knowledge-based management”.

5 Analysis: The Tampere way – managing with knowledge

Contribution of the paper relates to two aspects. First, the paper links the literature on knowledge management to public management stream. Previously this has been made primarily through certain service area or process, here the focus was on strategic management and a city level perspective was chosen (Edge, 2005). The paper also acknowledges the continuously evolving public environment (Sanderson 2001; van Helden et al., 2008) and considers how this should be taken into account in public knowledge management. Second, to knowledge management stream, the paper provides a practical illustration on how to apply knowledge management and to compose a holistic knowledge strategy for a complex service system like a city (cf. Hansen et al., 1999; Zack, 1999; Earl, 2001) and thus implements a knowledge-based view in public environment (Grant, 1996; Spender, 1996).

As the empirical examination illustrated, the Tampere model is built on basis of democracy and regulation of traditional public administration as well as quasi-markets of the NPM. The more recent NPG reform is transferring the focus more towards customer-oriented service development (cf. Hakari, 2013). Thus, the City of Tampere has passed through two design and delivery regimes of traditional public administration and New Public Management and is currently introducing the third, New Public Governance. Along with these new ways of governance management focus and managerial knowledge needs have evolved.

Under the public administration regime public services and organizations were managed with a hierarchical chain of command (Hartley, 2005; Osborne, 2010). The managerial knowledge needs related mostly to cost management and measurement of service outputs (i.e. units of service usage). Focus was on individual organizations and specific services, not on service chains and customer-perceived value. The role of a client was passive. Nevertheless, the provided information served well the needs of hierarchal decision-making because services were mostly produced by the city itself and the need for external information was low. Some of the existing management practices still go well back to this management regime.

The city's administrative reform in 2007, especially the multiple-provider model and increased customer-orientation, represents the move towards NPM regime in many ways. Customer-orientation and requirement for responsiveness turned the whole public "business-logic" upside down by focusing on service operations instead of organizational functions (Sanderson, 2001; Hartley, 2005; Pollitt et al., 2007). This also turned the management focus from organizations to service chains. Within NPM, citizens are expected to become active consumers and exercise choice between various providers of public services (public, private and nonprofit). When customer value is provided by a service system, also managerial information needs change. In addition to individual organizations, fluency of co-operation and customer-perceived value need to be continuously evaluated (cf. Lönnqvist and Laihonon, 2012; Laihonon et al., 2014). This highlights long-term effectiveness instead of direct service outputs.

More recently, the spread of network society (Hartley, 2005) and New Public Governance (Osborne, 2007; Osborne, 2010) implies a more pluralist model of governance and provision of public services. NPG puts much greater emphasis on citizen participation and third sector as a service provider than either traditional public

administration or New Public Management (Hartley, 2005; Osborne, 2010). Managing and governing this, even more fragmented and decentralized network of service providers, brings new challenges to public knowledge management. At the moment, it seems that three different cultures, management conventions and even generations of public managers collide, which leads to many problematic situations.

From the knowledge management perspective, city of Tampere is still relying strongly on those information and knowledge processes that were developed for the purposes of public administration. Focus is on organization- or function-specific information production not on the ability of the service system to bring added value for the customers. Despite the many development initiatives and strong strategic will to measure effectiveness and advance knowledge-based decision-making, the system is not ready to take the next step to New Public Governance. However, many of the weaknesses have been identified and as illustrated knowledge-based management has a high priority in all future plans.

NPM and NPG have brought several new requirements for knowledge management by raising new kind of information needs and adding variety to the system. However, those pay only modest attention to information flows and knowledge process. Their main contribution relates to the recognition of knowledge as an important resource for public decision making and acknowledging that networked and systemic nature of public service provision increases the complexity of knowledge-based decision support and respective information and knowledge processes. Knowledge management has been introduced as a tool for conceptualizing, planning, deciding, and implementing public actions as well as for providing general support (Wiig, 2002).

Based on the ideas presented in knowledge management literature (e.g., Zack, 1999; Earl, 2001) Tampere approached its knowledge management by beginning from the overall aim and purpose of city. As described, service provision was chosen as a target for more specific analysis. Here, performance was considered widely to retain productivity, efficiency, quality and effectiveness of services. A key to successful knowledge management is a tight connection to organizations business strategy (Zack, 1999). Thus, city strategy should define objectives and key measures that are used for following the success of the service system. These top-level objectives are operationalized through the management system, which should create a structure for information utilization in everyday decisions where knowledge-based management actually happens.

One of the most important findings and a real eye-opener for practitioners in Tampere was the central role the service architecture in understanding the actual knowledge needs. Service architecture refers to all cross-functional service process that influence and relate to each other. Their success requires seamless knowledge flow and collaboration and set new kind of managerial knowledge needs as described earlier in this paper. Previously Tampere has recognized knowledge needs by asking managers what information they need for their decision making. This has not led to desired results. Now the focus is turned to leading indicators and purpose is by this way guide information gathering towards the most essential tasks and aims. This approach follows the basic idea presented in strategic knowledge management literature (Zack, 1999; Earl, 2001) adding the perspective and complexity of public service system.

First step towards operationalization of the above thinking was the recognition of central roles and capabilities needed. In order to encourage and support the recognition of the leading indicators, a service architect is needed. Persons in this role have an important role in operationalizing city strategy. After the key information needs are recognized those need to be modelled and linked to the underlying information architecture. Information and enterprise architects are responsible for this task and coordinating the needed sub-activities. Then, gathering and presenting of information depicts the task, which brings the information to the availability of decision-makers. The work for clarifying the roles, responsibilities and structure of the knowledge-based management support started this year. Related to this work, the following tasks were identified: 1) guaranteeing data reliability, 2) refining data to decision-support, and 3) integrating knowledge to general management system.

Finally, it is important to understand the difference between knowledge-based decision support and the actual decision-making. Value of knowledge-based management is realized only if managers and other employees utilize the provided information and knowledge by making better decisions based on it.

6 Conclusions

The literature has considered knowledge management mainly as separate tasks supporting public administration and management. The novelty value of this paper lies in the very simple argument – public management is increasingly about knowledge

management. This paper calls for a shift towards more informed and knowledge-based management in public domain. Decisions should be based on the best available knowledge and lead to benefit of citizens. This puts knowledge-based management into a new position and a managerial challenge is to communicate this perspective.

The paper discussed knowledge-based management in a changing public management domain. It considered public administration, new public management, new public governance and noted that each of these has left a trace in public management. As a consequence, different cultures, management conventions and generations of public managers collide and challenge the creation of a shared understanding on the role of knowledge. The paper made several important notions on developing a knowledge strategy in public environment and complements the literature on strategic knowledge management in business-driven environments.

Both the literature and empirical findings highlight the importance of connecting knowledge-based management to strategic objectives, recognizing knowledge gaps and aiming knowledge initiatives to fulfilling these. In public service systems, it is often difficult to compose a shared understanding about the objectives but the paper described how this was done in one particular service system. Then, the implementation of the cultural change rests on the management system. Strategic objectives need to be operationalized into units' and individuals' targets and these have to be regularly followed. This kind of knowledge-based and performance-driven culture is very slowly gaining ground also in public sector.

The issue of public knowledge management offers several avenues for future research. Highly important one relates to implementation and operationalization of knowledge-based management as a part of the general management system. Central question is "How to build a management culture, which relies on knowledge-based management and informed decision-making". And further, what kind of management system would be most suitable for contemporary public organizations. Other interesting research questions relate to the role of customer and knowledge that is needed to better respond and manage the increasing demand for public services. The main limitation of the paper relates to having only one case organization. On the other hand, it is also a key strength of the paper: the action-oriented approach of the paper made it possible to study the process of developing a knowledge strategy under certain contextual settings.

Despite of its weaknesses, the paper lays a foundation for developing a knowledge-based management culture in public organizations. Simultaneously it puts in evidence the central role of the municipality and its knowledge management in fostering the vitality of the service ecosystem. Without proper information and understanding about the effectiveness of services, efficiency of service providers and ways of organizing it is not possible to make informed decisions.

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Synergies between Healthcare Lean Management and Clinical Risk Management: A Case from Spain

Maria Crema*, Chiara Verbano

Department of Management and Engineering
University of Padova
Stradella San Nicola, 3
36100 Vicenza - Italy

* *Corresponding author*

Structured Abstract

Purpose – The purpose of the paper is to study “lean & safety” projects, which are those ones that combine Health Lean Management (HLM) and Clinical Risk Management (CRM). Thus, the research objective is to understand how “lean and safety” projects can be implemented, investigating the significant features that characterize them: organizational aspects, phases and activities, tools, techniques and practices and key factors.

Methodology – As it is a new subject, case study methodology has been adopted; the selected project is one of the first cases where HLM is required firstly to reduce incidents and secondly to obtain efficiency improvements and HLM is fostered by who are in charge of patient safety. After creating an interview protocol based on literature, data has been collected conducting semi-structured interviews with the key informants involved in the implemented project. To guarantee triangulation, also relevant archival documentation has been collected and observations have been executed. Data were finally analysed to obtain a framework that answers the defined research objective.

Originality/value – The connection between HLM and CRM is not studied in literature yet. To this extent, organizational aspects, phases followed, tools and practices adopted and key factors for a successful “lean & safety” project implementation is described in this paper. This is one of the first researches that investigate characteristics of a HLM project adopted to solve CRM issues. The results suggest HLM and CRM should be considered in a new synergic methodology. First indications about how developing it are provided boosting future research, also in other contexts and contributing to the development of more safe and sustainable health care systems.

Practical implications – The outcomes of this research is valuable for hospital units or health organizations that need to achieve efficiency enhancement, improving quality and patient safety at the same time. For an improved management of clinical processes, hospital managers could consider the results of this research to solve their CRM problems. The indications about phases to follow for the implementation of a “lean & safety” project could be cogitated as guidelines during the application of this emerging methodology. In addition, they could grasp from this research the characteristics for a

successful implementation of projects that pursue multiple objectives in a challenging environment.

Keywords – lean management, clinical risk management, healthcare management, case study

Paper type – Academic Research Paper

1 Introduction

Healthcare systems have to afford multiple challenges especially during a crisis period in which many governments have to spending review in order to comply with international agreements. Particularly for healthcare systems that are guaranteed and funded by public institutions, efficiency should be increased cutting wastes and costs. On the other hand, accreditation standards require high performance in terms of quality and safety improvements. In a context where resources are scant and customers and ethical principles ask for high quality, new managerial solutions should be developed, in order to abandon the trade-off approach between diverging performance objectives and to take advantages of the benefits of different methodologies.

An increasing interest has been devoting to HLM in academic and managerial literature. It has been cogitated as a managerial approach that could contribute to efficiency improvements, identifying and eliminating any wastes, attributing more value to the patient and reducing costs. Few researches have analysed the impact of this methodology on quality and safety improvements; in particular, till now the possibility to combine HLM and CRM has received scarce attention.

Through the analysis of a single case study that is peculiar for its synergic approach adopted, this research aims to grasp guidelines and key lessons from the implementation of a successful project that has led to efficiency and patient safety improvements. In the project, elements of CRM and of HLM are integrated, contributing to the development of an original process managerial methodology. Considering not only the hardware but also the software elements of the projects, the organizational and contextual aspects will be highlighted. After presenting the national and regional context of the hospital in which the project has been developed, in the third section the emerging managerial approaches adopted in healthcare will be described. After defining the research objectives and justifying the followed research methodology, the analysis of the case will be reported

(section 5). Discussion of results and lessons learned will be presented in the sixth section and finally conclusion will be drawn (section 7).

2 The national and regional context

The Spanish National Healthcare System is based on the article 43 of the Spanish Constitution that recognizes the citizens' rights and the universality of the system, which must be guaranteed through territorial division of powers and equity distribution of health care resources, as well as equal access to health care. In 1986 the application of these principles started with the General Health Care Act, through which the healthcare system was conceived as decentralized, universal and tax-based financed (Segura, 1999; Reverte-Cejudo & Sánchez-Bayle, 1999). The insurance-oriented model of Bismack was substituted with the model of Beveridge financed by taxes, even if the system today includes also out of pocket payments that mean co-payment by citizens and private insurance in addition to public coverage (Veneziano & Specchia, 2010; García-Armesto, et al., 2010; Rajmil, et al., 2000). The contemporaneous decentralization process finished in 2002 attributing high responsibility and autonomy to the 17 Autonomous Communities, whose cohesion, strengthened also by Cohesion and Quality Law in 2003, is assured by the Interterritorial Council of the NHS (CISNS), composed by regional ministers and the national minister (García-Armesto, et al., 2010; Duran, et al., 2006; Lopez-Casasnovas, et al., 2005). The central government is responsible for several strategic areas (García-Armesto, et al., 2010). Each autonomous community can define a different territorial organization that is distinguished into Health Areas and Basic Health Zones, and the latter ones are the smallest unit of organizational healthcare (García-Armesto, et al., 2010; Borkan, et al., 2010). While regional health legislation, health insurance, health services planning management and provision fall within the competence of Autonomous Communities, the local authorities are responsible for sanitation, collaboration in health services provision and public health and community services (García-Armesto, et al., 2010). In health areas primary and specialized care are provided with few differences in the management among Autonomous Communities.

This healthcare system has been studied by different authors and someone (e.g. De Magistris & Bobbio, 2004; Lopez-Casasnovas, et al., 2005; Rico & Costa-Font, 2005) has emphasized the diversity among regions especially for the 7 Autonomous Communities that have acquired independency before the others. In particular, Catalonia, being the first

Autonomous region, has developed gradually a peculiar Catalan health care system (Departament de Salut, 2014) with a direct management of the public structures by the Catalan Institute of Healthcare and service coverage assigned to other public or private suppliers through an accreditation mechanism (De Magistris & Bobbio, 2004; Rajmil, et al., 2000).

Lopez-Casasnovas et al. (2005) underline this decentralized system has not generated inequalities; rather, it has increased quality improvements at least for what concerns patient satisfaction. Borkan et al. (2010) report that in 2007 the National Health System developed a Quality Plan: with inputs from local authorities, twelve strategies for quality and efficiency improvements and reduction of unnecessary costs and wait times for patients were developed and executed at the national, regional, and local levels.

According to Veneziano and Specchia (2010) the Spanish Health care system stands out for its efficiency and the peculiarity of its primary care organization. Based on the last OECD data (OECD, 2013), Spain performs well: in particular, the life expectation is within the highest in Europe and the hospital beds and the mortality rate are the lowest ones. Considering the waiting times calculated by OECD (2013), Spain reports lower values than the OECD average for almost the indicators.

Despite the good indicator for public debt in 2010, Spain presented poor performance for employment and economic growth and public deficit (Catan, 2008; García-Armesto, et al., 2010; Gené-Badia, et al., 2012). The latter problems has been faced decreasing the social spending (García-Armesto, et al., 2010), criticizing by Genè- Badia et al. (2012) that signal a reduction in surgical and clinical activities and in major investments, an increase of delay in payments to providers and salary reductions, which were still the lowest in Europe (OECD, 2013). This occurs together with a pressure to provide high-quality universal care in a context of population growth, even more aging people besides the global financial crisis (Martin-Moreno, et al., 2009; Carrasco-Garrido P, et al., 2009).

Genè- Badia et al. (2012) are concerned about the risk of increase people on waiting lists, bad condition in chronic patients and low health status for population. Borkan et al. (2010) state the agenda of Ministry officials encompasses the promotion of optimal levels of quality, equity, and innovation, improvement of human resources management and financial sustainability of the system. These multiple performance could be achieved by single hospital only adopting different managerial approaches, overcoming the trade-off

theory developed by Skinners (1985) and Hayes and Wheelwright (1984), as discussed by Crema & Verbano (2013a).

3 New managerial approaches in healthcare

According to Department of Health (1998, p. 6), clinical governance is “the process by which each part of the National Healthcare System quality assures its clinical decisions”. A system of continuous improvement into the operation of the whole system has to be introduced (Department of Health, 1998). In fact, through clinical governance, “organizations are accountable for continuously improving the quality of their services and safeguarding high standards of care by creating an environment in which excellence in clinical care will flourish” (Scully & Donaldson, 1998, p. 62). Clinical governance is based on integration of different approaches that requires attention to infrastructure, coherence, poor performance, culture, risk avoidance and quality methods. This means a cohesive programme of actions that should involve all the organization in addition to managerial commitment, leadership and creativity (Scully & Donaldson, 1998).

Clinical governance is an organizational innovation that needs a cultural change, which is not easily achievable (Walshe, 2000; Smith, 2001). Reale (2007) identifies the tools and practices to implement clinical governance (tab. 2).

Tab. 2 - Tools for an operative clinical governance according to Reale (2007).

TOOLS AND PRACTICES				
involvement of the patient and its family (through patient centered paths and assessment of patient satisfaction)	strategic capacity (vision and mission definition)	economic resource management of clinical processes	staff management	performance management
information and communication management (through ICT support)	multidisciplinary team working	open organizational culture	leadership involving top management	clinical risk management

3.1 Clinical Risk management

Clinical risk management (CRM) is an approach to improve quality in healthcare that places special emphasis on the identification of circumstances, which put patient at risk of harm, acting to prevent or control those risks. The aim is to both improve safety and quality of care for patient and to reduce the costs of such risk (Walshe & Dineen, 1998). CRM can be defined also as the system of guidelines, protocols, steps, organizational and clinical procedures adopted by a hospital to reduce the probability that events and actions, which might potentially produce negative or unexpected effects on patients health, occur

(Floreani, 2005). According to Borghesi (1985), CRM is a complex activity to reduce risks (in terms of frequency and severity) and the economic impact of their effects. Based on ISO 31000 the phases of CRM process are: establishment of the context, risk assessment (risk identification, risk analysis and risk evaluation), risk treatment and two phases continually acting, such as communication with internal and external stakeholders, and monitoring and review (Purdy, 2010).

The most used tools are (Verbano & Venturini, 2011): incident reporting, analysis of clinical records and clinical documentation, analysis of administrative data, client reports, brainstorming, Root Cause Analysis, checklist, Failure Mode and Effects Analysis - Failure Mode, Effects, and Criticality Analysis (FMEA-FMECA), Hazard Risk Assessment (HRA), Hazard and Operability Analysis (HAZOP), decision-making trees.

These instruments should be adopted to manage clinical risks that are the probability that a patient suffers any damage or inconvenience caused, even if unintentionally, by medical care provided during the period of hospitalization, causing a prolongation of hospital stay, a deterioration of health or death (Kohn, et al., 1999).

Clinical risks can be classified based on (Cinotti, 2004): the safety of structures, machines, electrical systems, hazardous substances, fire / explosion; the presence of chemicals, physical and biological agents and the risks linked with the work organization, psychological and ergonomic factors and difficult work conditions.

According to Reason (1990), a human error can be interpreted and analyzed adopting a “person approach” or a “system approach”. The first one was the most diffused and eradicated during last century and it considers the human behavior as a source of error, whose variability has to be reduced. This approach stresses the human component of the safety, such as the human factor and the cognitive processes at the base of errors (Damen & Novaco, 2004). Thus, in order to prevent risks, knowledge improvement and individual training are necessary as “bad things happen to bad people” (Reason, 1990). Instead, following a “system approach”, people make mistakes also in the best organization. Error is the result of a failure of a system composed by human and technological elements that are connected, integrated and aimed to common objectives. For this reason, it is necessary to redesign processes, understanding “how and why the defenses failed” instead of finding “who blundered”. Categories of errors reported by Ministry of Healthcare (2004) are: the error in the use of medicines, surgical errors, errors in the use of equipment, tests

or diagnostic procedures not executed or executed in a not appropriate way, errors in the timing.

Reason (1990) identifies three typologies of error: slips, lapses and mistakes. Slips and lapses are execution errors, while mistakes are errors that occur in the strategic planning phase (Reason, 1990; Ferner & Aronson, 2006). Furthermore, Reason (2000) introduces the “theory of latent error”, that constitutes the system approach; according to this theory the potential errors, called near miss events, become errors only when they bypass each defense system created by the organization, based on the Swiss cheese model. Adopting the person approach only the unsafe act (the active error) is identified, while the latent errors are far from the direct contact with the final customers. Reason (2000) claims "we cannot change the human condition, but we can change the conditions under which humans work". A lack in a defense organizational system is not sufficient to transform a near miss event into an error, an alignment of all of them is necessary through a trajectory of accident opportunity.

3.3 Health Lean Management and Clinical Risk management

Jacobs (2006) underlines it is not corrected to state that in healthcare it is not possible to achieve a condition of zero-defect, as complications are unavoidable; no other business would survive if it was permitted a certain percentage of defective products. Also Six Sigma allows a low percentage of errors that is not acceptable dealing with human lives (Bohmer & Ferlins, 2006). In order to face this issue, a strategy of real-time error reporting and decentralized problem solving are encouraged, but it is very hard to implement (Sirio, et al., 2003).

From a research carried out in United States by American Society for Quality (2009), it emerges that 53% of the American hospitals have adopted lean methodology even if only 4% of hospitals report a “full deployment” of this methodology that has been adopted to improve hospital throughput (73%), to satisfy business or cost need (68%) and to increase the service quality (56%). Health lean management (HLM) can be defined as a managerial approach, to identify and eliminate waste improving flow of activities to maximize value to the customer. It considers standardization and specification of work processes, organization of work in such a way that unexpected events are easy to spot, and deployment of activities that find and fix mistakes (Ohno, 1988; Womack & Jones, 2003).

In a complex organization, as an healthcare organization, error and the possibility of an incident are not eliminable, so all the possible interventions should be adopted at least to control such risks (Ministry of Healthcare, 2004).

Nolan (2000) suggests three strategies to design assistance and care system that guarantees safety to the patient. The first one is to prevent errors caused by the seven factors of Vincent (1998) (patient factors, task factors, individual factors, team factors, working conditions, organizational factors and institution context). The second strategy regards making errors visible, to eliminate the causes of errors. The third strategy concerns the mitigation of the effect of an error. An optimal error management integrates all these strategies. In order to implement at least the first two strategies of Nolan (2000), HLM with its principles, techniques and tools and practices could be a support for a proactive CRM. As mentioned by Ben-Tovim (2007), error is an absolute waste for a lean thinker. He states that retrospective error analysis is not so valuable when patient safety errors occur in one in five hospital admissions and also to add another incident reporting seems not the solution. Care processes examination and redesign allow to pursue the right thing preventing errors and to identify weaknesses and opportunities of improvement, fostering to act at system level rather than at individual blame (Ben-Tovim, 2007; Ben-Tovim, et al., 2008).

4 Research design

In the previous section, the pressure from external environment to achieve efficiency and quality improvements at the same time has been stressed. From industrial sector, managerial approaches are spreading into healthcare, reporting positive results. New methodologies that combine principles, tools and practices of CRM and HLM could be the solution. A previous research has demonstrated connections between HLM and CRM (Crema & Verbano, 2013b); based on this starting point, it is necessary to understand how it is possible to implement “lean & safety” projects defined by the same authors as HLM projects with impact on quality or safety improvement.

Detailing this purpose, the research objective is to understand how “lean and safety” projects can be implemented, investigating the significant features that characterize them: organizational aspects, phases and activities, tools, techniques, practices and key factors.

Starting from the guidelines grasped in Crema & Verbano (2013b), through a systematic literature review, according to the suggestion of Miles and Huberman (1994),

a research framework has been created after the formulation of research objective (fig. 1), describing the features that have to be analyzed in this research.

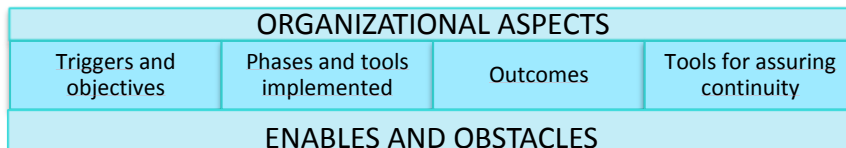


Fig. 1- Research framework.

The analysed subject is new, consequently considering the maturity cycle of the research, case studies and qualitative research with in-depth case studies for exploration and theory building are suggested as the knowledge are uncertain (Voss, et al., 2002; Eisenhardt, 1989; Yin, 2009; Malhotra & Grover, 1998). Benbasat et al. (1987) indicate to follow case study methodology if data are collected by multiple means, the analysis regards one or only a few entities, the complexity of the unit is high and deserves to be studied intensively. This methodology is justified also by the research questions «what, how» adopted in an exploratory study (Benbasat, et al., 1987; Meredith, 1998; Yin, 2009; Hedrick, et al., 1993). Deep single case study allows a rich description of a phenomenon in particular circumstances (Eisenhardt & Graebner, 2007; Voss, et al., 2002).

A single case study research design has been adopted, as the selected case is a critical and unique one (Yin, 2009). The aim is to analyse “lean & safety” projects, examining HLM projects with impact on quality or safety improvements. The selected project is one of the first cases where HLM is adopted firstly to reduce incidents and secondly to obtain efficiency improvements. This project has been implemented in a particular hospital (further called Omega) in the Spanish context, and it is one of the few hospitals that have implemented HLM projects. It has been built after the year 2000, it employs about 2500-3000 people to serve a catchment area of 500-1.000.000 persons, with about 400 beds. Its mission is to offer an excellent technical quality and to guarantee assistance continuity in an organization that emphasizes patient needs. This is a very peculiar context, as Omega promotes teaching, research and innovation and considers lean healthcare among the improvement approaches of the hospital. The development of the “Omega Production System” is a medium-long-term aim, so the lean management of processes is an integral

part of the hospital strategy. Omega reports high experience in HLM project implementation and plenty of HLM procedures have been formalized and documented.

Also the organization chart of the hospital is peculiar: inside the department of planning and patient safety (in staff to the general direction) HLM & quality unit and CRM unit are included.

In order to guarantee reliability of the analysis, a research protocol has been developed (Saunders, et al., 2009; Yin, 2009; Voss, et al., 2002); based on literature and on the research objective, an interview protocol has been created for data collection, including the following sections: general information, context, objectives, organization, planning, implementation, monitoring, feedback, future developments and suggestions. Data have been collected during 2013 by three researchers, one of whom was involved as observer in the project team. In this way three sources of evidences have been considering for data triangulation to assure research validity (Patton, 2002; Yin, 2009; Eisenhardt & Graebner, 2007; Healey & Rawlinson, 1994): open and semi-structured interviews, researcher observation, analysis of documentation and archival records. Considering the different possible roles of an observer, in this case it has been chosen observer-as-participant; with a moderate participation, it was possible to have access to the field and observe it without influencing it (Gold, 1958; Spradley, 1980; Kawulich, 2005; Flick, 2014). The interviews were formally conducted with the lean manager of the hospital and the manager responsible for patient safety, involved in the implemented project, in order to gain a multidisciplinary point of view. Data analysis was conducted according to indications of scholars about case study methodology (Neutens & Rubinson, 2002; Miles & Huberman, 1994; Strauss & Corbin, 1990; Glaser & Strauss, 1967). Data were reduced through coding, creating categories and variables further described. A matrix has been finally created to explain the obtained results and answer to the research objective.

5 Results of the analysis

The selected project regards the process of drug administration and the chain of activities that precedes it. Drug is required to the internal pharmacy by the inpatient unit, the internal storage of this unit is then supplied and drug is stored before its preparation.

5.1 Triggers, Objectives

In the analyzed hospital, HLM project is usually implemented in four circumstances. The first one occurs after a future state value stream map. The second one regards an auto evaluation; after that, if the requested improvement actions are complex and involved different processes and figures, the guide of the HLM unit is considered fundamental. HLM projects can be also implemented following a 5S audit that needs actions similar to those of the previous point. In this hospital a HLM project can also be started after the analysis of process incidents or adverse events, which are eradicated in complex causes and which cannot be solved with a daily kaizen (Hamel, 2010). The analyzed project started in this last circumstance where a high error percentage in the drug administration process was reported. The intervention was required by the person in charge of patient safety. Thus, the first objective of the project was the reduction of adverse events. In particular, the team aimed to reduce them by 80%. Moreover, other secondary objectives included cost reduction of 5%, for drug supplying, drug stock optimization, reduction of expired and wasted material, increase of the trust to the provider and of the collaboration between pharmacy and inpatient unit, and methodology learning.

5.2 Organizational aspects

In the analyzed organization where more than 350 people are trained in HLM, an external support for this project was considered not helpful. They started to adopt HLM in 2008, with the help of a consulting company for two years and then they continue to apply HLM by themselves. However, in the first day of the kaizen one-hour lesson was provided by the HLM manager. Inserting HLM in the strategic plan of the hospital, management staff was involved (even if with a not active role) also in the multidisciplinary team created for the project, where two management engineers, two nurses, a person of patient safety unit, a pharmacy technician, a pharmacist and the responsible of the inpatient unit were considered. The team was engaged full-time in the project and the CRM manager was the propeller of the project. According to the usual kaizen procedure, the role of tutor has to be assigned to who has raised the issue; nevertheless, for this project, instead of attributing it to CRM manager, this role was assigned to the responsible of inpatient unit, who was also the leader of the project, while the referent was HLM manager.

Four weeks before starting the project, the tutor informed all the involved operators about the motivation and the objectives of the project and he sent a written communication to each member about his specific assigned role. People that work in the field was consulted before the implementation: suggestions and opinions of employees were gathered in an initial brainstorming and several coordination meetings were executed. Two of them were carried out before the project starting: the first one involved the two management engineers and the patient safety manager and the second one involved also the inpatient unit manager. At the beginning of the project implementation two management engineers, the patient safety manager and the patient safety manager met together. During all the kaizen lasted three days, all the team took part in a daily meeting. A final meeting was executed to approve the improvement actions and to present what has been implemented. The same presentation was repeated with the top management. A closure meeting was carried out involving the leader, the tutor, the referent of the project and the responsible of economics and finance of the hospital in order to verify whether the objectives of the project were achieved or not.

5.3 Phases and tools implemented

Through the analysis of the errors, it was discovered the highest percentage of notifications came from the process of drug administration. 49% of them caused patient damages, 19% did not cause patient injuries, and the 32% were near miss events. After the identification of this problem an HLM project was required; therefore, objectives were defined and activities planned. First of all, the project was presented to motivate the team to the achievement of its objectives. A short lecture was provided, data were gathered and elaborated and the possible causes of problems were identified through problem analysis adopting brainstorming, 5 Whys and Ishikawa chart. The main sources of the issues regarded the lack of adequate procedures, the presence of not followed procedures, the lack of tasks distribution and responsibilities definition, no communication channel between the pharmacy and the inpatient unit. Another brainstorming was executed for gathering the 52 ideas generated for the process improvement. The created post-its were imported in an impact-effort matrix, in order to identify the interventions to be carried out. The implemented actions concerned: firstly the definition of new safety rules, that imposed to write any treatment variations in the medical records, secondly the preparation and administration of medicines one by one according to the one-piece-flow logic, and

finally a double check of their name. Procedures for the requirement of urgent and not-urgent drugs were also defined, in addition to the delineation of methods for consumption and reposition, through the use of Kanban system and other visual management tools (shadowing, visual signals and illustrative procedures). Other activities carried out regarded the determination of roles and responsibilities for: management of the labels, revision of the amount and cleanness of the medicines stock, revision of the loop to return medicines to the pharmacy, management and adoption of new and expired drugs, revision and updating of the existing procedures. Moreover, the stock had to be adequate to the actual consumption, defining the current codes and the respected quantities, identifying medicines at risk and similar ones. Supporting this intervention, Pareto analysis was conducted to identify the most used codes, the safety coefficient was calculated (1.2 = medicine not indispensable; 1.6 = medicine not replaceable, but that stops patient assistance; 1.4 = other cases) to eliminate medicines not necessary and never required; moreover, visual signs were created to recognize the risky medicines. Quantitative and qualitative tools supported the phase of monitoring and evaluation of the adverse events through also the submission of questionnaires to the personnel.

5.3 Outcomes and tools for assuring continuity

Of course, the implemented actions have led to efficiency improvements, eliminating activities and material costly and not necessary, but especially they have provoked positive results in terms of patient safety. An incidents-causes matrix was created, reporting the percentage of each incident that has been prevented eliminating a specific cause in the kaizen event. Applying this computation for all the eliminated causes, adverse events, near miss events and errors were totally reduced by 84.38%. Through a better identification of medicines and new procedures for drugs administration, patient safety improvements were achieved. With the new methods for consumption and reposition of medicines, also irregularities of the flow have been reduced. Staff involved were satisfied and their expectations were met. From the questionnaires it emerges they have appreciated in particular time management, the approach adopted for problem solving and the active participation of all the people. Time constraints were notified as a project limit. However, an increase of the participation and motivation has been reported in addition to a more proactive use of HLM tools.

The implemented project could be the reference point for others. Its replication has been planned for other similar processes, but potentialities for different processes have been also recognized. In order to guarantee the continuity of HLM adoption, it is fundamental to share the achieved improvements, whereby all the personnel has to be involved, aligned and updated about all the procedures, through training sessions, documentation sharing in the intranet, information panels and illustrative procedures. It is important to share all the results of the project, as they are feedback about HLM effectiveness. After this project, plenty of ideas have been generated and will be considered for future implementations according to PDCA logic.

5.4 Enablers and obstacles

Some factors have facilitated the project implementation, whereas some others hindered it. First of all the responsible of inpatient unit was already trained about HLM philosophy and tools; he had already taken part in other kaizen projects, besides being respected and esteemed by his collaborators. Other key elements for a successful implementation of the project are: the creation of a multidisciplinary team, the search of continuous improvement and the continuous application of the methodology in a favorable climate where the culture of HLM is spreading.

On the front of the hindering factors, the first was the lack of importance perception of the alignment between the core processes and the support ones. Other obstacles were recognized in the inexperience of operators, little time for the implementation of the project and the difficulties to identify the patient and what is valuable for him.

6 Discussion and lessons learned from the analysed case

After the project analysis it is possible to grasp the lessons learned. First of all it has to be underlined that the project has been required and promoted by the CRM unit. The linkages between HLM and CRM seem to appear firstly from the organizational chart, as their organizational units are inside the same department and this facilitates their interaction. Moreover, HLM is normally adopted in this hospital to solve complex problems connected to CRM. Solving the research objective, the key characteristics of the analyzed project are summed up in table 2. The peculiarity of this case is that the linkage between HLM and CRM starts at the initial phase of the implementation. In this particular organization, the key trigger of the examined project is the requirement of the responsible

of patient safety and the first objective of the project is errors reduction, while efficiency improvements were secondary objectives. The support of the top management is expressed first of all in the strategic plan, which fosters the adoption of HLM for all the organization processes.

Tab. 2 – The key characteristics of the project.

PROCESS OF DRUG ADMINISTRATION				
Motivation and objectives	Trigger	Incident analysis due to complex causes		
	Objectives	<ul style="list-style-type: none"> • safety improvement (reduction of adverse events) • efficiency improvement (reduction of drug supplying costs and of expired and wasted material, optimization of the drug stock) • increase of the trust to the provider (pharmacy) and of the collaboration between pharmacy and inpatient unit • learn the methodology 		
Organizational aspects	Key figures	Leader: person responsible for inpatient unit Referent: HLM manager Tutor: person responsible for inpatient unit	External support	Not necessary
	Top management support	Definition of a strategic plan where HLM is a methodology for innovation and improvement and a long term objective is the 'Omega production system', Top management involved in the project	Employees involvement	Informed, involved, consulted
	Training	Short, at the beginning, plenty of people already trained	Team	Multidisciplinary Full-time
	Role of CRM	Propeller of the project, CRM objectives, Involvement from the beginning	Meetings	Before, during and at the end of the project
Phases (Tools)				
1. Identification of the problem (incident reporting)				
2. Definition of the objectives				
3. Planning of activities (Timetable, Plan Do Check Act (PDCA), checklist)				
4. Communication and training				
5. Data collection and analysis of the problem (Brainstorming, 5 Whys, Ishikawa chart)				
6. Generation and collection of ideas for the improvement (Brainstorming with post-it)				
7. Prioritization and planning of the activities to implement (Impact-effort matrix, PDCA)				
8. Implementation (Definition of procedures, Determination of roles and responsibilities, Visual management, One-piece flow, New safety rules, Double checks, Perfection of the Kanban, Pareto analysis, Safety coefficient)				
9. Monitoring and evaluation (Monitoring and closure meetings, n° of reported notifications, incidents-causes matrix questionnaire for feedback, final presentation, PDCA, archiving and sharing of the material)				
Outcomes	Results	Reduction of adverse events, > normality of the flow		
	Changes of the organizational system	Clear definition of tasks, roles and responsibilities, small modifications of some tasks		
	Changes of the organizational climate	Proactive adoption of the tools, increase of participation and motivation		
	Employees satisfaction	Operators expectations are largely met, adequate training, high participation and motivation		
Sustainability & lean continuity	Ideas development for future, personnel involvement, future training sessions, questionnaires of feedback, project archiving and sharing, reference project for future, demonstration of effectiveness of HLM approach			
Enablers	Manager of inpatient unit already trained, inpatient manager' leadership, multidisciplinary team, continuous application of the methodology, climate and culture	Obstaclers	Inexperienced operators, limited time, cultural aspects, no perception of the importance of support processes, difficulties to identify the patient and the value of activities	

Besides the high multidisciplinary of the formed team, the definition of key figures has to be highlighted, in addition to the selection of the responsible for the inpatient unit as tutor of the project, exploiting his leadership and his HLM knowledge.

The collaboration of people with different backgrounds and points of view has been fundamental for the success of the project implementation.

Discussing the causes of the adverse events it emerges errors can be prevented improving organizational aspects, instead of identifying individual and personal faults that need to be punished and better trained. In this way the knowledge of the physicians are guaranteed and protected against organizational factors not well cogitated (mistakes rather than slips and lapses). Besides the use of hospital intranet and basic tools, no other particular ICT have been adopted. ICT seems not indispensable for the adoption of a system based approach that avoids human errors.

The phases and the tools to be followed for a successful implementation of the project that permits to achieve CRM objectives are reported in tab.2.

The presence of many empty answers in the feedback questionnaires, due probably to the lack of adequate experience, and the key project enablers, illustrated in the previous section, highlight the importance of the “soft” aspects (Shah and Ward, 2003; 2007) of a good implementation of “lean & safety” projects. Cultural aspects and the involvement of people already trained result fundamental. Moreover, archival documentation is considered relevant to assure the continuity of the adoption of these managerial approaches. This contributes to the organizational learning, providing formalized guidelines that could be adopted by others units to replicate the project. As emerged from the project analysis, for an organization that intends to develop the “Omega production system”, the capture and dissemination of the knowledge created during the project are vital, in order to guarantee the transfer of the knowledge according to knowledge management processes identified in literature (Carlucci & Schiuma, 2004; Wiig, 1997) that comprises generation, codification, application, storing, mapping, sharing, and transfer of knowledge. Dombrowski et al. (2012) underline Lean Production System is not simply a process redesigning; in order to create sustainable changes people's knowledge has to be modified. Moreover, the definition of key roles and the contribution of experts, which provide their experience in the project implementation, emphasized by Dombrowski et al. (2012), have been found also in the analyzed project.

7 Conclusions

The connection between HLM and CRM is not studied in literature yet, as this research stream is still at its early stage and requires extensive investigations (Crema & Verbano, 2013a). Giving a contribution to fill in this gap, context of application, organizational aspects, phases, tools and practices and key factors for a successful “lean & safety” project implementation have been described in this paper. This is one of the first researches that investigate the characteristics of a project in which HLM is adopted to solve CRM issues. The results suggest that HLM and CRM should be considered in an integrated methodology. First indications about how developing it have been provided stimulating future research, to test and exploit it, also in other contexts, such as different hospital units inside the same hospital, or other healthcare organizations that need to achieve efficiency enhancement, improving quality and patient safety at the same time. A second contribution of this study is the creation of a research framework, which could be considered as the basis for coding other cases, in order to carry out a comparison and a multiple case study to generalize the obtained results. Moreover, a further monitoring and evaluation of the first obtained results could be useful to refine the present research. Elements of knowledge management have emerged as enablers of the examined project. Creating a model of knowledge flows and studying the knowledge management tools helpful for these kind of projects could be an opportunity for further research, to study in more details how it is possible to implement sustainable “lean and safety” projects. The indications provided in this research contribute to the definition of guidelines to follow during the application of a synergic methodology, permitting to pursue multiple objectives in a challenging environment and fostering the development of more safe and sustainable health care systems for the benefit of the entire community.

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The added value of learning mechanisms for knowledge mobilization in a health eco-system: the experience of a regional programme for technology assessment

Emanuele Lettieri, Giovanni Radaelli*, Cristina Masella

Department of Management, Economics and Industrial Engineering
Politecnico di Milano
Piazza Leonardo da Vinci 32, 20133 Milano

** Corresponding author*

Structured Abstract

Purpose – Health policy-makers are increasingly promoting programs that embed cost-opportunity logics. Their implementation requires the mobilization and exploitation of expert knowledge controlled by professionals dispersed in the territory, unaccustomed to share/integrate their knowledge with others, and sometimes adversary to cost-opportunity logics. The success and viability of these programs thus depends on experts' commitment to mobilize and integrate their knowledge. Past studies highlight reasons why policy might not be able to stimulate change because of institutional forces that hinder knowledge mobilization and professionals' micro-processes and narratives that oppose new practices that alter their autonomy or their routines. The present study investigates if and how policy-makers can pursue a strategic change in their eco-system.

Methodology – We investigated the case of a new Health Technology Assessment (HTA) program in Lombardy. Our unit of analysis relates to the strategy implemented by Region Lombardy to implement the HTA program. We triangulated data from: (i) archival analysis of normative and documents; (ii) quantitative analyses measuring experts' participation in program, etc.; (iii) presentations and web reports; (iv) direct interviews with key informants; (v) participant observations of meetings and workgroups. Interviews involved the regional staff implementing the HTA program and a panel of 28 experts involved in its application.

Originality/value – Our study highlights the contribution of learning mechanisms on professionals' commitment to the new practice. The strategy implemented by Region focused upon professionals' learning and relied on three mechanisms: (i) cognitive mechanisms supporting learning through common language, frameworks and values; (ii) structural mechanisms supporting learning with inter-organizational infrastructures; (iii) procedural mechanisms supporting learning through methods and tools that institutionalized the new practice. The interplay of learning mechanisms was not sufficient to achieve the full-fledged diffusion of the practice in the territory, but 'only' to

disrupt indifference locally, and stimulate early HTA experiences that added up to the gradual legitimization of the practice.

Practical implications – Our analysis provides indications to policy-makers regarding the relevance and limitations of strategy of change entirely focused on learning mechanisms. It highlights the interplay of OLMs in creating an understanding of the change (instrumental for motivating individuals to engage in it) as well as a proper context, made of norms and infrastructures that are instrumental for allowing individuals the practical opportunity to mobilize and implement their knowledge.

Keywords – Learning Mechanisms; Knowledge Mobilization; Policy-Making; Health Technology Assessment; Professionalism

Paper type – Academic Research Paper

1 Introduction

Healthcare systems and organizations worldwide are experiencing expectations to do ‘more with less’, i.e. balance the contrasting goals of constantly improving the quality of care while reducing its costs. Most recently, the financial crisis has made this call even more pressing and urgent. The diffused emphasis on ‘austerity’ in public spending, in particular, has reduced the amount of resources available to healthcare providers which are now, on their part, expected to take important decisions that regard eliminating, streamlining or grouping wards, departments and staff units; constraining the employment of new staff; limiting the acquisition of new technologies (Stine and Choksi, 2012; Karanikolos, Mladovsky et al., 2013).

Such limitations can be understood as an attempt to preserve the *universalistic* nature of Italian NHS by preserving its *financial sustainability*. The Italian constitutional law shapes NHS universalism by demanding that “the Republic safeguards health as a fundamental right of the individual and as a collective interest, and guarantees free medical care to the poor” (art. 32). This article – which explicitly defines health-care as a ‘merit good’ with no possibility for exclusion – successfully established the NHS as a fundamental pillar for *social sustainability*, since health care is provided with limited or no out-of-pockets costs for citizens. As a result, the Italian NHS is mostly managed by the State and Regions, and made of public hospitals, whose behaviors and expenditures have a direct and massive impact on Regions’ and State’s budget. It immediately ensues that, in a time of large deficits, the debate is wide open on how this universalistic model can be made financially sustainable, or might need to be challenged. How cost reductions can be

pursued in the act of a continuous improvement of care represents one of the most eloquent and central issue that the NHS is called to address.

As an alternative to linear budget cuts – which have intrinsic limitations to push forward the introduction of new technologies – a few policy-makers have recently sought to implement a logic of *cost-opportunity*, according to which a structured approach to delist obsolete technologies and practices might generate the financial conditions for the adoption of new ones. The cost-opportunity logic is based on the evidence that healthcare providers host a number of inefficiencies and wastes that consume resources without providing any impact on patient-related outcomes. By spotting these inefficiencies, subtract them from the system and replace them with better performing technologies, the cost-opportunity logic hold the promise of achieving continuous improvement within the boundaries of financial sustainability.

In this regard, Health Technology Assessment (HTA) programs are emerging as an increasingly popular solution. HTA provides in fact a structured approach to identify which technology, among different alternatives, is most adept to address a specific clinical problem. It does so by comparing these alternatives through an evidence-based and multidisciplinary approach, i.e. by comparing their impacts on clinical effectiveness, costs, safety, organizational impacts etc. (Battista, 1992; 2006). HTA is consistent with logics of cost-opportunity since it considers if and how new technologies can substitute established technologies and to which extent obsolete technologies can be removed to create the ‘financial space’ for investments (Battista et al., 1998). Building on this premise, HTA experiences are spreading worldwide, with several agencies (e.g. NICE, ADTH, DHMA, DIMDI, HAS, IQWiG, Osteba) now actively involved in the production of HTA assessments.

Despite this interest, HTA programs still struggle to exert the expected balance between financial sustainability and the continuous improvement of care. A key reason for such struggle is the difficulty to *legitimize* HTA programs and outcomes to the various stakeholders involved in the HTA process. The problem of legitimization lies in the fact that HTA programs simultaneously affect and are affected by a heterogeneous *ecosystem of stakeholders* – citizens, professionals, healthcare administrators, policy makers and private firms – which (i) hold specific, and at times contrasting, needs and expectations about the introduction of new technologies, (ii) often consider HTA programs either irrelevant, alien or adversary to their interests. As a matter of fact, the outcomes of HTA

program directly affect stakeholders' decisions— to such an extent that the acquisition of a new technology might be inhibited or obsolete technologies might be delisted. This consequence leaves open the possibility that stakeholders might defy HTA outcomes and nullify the relevance of HTA programs. Yet, at the same time, stakeholders need to be involved in the production of HTA assessments. Regions cannot possess the expert knowledge required to assess the comparative appropriateness of new technologies. Such knowledge lies almost entirely on experts from the ecosystem – who thus must be engaged in the HTA process not just as passive recipients, but as active agents.

On top of these considerations, the present manuscript describes the implementation process of the new HTA program in Lombardy Region with the theoretical perspective of Organizational Learning Mechanisms (OLMs). This study aims at discussing the journey undertaken by the Lombardy Region to develop a regional network of multi-specialty experts through the implementation of a variety of OLMs. The main insights from this case provide leading practitioners and academics with new elements for furthering the debate about the complexity of learning processes.

2 The context

The Lombardy Regional Healthcare System is part of the Italian National Healthcare System (NHS) that is nowadays organized on a regional basis. The Italian NHS provides universal coverage free of charge. Due to near universal coverage, voluntary healthcare insurance providers have a marginal role in funding healthcare. The capability at the regional level to allocate the available tax-based resources effectively and efficiently is then essential.

In Lombardy, the total expenditure for healthcare delivery has risen from 7.9% GDP in 1990 to 9.1% GDP in 2011. These resources are employed to serve the 9.8 million inhabitants through the presence of 15 Local Health Agencies, 34 public hospitals and another 200 healthcare organizations - responsible for 2 million discharges annually. Healthcare delivery is possible through the daily work of 150,000 highly-specialized health and social care professionals who are employed in hospitals or other healthcare organizations, 8,150 General Practitioners and Pediatricians. Additionally, the private sector comprises 2,500 private healthcare organizations. The total bed capacity is thus around 30,000 beds. The annual expenditure amounted around 17b€ (17% of Italian total) in 2011.

The Lombardy Regional Healthcare System is considered the leading healthcare system in Italy because of its capability to deliver state-of-the-art care while containing its healthcare expenditure. In fact, this system is one of the few in Italy that shows equilibrium between cash inflows and outflows, while other Regional Systems collected relevant deficits. Despite this favorable situation, the Lombardy Region has to face the continuous shrinking of financial resources available for care, and find new paradigms for assuring the same care to future patients, or potentially better regarding quantity and quality of health and social care services. Within this context, technology plays a relevant double-faceted role. On one hand, technology is a major lever for elevating the current standards of care; on the other, it is one of the most critical factors for cost increases (Chandra and Skinner, 2011). This implies that the Region can govern this transformation process only by offering patients and professionals only those technologies that proved safe and offered value for the-money.

2.1 Lombardy technology assessment program

The capability of assessing healthcare technologies has become an urgent worldwide issue for policy-makers, practitioners and scholars of different disciplines. The Health Technology Assessment (HTA) framework has affirmed itself as the golden standard in all of the most industrialized countries. A variety of educational programs has grown around this discipline in order to educate a multitude of healthcare professionals (physicians, economists, engineers etc.). This has also occurred in the Lombardy Region, which has delivered many courses over the last five years.

Within this context, in 2008 the Lombardy Region decided to implement an HTA regional process aimed at supporting health policy-makers in deciding which technologies to introduce. The process grounds significantly on experts (mainly physicians, economists and engineers). The reason is straightforward: professionals are the only ones who possess the know-how and know-why to appreciate and substantiate what kind of innovative technology should be utilized in a context of limited resources. The Region is able to coordinate its efforts and implement its vision and strategy in the process, but the actual assessment activities need professional expertise.

Through a formal scouting process, the Lombardy Region selected around 200 experts from different fields: medicine, pharmacy, healthcare economics, engineering, information systems etc. Unfortunately, professional involvement was far from obvious

for at least two reasons. Firstly because very few had had any experience of HTA, as most simply did not know what HTA was or how they could contribute to it. Secondly, professionals are often skeptical of contributing to efforts they often do not recognize as relevant, but simply perceive as highly time consuming.

At the beginning, the efforts of engaging experts in the assessment activities were focused on providing them with state-of-the-art competencies regarding HTA. Despite high-quality instruction, results were modest in the early stages: only few “opinion leaders” contributed to HTA activities, while the majority intermittently attended meetings and rarely delivered value-adding contributions.

This initial failure pushed the Lombardy Region to revise its strategy and integrate teaching efforts with the activation of different Organizational Learning Mechanisms (OLMs). The new strategy produced surprising results since now the Region is able to leverage its HTA process on a community of 200 experts who all participate actively to its community life. Additionally, this community is today able to systematically learn and continuously improve its processes, practices and behaviors. A major part in this “success” was passed through the capacity to educate professionals about the use of HTA through a more articulated delivery of teaching methods and learning activities.

In the next sections we will describe what the Lombardy Region has done, and has kept on doing, to achieve these goals. These interventions can be characterized in terms of OLMs, so we will first outline the key concepts of OLMs, and then describe the specific interventions put into place by the Lombardy Region.

3 Organizational learning mechanisms

OLMs are the arrangements that allow organizations to systematically collect, use and disseminate information that is relevant to the effectiveness of the organization (Argote, 2011; Popper and Lipshitz, 2000). This definition implies that learning does not only emerge through the routine activities performed within the organization. Different OLMs can be designed to introduce new concepts and behaviors that are external to ongoing routines. OLMs thus concur to describe learning processes that take place beyond the mind of employees. OLMs can also be understood as concrete social arenas where knowledge is shared by individual members and becomes the property of the entire organization through dissemination and changes in standard routines and procedures.

Shani and Docherty (2003, 2008) provided a classification that distinguishes three broad categories of OLMs. First, cognitive mechanisms support learning by providing language, concepts, symbols, theories, frameworks, and values for thinking, reasoning, and understanding learning issues coherent with the strategy of the organization. Language learning is used mainly in the human resources field, in which one can equally find the term learning capability. Cognitive mechanisms allow for creating an understanding among all employees about the nature of organizational strategies and about the learning required to support these changes. Mission statements, strategy documents, policies and plans are some examples. Second, structural mechanisms concern organizational and technical infrastructures that encourage practice-based learning. They include communication channels; changes to work organization, the establishment of teams with the mutual need to learn; formal and informal forums; and learning-specific structures such as parallel learning structures and process improvement teams. Third, procedural mechanisms include the rules, routines, methods, and tools that can be institutionalized within the organization to promote and support learning (Pavlovsky et al., 2001). They may include assessment tools and methods, standard operating procedures, methods for collective learning (e.g., action learning) and de-briefing routines. Work-based dialogue and de-briefing procedures are two examples of methods that allow participants to learn from each other's experience. We use this classification to understand the Lombardy Region interventions and deliver the main insights.

4 Methodology

Our research interests were addressed through a holistic longitudinal case study on the design and implementation of the HTA program of design to answer this question. This methodology is adept to address exploratory and explanatory questions – which also reflect the criteria of focusing on contemporary events, not requiring control of behavioral events (Yin, 2009). Our unit of analysis related to the design of the HTA program, and to the implementation initiatives put forward in the years 2009-2012. We triangulated data from different sources. First, an important source of information related to the documentation and archival data produced by the Region over the years. The Regional law DGR 7856/2008 represents a relevant source of information on the key design choices made by Lombardy Region concerning the objectives, process and actors of the

HTA program. Subsequent regional laws provide further refinement to the HTA program and were taken into account in our analysis. A second important source of information related to the 'Multidimensional Impacts Form' that experts have to fill to make the assessment of the new technology. This document represents the primary source of information on the design choices made by Lombardy Region concerning the model of the HTA program

Second, interviews with key informants were the primary data source. Key informants were both the regional staff responsible for developing and implementing the HTA project as well as a panel of 28 experts involved in the assessment activities. We selected experts who showed a different level of engagement (very active, moderate active, and limited) and different backgrounds (17 physicians from different specialties, 5 health economists, 4 clinical engineers and 2 hospital information systems managers). The semi-structured interview consisted of three parts: (a) a description of the involvement in the HTA process, with particular attention to the willingness and ability to perform HTA-related activities and to take part in community life; (b) a description of the teaching activities and of the OLMs implemented by the Lombardy Region; (c) a description of the current state and performance of the Regional HTA process. The interviews were conducted from January-June 2012 by a research team comprised of two investigators who are the authors of this manuscript. The first investigator led the interview and personally interacted with the informants. The second investigator remained more detached as his primary role was taking notes and filling in gaps during the questioning. All interviews were tape-recorded. In the close aftermath of the interview, the tape-recording was transcribed by an investigator.

Third, the investigators directly participated in the HTA program, as members of the prioritization/appraisal groups. This participation allowed direct observations of the dynamics involved in the production of the HTA outcomes as well as of experts' involvement in the program.

5 Findings

The problem of getting professionals' involvement and providing education could not be entirely unraveled. A striking recursive relation could be immediately observed: (1) professionals' commitment toward HTA mostly depended on how much they had learnt about the use and benefits of HTA, while (2) professionals' acquisition of competencies

about HTA heavily depended on how much they were committed to the method. OLMs were then closely linked in an effort to provide commitment while providing competencies. Recognizing this problem resulted in two solutions: (1) to provide a wide spectrum of OLMs, comprising cognitive, structural and procedural mechanisms, since a single typology was unlikely to exert the expected results; (2) to provide a deepening of the structure to each OLM, so to encompass both education and commitment. Table 1 provides an overview of the key initiatives.

Table 1. Organizational Learning Mechanisms Initiatives

OLM	Definition	Initiatives
Cognitive	Learning is supported by providing language, concepts, symbols, theories, frameworks and values for understanding	✓ The regional law DGR 7856 (July, 30th 2008) formalized both language and concepts.
		✓ Publications and reports are shared among the members of two teams (NVP-CI and TTRAM) to promote a common language and the engagement of behaviours oriented to evidence-informed and multi-specialty assessment of new healthcare technologies
		✓ Interactions among the members of the NVP-CI and TTRAM teams are encouraged to create an enabling social context that can leverage on a shared cognitive social capital
Structural	Learning is supported by all the organizational, physical, technical and work system infrastructures that encourage practice-based learning.	✓ A dedicated website has been built to converge all the information and the debate about the assessment of new healthcare programs and technologies
		✓ Monthly meetings for the NVP-CI team and monthly meetings for the TTRAM have been established to build the community and facilitate a common understanding of the goals and the methods by leveraging on the social context and face-to-face exchanges
		✓ A set of KPIs have been defined and monitored to inform the task force about the level of engagement of the community that is under development and the level of learning
		✓ Politecnico di Milano has been identified as a key partner for implementing audit activities and assuring a third-party appraisal of the HTA-related activities
		✓ A systematic relationship with EVIDEM has been established to allow EVIDEM to monitor the progress in the Lombardy Region and suggest ideas for improvement
Procedural	Learning is supported by the rules, routines, methods and tools that can be institutionalized in the organization to promote and support learning.	✓ The regional law DGR 7856 (July, 30th 2008) formalized goals, methods and phases.
		✓ A tool-kit for education and diffusion is under development. This case is part of it.
		✓ Members of the task-force are systematically invited to conferences, workshops and masters to diffuse the methods implemented and the results achieved
		✓ A manual has been developed to clarify the HTA process step-by-step, its goals and methods are to facilitate learning by practitioners and feedback from academics

The first set of interventions involved lectures and (mini-)courses to teach professionals and experts the core aspects of HTA, and to explain how their contributions would fit into the novel HTA process. Notably, this set of interventions exerted a minor impact on professionals who had limited time to dedicate to HTA courses. As a matter of fact, it became quickly evident how professionals' learning was not able to occur before, but only during their involvement with HTA activities. We thus had a straightforward case of "learning-by-doing" in which the know-how and know-why were learnt during practice. The primary role of learning-by-doing stressed the importance of having professionals actually "doing" HTA at some point. How to get them involved was the fundamental issue.

In this regard, four initiatives sorted out most problems. First, a regional law formalized the introduction of HTA in the Lombardy Region. It moved in two directions. On one hand, it was a procedural learning mechanism, intended to communicate the set of concepts, methods and phases that were about to be implemented through the HTA program. As such, it was a first milestone and a permanent reference point for any professional and expert involved with HTA. On the other, it was intended to trigger a cognitive learning mechanism. The Region decided to use a formal intervention to recognize (and legitimize) how professionals and experts were about to have an increasingly relevant role. The latter aspect was intended to push the diffusion of HTA concepts and practice among professionals. Second, the Lombardy Region put forward a website completely dedicated to the HTA process. The language, goals and methods are consolidated here, deepened and updated. Its relevance is twofold: (1) it is the reference medium through which Regional staff and professionals are connected and interact; (2) it is a dynamic tool, through which the Region is able to provide instructions to professionals and share previous experience. Last, regular meetings are organized every month. These meetings are occasions for professionals to meet with Regional staff. More than the website, meetings are the occasion for opinion leaders – which also include some professionals – to support others in specific HTA activities, to promote more active involvement and share knowledge. The Lombardy Region has been working to build formal relationships with Italian leading Institutions to reinforce the cognitive legitimacy of HTA. A formal agreement was signed with AGENAS, i.e. the national Agency coordinating all the Italian Regional Agencies for healthcare. AGENAS has been appointed by the Italian Ministry of Health as the reference institution in Italy for the promotion of HTA and the development of shared practices among the Italian Regions. The Lombardy Region joined the RIHTA (i.e. Italian Network for HTA) project and made the practices and knowledge developed in the last three years available to all the other Regions. By becoming part of both the international and national networks, the Lombardy Region was actually able to promote professionals' willingness to learn and deepen HTA-related concepts and methods, and to actively participate in the HTA community. Matching educational programs with an external legitimization has both triggered and enabled this transformational journey towards a sustainable effectiveness by developing a legitimized decision-making practice.

6 Discussion

The transformational journey led by the Lombardy Region for building a community of HTA multi-specialty experts offers new insights for furthering the current debate about the complexity of learning processes. With HTA being a complex and non-routine task, the Lombardy Region could not leverage on pre-existing competencies among its professionals, or on a diffused conviction that HTA was an important thing to do. The Lombardy Region had to exploit the knowledge assets embedded in the constellation of organizations that populate the healthcare eco-system. In particular, the Regional task force understood that the dynamic knowledge among its people was increasingly more relevant, for decision-making, than the codified organizational knowledge embedded e.g. in tools, tasks, technologies. However, this type of expert knowledge is not fully accessible to Region executives, since it is controlled and protected by experts from the “bottom level”. Because of this information asymmetry, executives can foster experts’ willingness to share knowledge by leveraging their social context.

The initiatives then worked to support knowledge sharing and decision-making improvement by creating internal mechanisms for learning and developing environments conducive to learning. Various initiatives were experimented with to institutionalize structural and procedural arrangements allowing experts to systematically collect, disseminate and use information relevant to HTA. The Lombardy Region worked on three broad categories of initiatives that leverage on cognitive, structural and procedural learning mechanisms, to promote and sustain change. It is crucial to observe the role that cognitive legitimization has played in supporting these learning mechanisms. The very possibility of learning came from a diffused legitimization of HTA as something relevant and “worth taking time for”. Each initiative was always considered an occasion to push the legitimization of HTA by “making things easier” for the professional (e.g. the website), promoting its strategic relevance (e.g. the regional law) and bringing together the opinion leaders with less proficient experts (e.g. meetings). Each initiative was multi-faceted, and retained a double track: (i) providing knowledge and (ii) providing legitimacy. The relation is recursive: by providing knowledge, the virtues of HTA become more apparent and more legitimate; by making HTA more legitimate, professionals are more active in using and sharing their knowledge.

On further analysis, knowledge represented a major trigger and enabler of such cognitive legitimization. The fact that this knowledge was largely unspoken and

contained to the experts meant that the Lombardy Region had to face the challenge of mobilizing this knowledge to leverage on it. Experts are expected to engage the technology assessment challenge and share their precious, complex and tacit knowledge with others to allow for improvements. Improvements will be the result of both the exploitation of current knowledge and the exploration of new knowledge. With this respect, the Lombardy Region became aware that knowledge sharing is an intentional act, meaning that, in order for experts to share knowledge they must not only be able but also willing to do so. Neglecting this evidence may prejudice the understanding of which organizational strategies and levers effectively promote and facilitate knowledge sharing among experts. With this respect, knowledge sharing is a socially embedded phenomenon, and experts' willingness and ability to share their knowledge and perspectives about new healthcare programs and technologies are the result of complex interactions among individuals within a social setting. Accordingly, social relations are thus considered as more efficient mechanisms for sharing both tacit and explicit knowledge among individuals and help them learn, rather than other mechanisms, such as information systems and formal control. In fact, the task force is stressing the need to 'go beyond information systems' and to implement a bundle of different organizational arrangements – e.g. flexible work structures, clan-fostering initiatives, trans-specialist development - to facilitate knowledge sharing.

7 Conclusion

Our case illustrates an example of policy-makers organizing (and strategizing) for sustainable effectiveness. The problems faced by policy-makers might appear paradoxical: multiple actors in the eco-system separately contribute to a shared greater good (e.g. care effectiveness, safety, patient accessibility) maximizing their local practices – however they struggle to integrate their efforts in new practices that put together their peculiar disciplinary perspective.

The case advances the notion that the logic of 'cost-opportunity' might mediate the logics of 'appropriateness' and 'efficiency' pursued by professionals and managers (Llewellyn, 2001). In order to do so, however, OLMs are crucial to create not only an understanding of the change, but also the learning context - rules, norms, infrastructures that allow professionals to implement that logic in their practice.

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Using patient knowledge for better health systems

John S. Edwards *

Operations and Information Management Group.
Aston Business School, Aston University
Aston Triangle, Birmingham, B4 7ET, U.K.

Sara McCracken

Coventry Business School, Coventry University,
Priory Street, Coventry, CV1 5FB, U.K.

** Corresponding author*

Structured Abstract

Purpose – This paper describes a “work in progress” research project being carried out with a public health care provider in the UK, a large NHS hospital Trust. Enhanced engagement with patients is one of the Trust’s core principles, but it is recognised that much more needs to be done to achieve this, and that ICT systems may be able to provide some support. The project is intended to find ways to better capture and evaluate the “voice of the patient” in order to lead to improvements in health care quality, safety and effectiveness.

Design/methodology/approach – We propose to investigate the use of a patient-orientated knowledge management system (KMS) in managing knowledge about and from patients. The study is a mixed methods (quantitative and qualitative) investigation based on traditional action research, intended to answer the following three research questions:

- (1) How can a KMS be used as a mechanism to capture and evaluate patient experiences to provoke patient service change
- (2) How can the KMS assist in providing a mechanism for systematising patient engagement?
- (3) How can patient feedback be used to stimulate improvements in care, quality and safety?

Originality/value –This methodology aims to involve patients at all phases of the study from its initial design onwards, thus leading to an understanding of the issues associated with using a KMS to manage knowledge about and for patients that is driven by the patients themselves.

Practical implications – The outcomes of the project for the collaborating hospital will be firstly, a system for capturing and evaluating knowledge about and from patients, and then as a consequence, improved outcomes for both the patients and the service provider. More generally, it will produce a set of guidelines for managing patient knowledge in an NHS hospital that have been tested in one case example.

Keywords – Knowledge Management Systems, Health care, Patients, Customer Knowledge Management, Service Management.

Paper type – Academic Research Paper

1 Introduction

Knowledge management in health services has concentrated almost exclusively on clinicians and managers. Patient knowledge has rarely been considered except where the service is being provided in the patient's home (Cegarra-Navarro et al., to appear). With health service providers trying to meet the growing demands of an ageing population with limited resources, it is time to seize this missed opportunity. There is potential to use this knowledge to improve the outcomes for both healthcare providers and patients.

Patient knowledge as a concept should not seem very unusual to those in the knowledge management (KM) field, even if the phrase is unfamiliar. It is the specific form that customer knowledge takes in health care. Customer knowledge management has been an active field of research since the paper by Davenport et al. (2001). Two central concepts emerging from customer knowledge management are the categorisation of different types of customer knowledge, and the attributes of "attractive quality".

Using these and other concepts from research on customer knowledge management, and from broader research on service management, including service quality and service productivity, we plan an action research investigation of the use of a patient-orientated knowledge management system (KMS) in managing knowledge about and from patients. The study is to be conducted in a large UK National Health Service (NHS) public hospital. It is a mixed methods (quantitative and qualitative) investigation intended to address the following three research questions:

- (1) How can a KMS be used as a mechanism to capture and evaluate patient experiences to provoke patient service change?
- (2) How can the KMS assist in providing a mechanism for systematising patient engagement?
- (3) How can patient feedback be used to stimulate improvements in care, quality and safety?

We intend to concentrate in the first instance on elderly patients and their carers. The elderly represent the greatest users of healthcare services, but also the group least likely to be familiar with ICT systems. Specific objectives with this group are to clarify what matters most to elderly patients, and what a UK NHS hospital as service provider needs to know about/from them; to develop a method to capture the voice of this group of patients; and further, to feed this back into the management of NHS service provision.

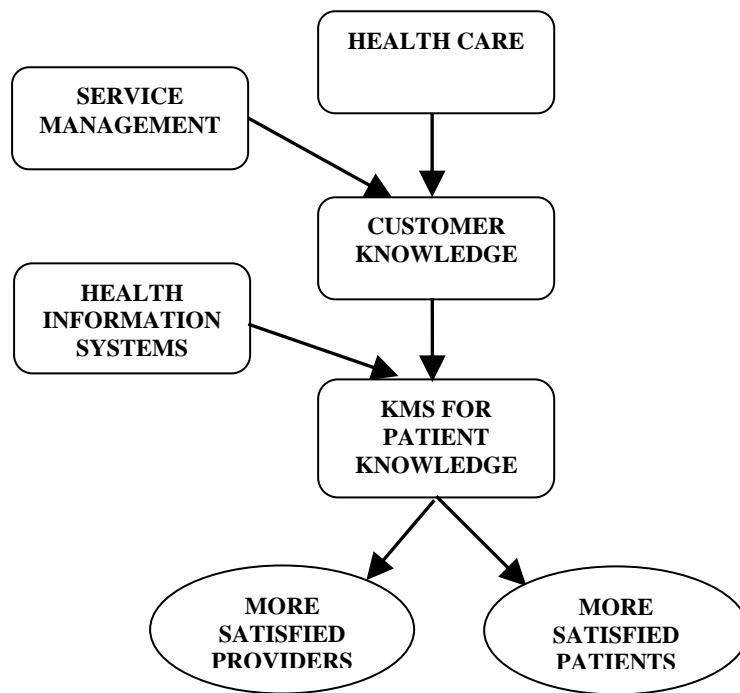


Figure 1: Logical structure of paper

Figure 1 illustrates the logical flow of this paper. Beginning with our domain of health care, the next section reviews ideas from service management and in particular the role of the customer and therefore customer knowledge. The focus then turns to customer knowledge management systems (KMS), bringing in ideas from the health information systems field, with the overall project aim being to help deliver better outcomes for both patients and health care providers. The project is "work in progress" at the time of the IFKAD 2014 conference.

2 Health care as a service and the role of customer knowledge

Lovelock and Wright (1999, p.6) define services as follows: "Services are economic activities that create value and provide **benefits** [emphasis in the original] for customers at specific times and places, as a result of bringing about a desired change in—or on behalf of—the recipient of the service." Thus there can be no doubt that health care is a service, even if it may include some tangible elements such as surgery and provision of drugs.

The role of the customer in a service is known to be important: Cook et al. (2002) view the "service encounter" as a triad, consisting of the customer, the service organisation and the customer-facing contact personnel. However, there is still a long way to go on the journey towards truly regarding patients in a public health care system as customers. In this section we review relevant concepts from the literatures on service management and service productivity, and then on customer knowledge management.

2.1 Service management and service productivity

Given the central involvement of the customer as the recipient of the service, the conventional manufacturing concept of value creation is not sufficient: it is more useful to consider a service as a process of value *co*-creation by the provider and the customer (Parasuraman, 2002). This immediately raises the point that the customer's perspective is not necessarily the same as that of the service provider organisation, even if the real situation in health care is not as extreme as the old saw "the operation was a success but the patient died" implies!

Chase and Dasu (2001, p.84) advise those designing and managing services to "put yourself in your customer's shoes and imagine their journey". Parasuraman (2002, p.8) sets out five questions for such service executives, including two of particular relevance in health care:

- What inputs do our customers and we currently channel into our service process?
- In evaluating the results of our service operations, do we define the outcomes sufficiently broadly and from the perspective of our customers as well?

Vargo et al. (2008) consider the concept of value *co*-creation further, arguing that the distinction that matters is not simply that between goods and services, but between

"goods-dominant logic" and "service-dominant logic". The latter can apply even to the provision of goods, so that a car, for example, can be viewed not as an object but in terms of what one can do with it, even if that is simply show it off rather than using it to travel somewhere. Service-dominant logic is tied to the long-established concept of value-in-use, Vargo et al. ascribing the latter term to Adam Smith and the original idea to Aristotle. Vargo et al. go on to extend value-in-use to value-in-context, the latter based on the premise that "Value is always uniquely and phenomenologically determined by the beneficiary" (p.148). The money-based value-in-exchange may thus have no association at all with value-in-use. There is a clear linkage between the two to explain why the price paid for an "old master" painting varies so dramatically according to who is believed to have painted it, but it is much less clear in public healthcare provision, where there is often no direct cost for a specific service, the choice for the patient/customer is simply whether to have the service or not, and concepts of substitution or opportunity costs are far less well-defined than in conventional money-based economic theories. Nevertheless, the importance of customer inputs and perspective is well-established in this literature.

2.2 Service productivity in public health care and welfare

This lack of a direct link between value-in-exchange and value-in-context raises the question of defining service productivity in public services. Lönnqvist and Laihonon (2012) examine social service productivity in Finland. They first set out to define service productivity appropriately in what they term "welfare services" (which includes health care). The definition they offer (pp.132-133) is:

"Welfare service system productivity (WSSP) refers to the ratio between the services offered to the service user and the resources consumed by all organizations involved in the service process.

WSSP is affected by the productivity of the activities of each member organization of the system. In addition, at the core of system-level productivity lays the co-operation of participants, clearly defined and communicated system roles and agreed system-level objectives. System-level productivity stresses the customer perspective and, instead of focusing on direct service outputs, it turns the focus on the outcomes of a service."

Overall objectives in public health care usually at least partially meet this definition. In the UK, typically they are framed in terms of high quality of care, better patient

outcomes and cost effectiveness. The fact that "high quality of care" normally comes first appears to meet the requirement of the Lönnqvist and Laihonen (2012) definition to stress the customer perspective.

Another issue discussed by Lönnqvist and Laihonen (2012) is the complexity of public welfare provision, with several organisations involved. The need for a systemic approach in public health care to avoid sub-optimisation and assist focus on the overall outcomes has also been pointed out by others, for example Edwards et al. (2005). We will not discuss the complexity and coordination issues further here, as the first phase of our project concerns only services provided onsite by a single hospital.

2.3 Customer knowledge management

Having established the importance of the customer perspective both in service provision and in understanding improvements in service productivity, it is necessary to consider how an organisation might know what the perspective of its customers actually is - customer knowledge management. The benefits to an organisation of actively managing knowledge about its customers were first described by Davenport et al. (2001), on the basis of interviews with 24 for-profit organisations with headquarters in North America, and it has been an active field of study within KM ever since. Two concepts from customer knowledge management that are especially relevant to the research proposed here are the categorisation of different types of customer knowledge, and the attributes of "attractive quality".

Three types of customer knowledge have been identified (Garcia-Murillo and Annabi, 2002): knowledge *for* customers, knowledge *about* customers, and knowledge *from* customers. The organisation must manage knowledge for customers in order to better satisfy customers' needs for knowledge on products/services, the market, and other relevant items. Managing knowledge about customers enables the organisation to capture customers' background, motivation, expectation, and preference about products or services. Managing knowledge from customers is central to the organisation's understanding of customers' usage patterns or consumption experiences of products or services.

Chen and Su (2006) then combined these three types of customer knowledge with the earlier work by Kano and others (Kano et al., 1984) on "attractive quality". The three key dimensions of the latter are "must-have" quality, originally called "must-be" quality (the

essential elements of a product or service, often taken for granted and whose absence leads to dissatisfaction), attractive quality (unexpected elements that surprise or delight the customer but whose absence would not leave them dissatisfied), and measurable quality (one-dimensional aspects where a strict quality comparison is possible).

The relationship between the three types of knowledge and these three dimensions of quality is not an entirely straightforward one. However, in thinking about - and managing - attractive quality - Chen and Su present a logical progression through the three types of customer knowledge. First, the organisation's knowledge of product/service benefits is used to provide knowledge for customers, then knowledge about customers yields customer satisfaction categorisation, then comes an interpolated step of market segmentation which Chen and Su see as codifying tacit knowledge, and finally knowledge from customers enables the organisation to understand customer usage patterns for the product/service.

In the next section, we look at how to manage this customer knowledge, especially in public health care.

3 Knowledge management and KMS in health care

Our position regarding knowledge in this paper is a pragmatic one - the knowledge to be managed is whatever those involved (clinicians, managers, patients and their carers) think of as knowledge. Space does not permit discussion of the many definitions of KM and KMS. For knowledge management we prefer the early definition of Wiig (1994):

“In its broadest sense, knowledge management (KM) is a conceptual framework that encompasses all activities and perspectives required to making the organization intelligent-acting on a sustained basis. KM includes activities for gaining overview of, dealing with, and benefiting from the areas that require management attention by identifying salient alternatives, suggesting methods for dealing with them, and conducting activities to achieve desired results.”

For knowledge management systems, we prefer that of Gallupe (2001): “Knowledge management systems (KMS) are the tools and techniques that support knowledge management practices in organisations.” However, it needs to be understood that these tools and techniques do not have to be ICT-based, and may rely on people or process rather than technology (Edwards, 2009). Progress in ICT nevertheless offers new forms of

support for managing knowledge, i.e. new forms of KMS. An additional element that may be either a problem or an opportunity for KM is that large public health care organisations are large users of ICT, and often have to link their own systems with even larger regional or national systems.

Myllärniemi et al. (2012) study the management of organisational knowledge flows in health care, specifically a laboratory and a radiology unit in South Karelia, Finland. They take an approach based on defining use case categories that trigger the need for these services. They observe (p.61): "a common challenge for knowledge management in healthcare relates to excessive focus on patient data [as opposed to information or knowledge], though, the important role of interpretation and a human aspect on knowledge management were emphasized".

Cross-functional knowledge sharing was also identified as a general challenge (p.62): "From the point of view of knowledge dynamics the challenge seemed to lay in combining the actors' knowledge assets into a coherent and timely support for decision-making."

Chua and Banerjee (2013) examine how four types of social media (blogs, social networking sites, location-aware mobile services, and corporate discussion forums) can be used to support the three types of customer knowledge management explained in section 2.3, using Starbuck's as a case example. They assert on theoretical grounds that all four social media types can be used to support any of the three types of customer knowledge, and present evidence that eleven of the twelve combinations are already in use by Starbuck's. The lessons they draw may not, however, transfer to the NHS because of the more personal nature of the interaction between a healthcare organisation and its customers, and its position as the sole provider of public healthcare in the UK.

Berg (2004) categorizes important information types for informative-intensive organizations like hospitals and other healthcare organizations as follows:

- information about the patients;
- management information that contains information about the processes and outcomes of the organization;
- professional knowledge required to handle the patients optimally.

These categories offer some encouraging similarities to the customer knowledge types, but the use of the term "optimally" demonstrates that the crucial point about the difference between provider and customer perspectives is not part of this view. Thus,

although we might term it “outcome-informed”, it is a rather more passive approach than is generally associated with KM.

With a more active viewpoint, Gastaldi et al. (2012) examine Electronic Medical Record systems (EMR) in three large Italian hospitals in Lombardy, looking at the “feasibility of EMR as a trigger and an enabler of improved knowledge asset dynamics within hospitals” (p.17). The potential for improvement using the EMR is considered using the contrast between knowledge exploration and knowledge exploitation (Henderson and Clark, 1990, March, 1991). Gastaldi et al. define 14 different types of “ICT-based solution” which they look for in the three case hospitals. The EMR (on their definition this is the local system, i.e. in that hospital only) and links with the (broader regional) Electronic Health Record are two of the 14. They find three emergent strategies of EMR development:

- horizontal, mainly to achieve efficiency in clinical data management (low level, across all specialisms, exploitation comes first);
- vertical, mainly to achieve effectiveness in clinical data management (pervasively in one specialism before moving on to others, exploration comes first);
- transversal, to simultaneously achieve effectiveness and efficiency in clinical data management (most critical areas first, wherever they are, exploration and exploitation alternate).

Returning to the types of customer knowledge management, providing knowledge for customers has been core to the work of the UK NHS for many years, especially with the growth of online resources such as NHS Choices. However, there has been less emphasis on knowledge about customers, except within specific research projects about innovations, and less emphasis still on knowledge from customers. In many cases, what the NHS has about and from customers is a great deal of data but not much knowledge, as with the findings of Myllärniemi et al. (2012) in Finland.

4 Research project design

4.1 Project aims and research questions

This project is conceived as action research: research “which focuses on simultaneous action and research in a participative manner” (Coghlan and Brannick, 2010, p.43). The purpose is to make better use of knowledge about and from customers/patients. Given that

health care is a service, and so the outcomes must be considered from a customer perspective, greater patient involvement has the potential to improve the outcomes, certainly from the patient perspective and almost certainly from the NHS perspective. Note that we are moving back and forward between the words “customers” and “patients” here. The theory we use in this research is definitely about customers, but too much use of that term still tends to alienate many NHS workers. Thus apart from the term “KMS”, the research questions are phrased in ‘NHS language’ rather than ‘KM language’:

(1) How can a KMS be used as a mechanism to capture and evaluate patient experiences to provoke patient service change?

(2) How can the KMS assist in providing a mechanism for systematising patient engagement?

(3) How can patient feedback be used to stimulate improvements in care, quality and safety?

The emphasis on “how” signifies the action research focus, taking the “that” in each element for granted, but accepting that the research challenge is implemented these concepts effectively in public health care. Theory relating to knowledge about and from customers provides the foundation for the first two questions - that a KMS can help capture and evaluate patient (customer) experiences and help systematise patient (customer) engagement. Theory relating to service management, as well as customer knowledge management more generally, justifies the third - patient (customer) feedback is essential to properly incorporate the customer perspective in understanding and improving outcomes.

The research questions are also chosen to resonate with the “core principles” of the collaborating NHS Hospital Trust, especially the core principle relating to Patient Experience: “To ensure shared decision making and enhanced engagement with patients.” Note that a Trust hospital has more autonomy within the NHS than a non-Trust hospital.

A point to note is that NHS managers and clinicians have to act on the patient feedback. The collaborating Trust has made a good start here by formally monitoring and responding to comments made on the NHS Choices website: as Gorry and Westbrook (2012) have observed, product and service providers even in the for-profit sector by no means always do this.

4.2 Project stages and activities

The research element of the project is designed in three stages (after a preliminary stage), as shown in Figure 2. However, the intention of the ‘action’ part is not just to do this project as a one-off, but to set up a system that will carry out the key activities on an ongoing basis. Returning to the research questions, these are capturing and evaluating patient experiences, provoking patient service change, systematising patient engagement and stimulating improvements in care, quality and safety.

The research project necessarily has to place more emphasis on the capture and evaluation to help develop the ongoing systems that are needed, and hence these are distinguished as the first two phases before moving on to ensuring impact. Note also that the second phase (evaluate) explicitly incorporates the possibly different perspectives of clinicians and managers.

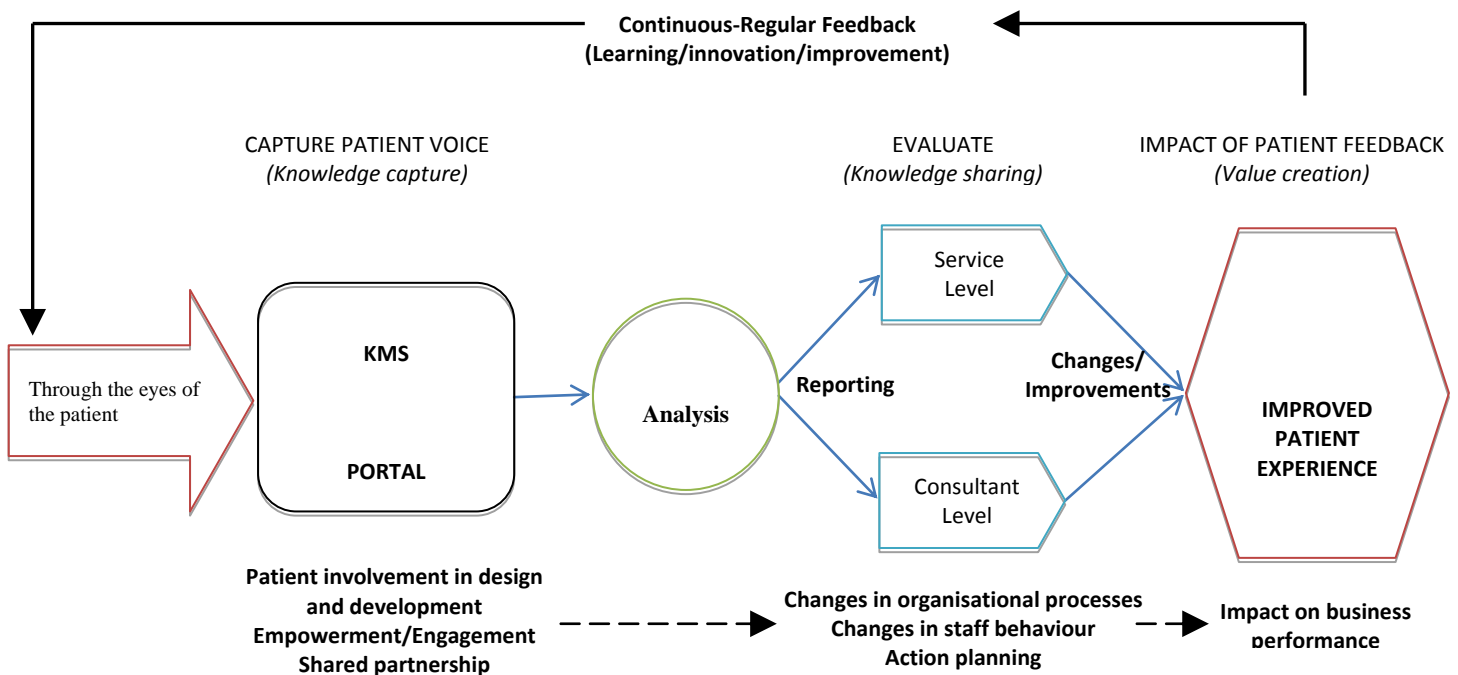


Figure 2: Research project stages and objectives

A most important caveat is that the preliminary phase of the project is to involve a selection of patients in the final design and development of the project as a whole. Thus

Figure 2 at present represents not a fixed plan, but rather a proposal for their discussion and if necessary amendment. hence we will not go into more detailed discussion of precise details at this stage.

4.3 Research method

Figure 2 is constructed around the “action” part of the project, but also guides the “research” part. Specifically it will be traditional action research (Coghlan and Brannick, 2010) as conceived by, for example, Lewin (1973). As in the previous section, our comments here have the status of proposals until the preliminary phase has been completed. Nevertheless, the project will definitely be a mixed methods (quantitative and qualitative) investigation. Qualitative semi-structured interviews will take place with patients, clinicians and managers, and focus groups with patients. The interview guides will be based on the theory from service management, customer knowledge management and KMS: as with the research questions, they will be phrased in health care rather than KM terms. At least three sets of interviews are envisaged: the preliminary study; guiding the development of the KMS; and once the KMS is in use. The latter in particular may need to be repeated. The main quantitative element is expected to be the analysis of performance and outcomes from the provider perspective (before and after implementation of the KMS), although if it is possible to carry out quantitative outcome analyses from the patient perspective we shall do this as well. Standard “provider” outcome measures are well-defined and recorded across the UK NHS. By contrast, devising appropriate patient outcome measures is part of this research project.

Broadly, therefore, the design of the implemented KMS will be based mainly on qualitative analysis, while the assessment of whether there are improvements as a result of the implementation will be based on both quantitative and qualitative analysis.

5 Conclusions

There appears to be considerable potential to use patient knowledge to improve the outcomes for both healthcare providers and patients. The theories of service management and of customer knowledge management both offer examples from other sectors of the benefits that the use of this knowledge could potentially provide. The challenge facing this action research project is to devise and implement ways to realise these benefits in the specific context of a public health care provider, a large UK NHS Trust hospital.

The project is work in progress at present. We hope to be able to report further developments (but not final results) by the time the IFKAD conference takes place.

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Learning and work context as antecedents of innovative behaviour: empirical evidence from Russian companies¹

Mariia Molodchik *, Aleksandra Krutova, Anatolij Molodchik

Department of Financial Management
National Research University of Higher School of Economics
University Address: Lebedeva str. 27; 614070; Perm campus,

* *Corresponding author*

Structured abstract

Purpose – The paper explores the relationship between learning process and innovative behaviour of employees in large and medium-sized manufacturing companies in Russia. The authors assume that intrinsic motivation, leadership, flexible organizational structure, culture of self-organization and self-development are supporting factors for employees' learning.

Design/methodology/approach –The constructs for dependent and independent variables are developed drawing on a literature review. Hypotheses on casual path dependence were put forward. The model is tested on a database collected in 2013 containing the responses of 95 employees from 15 companies. The Partial Least Squares Structural Equation Modelling (PLS-SEM) technique is applied.

Originality/value – This methodology provides evidence that suggests that for Russian companies the learning process and work context are the antecedents of innovative behaviour.

Practical implications – The findings suggest that to facilitate innovative behaviour managers should build a supportive environment for learning processes. This environment should be based on intrinsic motives, encouraging leadership, self-organization and self-development principles.

Keywords – learning, work context, innovative behaviour, empirical study, Russian companies.

Paper type – Academic Research Paper

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1 Introduction

A knowledge-driven economy determines innovation as a key source of competitive advantage (Nonaka and Takeuchi, 1995; Sankowska, 2013; Fernández-Mesa et al. 2013). The factors that influence innovative behaviour are investigated from a theoretical and practical point of view (Smith et al. 2008). The studies such as Scott and Bruce (1994), Saros et al. (2008) underline the holistic perspective of innovative behaviour of employees. This means that innovative behaviour is influenced by a variety of different factors, which in turn interrelate. One of the core factors which impact on innovative behaviour is learning (Sankowska, 2013). If we define innovative behaviour as a process of new knowledge creation, learning becomes a prerequisite. At the same time, the learning environment and other company building blocks that create new knowledge are essential for effective innovation (Nonaka, 1998; Garvin et al., 2008). The authors assume that intrinsic motivation (Thomas and Velthouse, 1990), flexible organizational structure (Martins and Terblanche, 2003), leadership (Jong and Hartog, 2007; Sarros et al., 2008), culture of self-organization and self-development (Sarros et al., 2008) are supporting factors for learning that precede employees' initiative behaviour. The authors found out that the proposed combination of mentioned factors and their simultaneous impact on learning and further on innovative behaviour were not explored empirically although determined theoretically. This was the start point of this research and motivation for database collection oriented on exploration of the phenomenon of innovative behaviour.

The main research question addressed in this study aims to find empirical evidence of a relationship between learning and innovative behaviour, taking into account work context. Moreover, authors explore these processes in the companies which work in the developing market. According to Jamali and Sidani (2008) the field of empirical exploration of learning organization in a context of developing countries is underdeveloped. Such kinds of studies contribute to the theoretical issues of learning organization as well to its practical implementation.

The paper is organized as follows. Next section presents theoretical background and hypothesis development. Section 3 is devoted to methodology and data description. Further the results of econometric modelling are analysed. And section 5 provides the conclusions and discussion.

2 Theoretical background and hypothesis development

The concept of learning organization (Senge, 1995; Pedler et al., 1997) connects innovative behaviour and learning. In line with Garvin et al. (2008) and Holsapple and Singh (2005), the authors emphasize the significance of work context as an enhancer of and mediator between learning and innovation in a company. The research design of this study includes identifying four exogenous constructs: supporting elements for learning – motivation system, organizational structure, leadership and organizational culture. And two endogenous constructs: learning and innovative behaviour of employees. Figure 1 presents the proposed model.

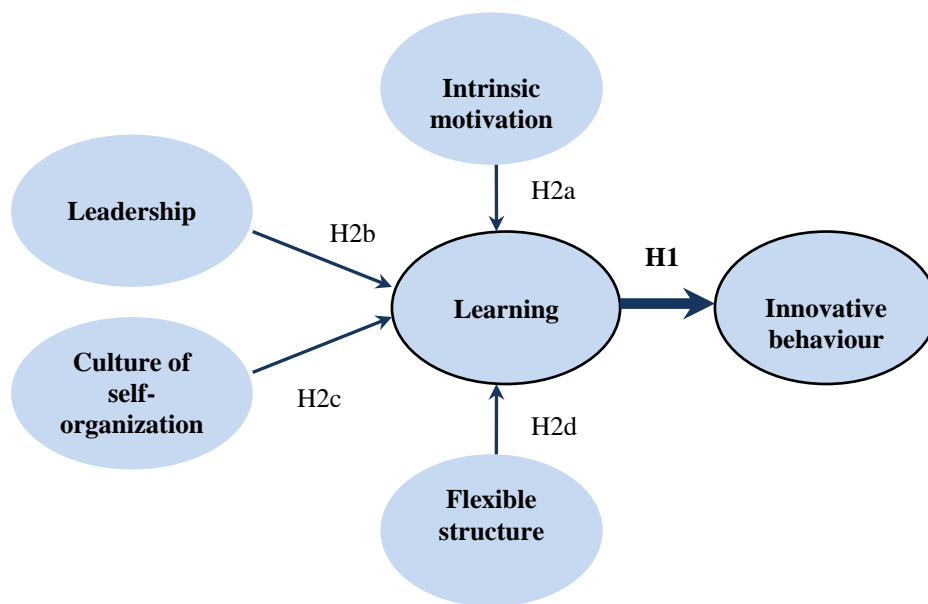


Figure 1. Framework of research

Innovative behaviour

This study considers innovative behaviour as employee activities directed at improving products and services as well as implementing new management tools and work techniques and excelling in knowledge creation in a wide sense. The link between innovative behaviour and companies' performance is explored profoundly. Meanwhile, the factors that determine innovative behaviour are less investigated due to the specific nature of explored phenomenon. The theoretical and empirical studies such as Scott and Bruce (1994); Smith et al. (2008) provide the evidence that the motivation to innovate is influenced by learning, management style, organizational structure, available resources, organizational culture and corporate strategy. In this study the authors assume that all these factors matter for innovative behaviour but the casual link should be built through learning.

Learning

The main characteristic of a learning organization is that learning processes are mandatory and on-going (Nonaka and Takeuchi, 1995; Pedler et al., 1997). Such organizations invest continuously in training and upgrading of individual and organizational skills. Knowledge is transferred between individuals, groups, and departments effectively and on a voluntary basis. The organization constantly identifies and accesses new external and internal opportunities, developing dynamic capabilities (Sankowska, 2013).

The main hypothesis tested in this study is:

H1: Learning has a significantly positive effect on innovative behaviour.

The next factors help create an environment that is supportive of the learning process. The second group of hypotheses reflect the relationship between different factors and learning.

Intrinsic motivation

Theoretically, there exists both intrinsic and extrinsic motivation (Deci and Ryan, 1985). The first means that motives are internal to the employee and that there is a self-evaluation mechanism at work. Intrinsic task motivation is achieved through: (1) meaning, i.e., value of work goal or purpose, competence, and self-determination; (2) autonomy in the initiation and continuation of work; and (3) impact, where employees

influence work results (Thomas and Velthouse, 1990). The literature supports the view that employees who are empowered, self-determined and intrinsically motivated have a greater degree of willingness to learn. The authors put forward the following hypothesis:

H2a: Intrinsic motivation is positively related to learning.

Leadership

Leadership is an essential element of a learning organization (Holsapple and Singh, 2005). As noted by Garvin et al. (2008) organizational learning is strongly influenced by the behaviour of leaders. Leaders in learning organizations inspire people to accomplish extraordinary results by applying charismatic leadership, creating larger-than-life mindsets, inspiring everyone to do their best, and mobilizing individual initiative (Garvin et al., 2008). More level leadership is developed through cultivating internal leaders by encouraging people to become leaders, filling positions with internal talent, and promoting from within. Such leaders stimulate change and improvement by continuously striving for self-awareness and renewal and developing dynamic managerial capabilities to enhance flexibility. Although several studies like Jong and Hartog (2007), Sarros et al. (2008) have found direct impact of leadership on innovative behavior, this study assumes that leaders motivate employees for learning and then they exhibit innovative behavior. Taking this into consideration the next hypothesis is:

H2b: Leadership is positively related to learning.

Culture of self-organization and self-development

The principles of self-organization and self-development suppose that an organization fosters individual growth and achievement by developing self-reliance and encouraging learning, probing, and discovering. Such a culture makes people feel that they are part of a bigger thing, and inspires them to achieve greatness; it instils in employees a sense of confidence, collective will, can-do attitude, and emotional energy (Chang and Lee, 2007). Employees have a shared strategic vision. As noted by Steiber and Alänge (2013) for continuous improvements the companies should select and facilitate self-organizing individuals in innovation processes. The empirical findings of Jamali and Sidani (2008) confirmed that in developing countries culture of self-organization plays a pivotal role for learning process. In the framework of this study the following hypothesis is put forward:

H2c: Culture of self-organization and self-development is positively related to learning.

Flexible organizational structure

The organizational structure determines the flexibility of business processes, the speed and quality of knowledge transfer, the possibility of the creation of new structural units and project development. Martins and Terblanche (2003) argue that structure is a key factor which promotes innovation and initiative behavior. According to their findings flat structure, empowerment, decision making and autonomy will promote new ideas, willingness to learn. The traditional organizational hierarchy should be broken down, establishing an agile organizational structure. Such a structure is characterized by highly transparent communication networks, clear rules for initiative implementation and resource distribution. All this enables an organization to be better in problem solving, experimentation and organizational learning (Holsapple and Singh, 2005). The last hypothesis is:

H2d: Flexible organizational structure is positively related to learning.

Five constructs are proposed to be the factors that facilitate innovative behaviour. They are concerned to be the part of learning organization. As mentioned by Garvin et al. (2008), a lack of empirical studies and concrete practical prescriptions on learning organizations impedes the development of this concept. This paper contributes to the empirical analysis of learning roles for innovative behaviour, taking into account the environmental factors that support or obstruct this link.

3 Methodology and data

For econometric justification of the hypotheses, the authors implement PLS-SEM analysis. This technique allows building the unobservable and hard-to-measure latent variables; and visually examines the relationships that exist among variables of interest. (Ringle et al., 2005). According to Hwang et al. (2010) and Wong (2010) PLS-SEM is proposed for application when a sample is small and there is little available theory. This study faces both restrictions; consequently PLS-SEM technique was chosen. The authors used Smart PLS software which is freely available to the research community across the globe and has been deployed in many fields, such behavioural science, marketing, organization and business strategy (Wong, 2013).

Data for this study were collected in 2013. The questionnaire was sent to the medium- and large-sized companies of Perm region per email. The authors received 112 responses from 18 companies. The final empirical data consist of questionnaire responses

of 95 employees from 15 Russian medium- and large-sized companies. Among the respondents 64% were male and 36% female; the distribution according to their position was as follows: 43% - top-manager; 34% - middle managers; 23% - specialists; 62% of respondents work in the company more than three years. All companies were from manufacturing industry.

The questionnaire was developed considering the previous studies of Watkins and Marsick (1998), Garvin et al. (2008), Jamali and Sidani (2008), and Galisir et al. (2013). The challenge that has been faced by the authors was the translation of metrics used by mentioned studies into Russian language. In order to adapt all metrics carefully the preliminary testing of each question was provided.

Learning activities and work context were measured questioning employees about the appearance of each item in their practice, on a scale ranging from 1 (does not appear) to 5 (appears very often). Questionnaires to measure innovation initiative had a scale from 1 to 5 as well. For all latent constructs depicted on the figure 1 the items (questions) were defined. Initially the questionnaire contains 60 items (questions), but after several iterations the constructs included in the model were described through 33 items. The criteria for selection were loading factors and item reliability. Table 1 presents items for each latent variable as well as values of item reliability.

Table 1. Latent construct and item reliability

Latent variable	Items	Loadings	Item reliability
Innovative behaviour	In my organization people frequently discuss and initiate the improvement of their work	0.877	0.769
	In my organization people frequently experiment with new ways of working	0.859	0.737
	In my organization people initiate the implementation of new ways of working	0.830	0.688
	In my organization people initiate experiments and development regarding new products or service offerings	0.762	0.580
	In my organization people learn new requirements, standards, rules without assistance	0.840	0.706
	In my organization people solve conflicts and establish effective communication without assistance	0.777	0.604
Learning	My organization identifies, develops and retains talented employees	0.851	0.723
	In my organization people help each other learn	0.773	0.597

	In my organization people are eager to share information and experience	0.817	0.668
	In my organization leaders generally support requests for learning opportunities and training	0.802	0.643
	My organization frequently compares its performance with that of competitors and best-in-class organizations	0.789	0.622
	The best practice of one department quickly diffuses within the organization	0.640	0.410
Intrinsic motivation	In my organization people are eager to solve new, atypical problems	0.702	0.493
	In my organization people demonstrate the willingness to participate in team-work	0.760	0.578
	In my organization people attempt to achieve best results even to the detriment of personal interests	0.872	0.761
	In my organization people are ready to use private time for education and training	0.853	0.728
	In my organization people are able to achieve results with minimum external intervention	0.783	0.613
Culture based on self-organization and self-development	My organization invites people to contribute to the development of strategy	0.665	0.442
	My organization builds alignment of visions across different levels	0.777	0.604
	In my organization learning and self-development are valued	0.896	0.803
	My organization supports and rewards team-work	0.921	0.848
	My organization encourages initiative and objective-oriented behaviour	0.870	0.756
Leadership	Managers effectively exhibit the role of mentor and coacher	0.748	0.559
	In my organization leaders inspire others to accomplish extraordinary results	0.875	0.765
	Managers encourage multiple points of view	0.910	0.827
	Managers provide time, resources, and venues for identifying problems and organizational challenges	0.822	0.676
	Leaders acknowledge their own limitations with respect to knowledge, information or expertise	0.773	0.597
	Leaders are the example of entrepreneurial and self-development behaviour	0.841	0.707
Flexible organizational structure	Organizational structure facilitates more equal leadership	0.713	0.508
	New units, departments and projects can be launched quickly	0.827	0.684
	Managers delegate authority and decision-making	0.753	0.567
	My organization provides resources for innovation initiatives and projects	0.800	0.640
	Clear and transparent regulations support implementation of innovation initiatives	0.793	0.628

As we can see, all of the indicators have individual item reliability values that are larger than the minimum acceptable level of 0.4, and most of them are close to the

preferred level of 0.7. All reflective latent variables show high levels of internal consistency reliability. The value of composite reliability for all variables is larger than 0.6. To check convergent validity, each latent variable's Average Variance Extracted (AVE) was evaluated. All of the AVE values are greater than the acceptable threshold of 0.5, so convergent validity is confirmed (Wong, 2013).

4 Results

In the framework of this study several models were tested using the smart PLS program. The authors choose the best model to explain casual path dependencies among the above-presented variables. The criteria of selection were the level of significance of each path and the explanation power of dependent variable. Figure 2 visualised the results obtained in this study.

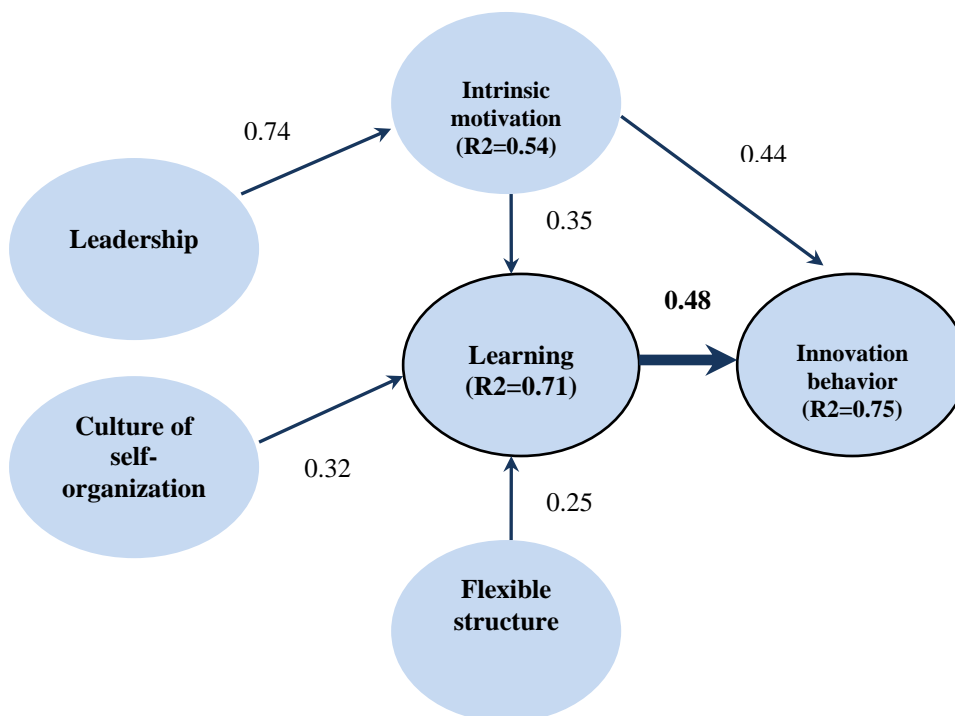


Figure 2. Results of PLS-analysis

Learning and intrinsic motivations explain 75% of the variance in the endogenous latent-variable innovation initiative, which is substantial. Meanwhile,

intrinsic motivation, flexible organizational structure, culture of self-organization and self-development explain 71% of the variance in learning. Leadership determines 54% of the variance in intrinsic motivation. The structural path significance was checked with the bootstrapping procedure. All indicators (see Table 2) show t-statistics larger than 1.96, which means the values are highly significant.

Table 2. Results of checking structural path significance

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	Standard error (STERR)	T statistics ((O/STERR))
Learning -> innovative behaviour	0.48	0.4852	0.05	0.05	9.6721
Motivation -> innovative behaviour	0.43	0.436	0.0514	0.0514	8.5021
Leadership -> motivation	0.74	0.7375	0.0182	0.0182	40.3165
Motivation -> learning	0.35	0.3534	0.0362	0.0362	9.7666
Culture -> learning	0.32	0.3182	0.0461	0.0461	6.8903
Structure -> learning	0.25	0.247	0.0452	0.0452	5.4464

The implemented methodology provides evidence for the positive impact of learning on the innovation initiative of employees. This fact is reflected by the positive and significant coefficient – 0.48. The first hypothesis is confirmed.

Contrary to our expectations, not all factors influence learning directly. As we can see in Figure 2 and Table 2, flexible organizational structures as well as a culture based on self-organization and self-development principles have a significant positive impact on learning; intrinsic motivation has a significant positive influence on both innovative behaviour and learning. The most important factor for learning according to the PLS_SEM analysis is intrinsic motivation with standard coefficient value - 0.35. For innovative behaviour intrinsic motivation and learning are practically equally significant considering the value of their standard coefficients.

Leadership influences learning indirectly through intrinsic motivation. Hypothesis H2b is rejected but the findings show that leadership should not be excluded

from the framework of analysis. The results obtained in the database of Russian companies determine the role of leaders as enhancers of innovative behaviour and learning through developing intrinsic motivation of employees.

Summarizing the results of PLS-SEM analysis the authors revealed that the first hypothesis was confirmed and the second group of hypotheses were partly confirmed.

5 Conclusions

The study contributes empirical evidence on the implications of learning-organization principles in developing countries. It extends the ideas of Watkins and Marsick (1998) and Pedler et al. (1997), investigating learning-organization mechanisms and their impact on a company's innovation (Galısir et al., 2013) in practice.

The findings of this study confirm the pivotal role of learning for innovation in the context of developing markets. Moreover, the authors justify empirically that self-involvement, self-development, intrinsic motivation, decentralization and a more agile organizational structure are essential for the learning and consequently for the creation of new knowledge. The findings extend the results obtained for developing markets by Calısir et al. (2013) and Fernández-Mesa et al. (2013), confirming the hypothesis of the positive impact of learning as well as work context on a company's innovation.

The results of this study make evidence that all five factors proposed in the model matter for employees' innovative behaviour. Staying in consistence with studies of Nonaka (1998), Scott and Bruce (1994), Saros et al. (2008) this paper underlines the holistic view and systemic approach for investigating of innovative behaviour. For Russian companies the phenomenon of innovative behaviour is explained through learning and intrinsic motivation. For managers these empirical facts designate the spheres of interventions for effective innovation management. In order to facilitate learning process managers should create special environment based on self-determination, self-development and self-evaluation. This study confirms the argumentation of Garvin et al. (2008) that for effective learning the company needs supportive learning environment.

The authors consider the potential value of the presented study to be twofold: firstly, the methodology provides a questionnaire which is adapted from English into Russian and allows further exploration of Russian companies; secondly, the study provides unique empirical evidence of the enabling of innovation for Russian companies through learning and work contexts. The outcomes are expressed in practical recommendations for

managers to build learning organizations by designing and implementing organizational learning mechanisms.

The limitation of this study concerns the small size of the sample that can be extended in future research. Additionally, the fact of indirect impact of leadership on innovative behaviour stands in contradiction to the previous studies and therefore should be explored more carefully. The issues of cross industry comparison might be addressed in the future research too.

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Revealing innovation potential in complex environments

Satu Parjanen *, Mirva Hyypiä

Lahti School of Innovation
Lappeenranta University of Technology
Saimaankatu 11, FI-15140 Lahti

** Corresponding author*

Structured Abstract

Purpose – In this study the complex environments are approached with help of the concepts distance and proximity. The distance between innovating partners presents both a problem and an opportunity. This study is interested in what kind of distances there are in complex environments. In attempts to create innovation, different kinds of distances would need to be exploited knowingly. The purpose of this study is also to define different kind of methods to reveal innovation potential in distance.

Design/methodology/approach – This study uses a case study as a research strategy. The case study is a research strategy that focuses on understanding the dynamics present within single settings. This study builds on the MOTION! project which aims to develop the exercise and well-being industry, and create new collaboration models for co-operation between the private, public and third sectors.

Originality/value – In order to foster innovation and strengthen competitiveness, it becomes important to integrate different types of knowledge, competences and experiences into a cooperative perspective. However, it is far from clear how co-operative innovation processes including innovating partners with very different backgrounds and interests can be conducted successfully. This study attempts to shed light on the problem and outline methods applicable in such situations.

Practical implications – The identifying the distances between innovation actors facilitates the planning and coordination of the innovation activities. Distances may explain why some of the actions have not been successful or why some of the actions should be repeated several times. This study also gives practical examples how distances could be exploited knowingly.

Keywords – Complex Environments, Innovation Potential, Distance, Case Study

Paper type – Academic Research Paper

1 Introduction

The knowledge era is characterized by the forces of globalization, technology, deregulation and democratization collectively creating an extremely complex operating environment for organisations. This uncertainty and complexity creates risks but also opportunities, making innovation vital to achieving and maintaining competitive advantage. (Hyypiä, 2013; Uhl-Bien, Marion and McKelvey, 2007; Halal and Taylor, 1999.)

Companies are trying to respond to the increasing uncertainty and complexity in various ways. Development of open innovation and networking have already been well documented; they are based on the notion that tackling challenges in contemporary business environments demands a recognition of a shift in competitive factors from the company and industry level towards constellations of companies and other stakeholders linked together through knowledge flows and shared value creation processes. (Bakhshi, Freeman and Potts, 2011; Desai, 2010.)

In this study the complex environments are approached with help of the concepts distance and proximity. The distance between innovating partners presents both a problem and an opportunity. As distance increases, it has a positive effect on innovation by interaction because it yields opportunities for novel combinations of complementary resources. Knowledge building requires dissimilar, complementary bodies of knowledge (Boschma, 2005). However, at a certain point distance becomes so large as to preclude a sufficient mutual understanding needed to utilize opportunities of distance (Nooteboom et al., 2006). This study is interested in what kind of distances there are and how these distances prevent the use of innovation potential in complex environments. In attempts to create innovation, different kinds of distances would need to be exploited knowingly. The purpose of this study is also to define different kind of methods to reveal innovation potential in distance.

2 Innovation in complex environments

As Schumpeter splendidly crystallised almost a century ago, an innovation does not have to be something completely novel. Nor does it have to be radical; innovations can take the form of incremental social and organisational changes as well as technological advances. They are not solely the results of scientific work in laboratory-like environments; they are also developed in networks where actors of different backgrounds are involved in a process that demands innovativeness. The science-push effect as the driving force of innovations is the exception rather than the rule (Schienstock and Hämäläinen, 2001). More and more often, innovations emerge in practical contexts, leading to, for example, middleground innovations, in which knowledge from different disciplines as well as practical interests and scientific interests are combined (see e.g. Johansson, 2004; Harmaakorpi and Mutanen, 2008).

Innovation generation in organisations can be viewed as being dependent on two fundamental processes: analysis and interpretation (Lester and Piore 2004, pp. 5-7). The analytical process is generally assumed to be easier and more natural for business management, as it is based on the rational, linear decision-making models taught in engineering and business schools. But innovation generation entails more than problem-solving alone: innovation processes are affected by issues that cannot be 'solved' or unified in a logical, linear and analytical fashion. This has led to the recognition of interpretative innovation, which is often based on co-creation, a fragmented, on-going, open-ended, multi-voiced, dialogue-based process that emphasises interaction and communication (Lester and Piore 2004, pp. 6-8; 97-98). Harmaakorpi and Melkas (2012) support this interpretative type of innovation in their approach known as practice-based innovation.

From the perspective of innovation, knowledge provides the organisation with the potential for novel action, and the process of constructing novel actions often entails finding new uses or new combinations of previously disparate ideas (Weick, 1979; Hargadon and Sutton, 1997). Through the dynamics of creating knowledge, people can foster innovation, share knowledge and create new ideas (Nonaka and Takeuchi, 1995). For example, practice-based innovation highlights the fact that collaboration among people with expertise in different domains creates an environment conducive to the

emergence of knowledge sharing. (Parjanen, Harmaakorpi and Frantsi, 2010; Hennala, Parjanen and Uotila, 2011; Harmaakorpi and Melkas, 2012.)

Integrating various actors into the innovation process brings different kinds of knowledge into the organisation. Different kinds of innovative networks are important tools for getting new ideas and information from outside the organisation. The relations like the proximity and distance between the actors in networks can be described as strong ties and weak ties. Strong ties are characterized by common norms and high network density. These strong ties are easier for innovations, since they normally include a relatively high amount of trust, common aims and the same kind of language with which to communicate. However, strong ties add little value when one is searching for resources such as new knowledge because everyone within the network has access to the same resources (Granovetter, 1985). If the network relations are related to specific trading partners, diversity decreases and it becomes difficult for the organisation to adapt to new trends and directions (Andersson, 2001). Over-embeddedness can reduce the flow of novel information into the network because the redundancy of ties to the same network partners means that there are only few or no links to outside members who could potentially contribute innovative ideas (Burt, 1992).

3 Research strategy

3.1 Case study

This study uses a case study as a research strategy. The case study is a preferred strategy when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context. Thus, the distinctive need for a case study arises out of the desire to understand complex social phenomena. Importantly and specifically, a case study is the method of choice when the phenomenon under study is not readily distinguishable from its context (Yin, 2003). As Stake (1995: xi) emphasizes: “A case study is expected to catch the complexity of a single case ... We study a case when it itself is of very special interest. We look for the details of interaction with its contexts ... coming to understand its activity within important circumstances.” As Yin (2003) argues, the case study method allows investigators to retain the holistic and meaningful characteristics of real-life events.

3.2 The case

The need for health enhancing sports activities has increased dramatically in the past decade. A resident who does not get enough exercise for his/her health, who is overweight and who is in poor physical condition is at a higher risk of falling ill and thereby creating social welfare and health care expenditure for the local authority. Physical activity is fundamental in improving people's physical and mental health. It reduces risks of many diseases. Thus, different kinds of innovations both in public and private sector are needed to encourage physical activity.

The study builds on the MOTION! project which aims to develop the exercise and well-being industry, and create new collaboration models for co-operation between the private, public and third sectors. Physical activity referral schemes aim to identify inactive adults in the primary care setting. The primary care professional refers the patient to a third party service, with this service taking responsibility for prescribing and monitoring an exercise program tailored to the needs of the client. To enhance physical activity counselling and referral process the MOTION!-project is establishing an online physical activity pharmacy. Physical activity pharmacy platform will provide a toolbox to support physical activity counselling and referral. It will also offer private sector companies an opportunity to offer their services at all levels of the health and exercise service chain and to find new service and product concepts.

This case study is qualitative. Qualitative researchers tend to collect data in the field at the site where the participants experience the issue or problem under study. This up-close information gathered by actually talking to people directly and seeing them behave and act within their context is a major characteristic of qualitative research. (Creswell, 2007.) The data collection in case study research is typically extensive, drawing on multiple sources of information (Creswell, 2007; Eriksson and Koistinen, 2005). The empirical data of this study consists of innovation and development sessions, workshops, questionnaire, focus group interview and written material (Table 1).

Table 1. Summary of the data collection

Innovation/development sessions	3 development sessions for experts of health enhancing sports an innovation session for sport service providers and third sector
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Seminars with workshops	2 health communication seminars for researchers, developers, planners, health care professional and representative of private and third sectors
Workshops	1 for sports counsellors 2 for nurses and physiotherapists 1 for local councillors evaluation workshop for managers, employees and partners in co-operation 2 sub-projects' workshop about the results of the project
Questionnaire	for employees in primary health care organisation
Focus group interview	for sport counsellors
Written material	reports for the financier, notes of meetings

4 Distances in complex environments

Innovation often requires dissimilar, complementary bodies of knowledge. Cognitive diversity will increase the likelihood that creative new knowledge emerges (Boschma, 2005; Nooteboom et al., 2006). In this case study the cognitive challenge was related to missing expertise. For example, sport service providers had no knowledge or experience about the demands of inactive people. Neither did they have any services focused for inactive persons. They also considered that it was difficult to market their services because “they have no expertise in marketing”.

In the public sector physical activity promotion was considered as a co-operation of many experts from different fields of operation. The co-operation is done mostly between health care professionals and sport counsellors from sport departments or third sector organisations. However, according to the questionnaire every fourth health care professional did not take a stand whether s/he cooperates with sport counsellor. Also in the workshops there was a clear wish that co-operation between sport counselling and physiotherapy should be tighten. One respondent said that “co-operation between sports counsellors and health care professionals is one of the most important issues” in successful physical activity counselling. However, many respondents found that there are many things that should be developed between social and health care sector and sport

department. For example, many considered that responsibilities and duties are unclear. Also the sport counsellors felt that the health care professionals do not know enough about their expertise.

Too little of cognitive diversity means lack of sources of novelty, while too much cognitive diversity implies problems in communication (Nooteboom et al., 2006). In this case study the expertise in public and private sector was so different that there were misunderstandings. For example, some concepts like “basic service of municipality” or “exercise service” were understood differently. One participant even noticed that “doctors and sport counsellors are not speaking the same language”.

There were also lacks of knowledge how to bring up physical activity with the client or how to discuss about the need of physical activity promotion inside the organisation. For example, many health care professionals considered that they would like to have more conversation about the role of physical activity counselling and referral in health promotion. This was considered as a responsibility of the management. One respondent explained that organisation “should give a clear presentation about why physical activity counselling is important in the organisation and how it should be given”. It was also considered important to increase the knowledge of local councillors about the effects of health enhancing sport as a preventive method.

An ability to communicate and exchange ideas is an important part of innovation processes. The innovation partners’ success in reaching a common vision, exchanging creative ideas and evaluating them depends on the ability to devise a shared language, which is an essential asset in developing a common understanding. Sharing of a common language facilitates people’s ability to “gain access” to other people and the information that they possess (Nahapiet and Ghosal, 1998).

Innovation depends also on a capacity to coordinate the exchange of complementary pieces of knowledge within the organisation and between organisations. According to the data it is difficult to share information in “too large organisations” and especially when “roles are unclear”. Some pointed also that some organisations or teams are “withholding of necessary information”. Gittel and Weiss (2004) noticed that the boundaries between inter and intra-organisational relationships are often blurred, with, for example, intra-organisational boundaries across departments or units sometimes being more sharply

defined than relationships across organisations. However, interaction between different departments has been shown to influence innovation (Moenaert et al., 2000).

Knowledge sharing is also difficult if “development teams are too small and tight and new members are not welcome”. Organisational proximity is believed to be beneficial for innovations, because new knowledge creation goes along with uncertainty and opportunism. For example, sport services providers were pondering to whom it is wise to tell ideas. However, too much of organisational proximity is accompanied by lack of flexibility. There is a risk of being locked-in in specific exchange relations. Search for novelty often requires going out of the established channels. (Boschma, 2005).

Economic relations are to some extent always embedded in social contexts, and social ties or relations in turn affect economic outcomes (Boschma, 2005; Granovetter, 2005). Social proximity may facilitate the exchange of tacit knowledge, in particular, because of trust-based relations. According to the data “envy, prejudice and fear prevent co-operation in the networks”. In the data the social distance between health care professionals and sport counsellors came up very clearly. Health care professionals hesitate to give physical activity referral to clients because they do not know sport counsellors personally or they are not familiar with the content or methods of physical activity counselling process. The importance of social proximity lies in the fact that social relations not only coordinate transactions but are also vehicles that enable the exchange of knowledge because of mutual trust, kinship and experience as well as external resources to be mobilised (Boschma, 2005; Oerlemans and Meeus, 2005). When there is a close relationship, people are willing to support and encourage innovative ideas, as the individuals involved are able to give the confidence needed to turn ideas into successful projects (Carmona-Lavado, Cuevas-Rodríguez and Cabello-Medina, 2010).

On the other hand, too trust-based relations may weaken the innovative capacity of organisations. One participant of the workshop said that there are “secret development teams that do not tell what they are doing or invite outsiders to the teams”. Closed network systems may incur opportunity costs because outsiders with new ideas and knowledge are denied entry. Long-term relations or relations with too much commitment may lock members of social networks into established ways of doing things at the expense of their own innovative and learning capacity. (Boschma, 2005.)

Every organisation and even its subunits have a culture of their own, which influences the ways in which its members think, feel and act. For example, health care professionals acknowledged that “own attitudes are in important role” when adopting new ways of doing. In the workshops it was noticed that there are still many organisations or departments that “never tries anything new because they are such a stick-in-the-mud”. Also “I do know myself” attitude inhibits common development activities in the organisations. Especially, this was highlighted in small companies. For example, they were “not used to develop their business with help of outsiders”. In many organisations there were also tendency that employees prefer working with those who they know very well and who thinks like they themselves. That way “diversity is not valued”.

The temporal complexity is related to, for instance, how organisations perceive future and how they use their networks to get weak signals (Parjanen, 2012). Innovation is often considered to be path-dependent. This path-dependency may lead to lock-ins to existing production and systems (Pihkala, Harmaakorpi and Pekkarinen, 2007). In the workshops it was noticed that “public and private sectors operate temporally differently” and that may hinder common development. It also takes time before new ways of doing are rooted to organisational routines. Temporal challenge may also be related to the fact that employees are “too busy with the routine work that they have no time to develop their work”. According to one sport service provider she has “time to plan only the next day”. Also sport services providers considered that they are “caution” and “do not take risks”.

5. Revealing innovation potential in complex environments

The development of health enhancing sport is challenging because the extensive network of actors ranges from groups within the public sector’s social and healthcare services as well as private companies to third sector organisations and sports institutes. As seen in previous chapter in this kind of innovation processes change is required at the employee, organisational and network level. Therefore, innovations are highly uncertain and successful innovation paths cannot be predicted. Innovation generation entails more than problem-solving alone. Instead innovation generation is based on co-creation emphasising interaction and communication (Lester and Piore, 2004). The development of health enhancing sports is also situated, context-specific and takes place in very practical environments like in prime care organisations, private companies or third sector

organisations. According to the data the development could be defined as interpretative (Lester and Piore, 2004) and practice-based (Harmaakorpi and Melkas, 2012).

Practice-based innovations are seen to be triggered in different places of practically oriented social and economic networks using, for example, the weak ties and structural holes of the innovation system. The diversity perspective on innovation emphasises the importance of the connectivity of a heterogeneous group of actors. Based on the data the formation and functioning of these kinds of innovation networks can be problematic because of the existence of several distances between innovating actors. In order to use these distances as an innovation potential, there is a growing attention to having brokers to facilitate innovation processes (van Lente et al., 2003).

According to this case study to reveal the innovation potential in distances there may be need to different kind of brokerage – internal and external. Internal brokerage is needed inside the organisation where different distances create problems in communication, knowledge sharing and innovation. In this case study internal brokers organised official and unofficial occasions where employees from different departments could meet each other and have a possibility to get information about physical activity counselling. They also built cross-sectoral and multi-professional development teams to break organisational silos.

The challenges of an internal broker are related to the fact that people usually perceive in their environment things which strengthen already existing matters or ways of doing. Many health care professionals still think that treatment goes before prevention and health promotion and there is reluctance to accept health promotion task as responsibility. In organisations, things are often done in a familiar manner. This is especially true if the operations have been successful in the past. In innovation processes, it is central that the internal broker gets people to perceive things in a new way. Social proximity between internal broker and employees at different departments and knowledge about organisational practises were considered essential in internal brokerage. Also the managerial support was considered important as one broker explained “it is good to find someone at management level who has enthusiasm to health promotion”.

External knowledge and ideas can only be recognised; accessed and assimilated when organisations develop new practices and change their organisational structure to facilitate practice-based innovation processes. According to the evaluation workshop in prime care

organisation “the cross-sectoral work has increased in the organisation”. This has been possible, because the focus of development has been defined, the own role in cooperation has been clarified and understanding of the need for co-operation between different departments has been increased. It was also seen that the cross-sectoral collaboration has “changed the organisational culture”.

The external brokerage functions relate to the providing of the links, knowledge sources and tools so that organisations can accelerate and increase the effectiveness of innovation processes. In this case study external brokers identified possible stakeholders at regional and national level. At the regional level it was important to include local councillors in the activities of the projects. In practice brokers organised data gathering among local councillors about their attitudes and ideas related to health enhancing sport. Based on the data a participatory info and exhibition was organised as part of municipal decision-making seminar. Welfare and health services are mainly produced in the public sector and because there is a strong societal concern over them, political agendas may prepare ground for spreading of innovations in this sector.

To answer the challenges of private service providers possibilities to network with other services providers and public sector organisations were arranged. As a result a network of 40 service providers was organised where the brokerage included to “inform the participants” and “being present”. Brokers’ role was seen as “building bridges” between different actors and “sparring”. Brokers also developed different kind of tools to facilitate the innovation processes in private sector. For example, to help participating companies to design services so that they meet the needs of the physical activity referral customers the model for productization was developed. Also, business clinics were used to recognize potential development targets and to refine the development targets boot camps were organised.

Practice-based innovation highlights the enriching interaction between innovation actors. The origins of innovations are not only networks but also employees, users and customers (Harmaakorpi and Melkas, 2012; Hennala, Konsti-Laakso and Harmaakorpi, 2012; Nilsen and Ellström, 2012). One principal of the project was to engage users and user communities as active participants in development of health enhancing sport. In this case study users were those who will use the online physical activity counselling platform. During the project developers, future users and service providers from public,

private and third sector were brought together to discuss and to innovate what the physical activity pharmacy could be, what purposes it needs to fill. The focus group of 50 has included: doctors, managing nurses, public health nurses, physiotherapists, physical education instructors, entrepreneurs, planning officers and development personnel from local and national institutions. The user-driven development was mentioned several times in reports as an essential factor to reach the results.

Practice-based innovation requires a set of instruments. Those tools may enable users to participate in innovation or enable organisations to integrate external problem solvers or idea creators to innovation process. For example, to develop the physical activity pharmacy's contents and its quality system innovation sessions were organised. The idea of the innovation session is based on open innovation (Chesbrough, 2003) and the fact that there is huge innovation potential in combining different fields of knowledge and expertise (Leonard, 1995; Johansson, 2004, Carlile, 2004).

A Living Lab offers services and methods which enable the users to actively take part in development and innovation. The Living Lab laboratory is located where the people are, that is, at home, in school, in the workplace, in town, and among hobbyists. (Niitamo et al., 2006; Eriksson et al., 2006.) For example, workshops have been organised where the users are like in prime care organisations or sport service companies.

The increasing complexity of most potential innovations requires collaborative creative efforts. The source of individual and collective creativity in practice-based innovation could be found in different kinds of distances, between individuals, groups, departments, organisations and networks in the region or outside the region (Parjanen, 2012). There are possibilities for collective creativity, when more people from diverse backgrounds bringing to bear different experiences are going to offer a greater variety of ideas to use for ideation. That way, the variation of the ideas proposed as the solutions to a particular problem also increases. That way groups are going to bring their increased depth of experience and expertise to bear against the weighting of criteria used for selections of new ideas. (Kozinets, Hemetsberger and Schau, 2010.) In a group context, diversity between group members is considered as potential for creative ideas in practice-based innovation. The facilitation of the group work focuses on shortening social distances between participants so that the group could better use cognitive distance as the source of creativity (Parjanen, 2012). The sessions and workshops have been facilitated

by a trained facilitator. Also different kinds of creativity methods have been used. These include for example learning café, perspective change, game and speed dating.

The practice-based innovation processes aim at combining knowledge interests from theory and practice alike, as well as knowledge from different disciplines (Harmaakorpi and Mutanen 2008). In this case study different kind of communicative challenges were highlighted. To develop health communication scientific knowledge was combined to practical context. In health communication seminars there were health communication and health promotion researchers. This communicative distance was the base for many ideas to develop more effective and suitable ways of communicating about health enhancing sports. As a result new material for clients were made, new channels to inform citizens about health enhancing sports were piloted and new way to inform local councillors was organised.

Table 2 introduces the distances found in this study, methods to use distances as innovation potential and examples of the innovations generated in the project. As seen in the Table 2 innovations are, for example, new services (physical activity counselling as a group format), models (model for lifestyle guidance, model for productization), or way of doing (cross-sectoral collaboration, user-driven development). Many of these innovations are not totally new, but they are new in the context. For example, cross-sectoral collaboration in prime care organisation was considered “exceptional also at national level”.

Many of these innovations are ways to shorten distances found within and between organisations. Actually, one innovation could shorten many distances. For example online physical activity counselling platform reduces cognitive and communicative distance between different professionals. It also creates a virtual place where different professionals may discuss about health promotion issues reducing social distance. At its best, these discussions reduce temporal distance revealing weak signals and possible innovation.

Table 2. Methods used in revealing innovation potential.

Challenges	Methods	Innovations
Cognitive	Practice-based innovation Brokerage functions	Online physical activity pharmacy Quality work book for wellbeing companies Orientation material for new employees in the public sector Model for lifestyle guidance
Communicational	User-driven innovation Cross-sectoral collaboration Diversity (practical and scientific knowledge) Creative and participatory methods	The definition of health communication The communication plan of health enhancing sport in organisations Material for physical activity promotion (leaflets, magazine, poster, hand-outs) Health communication pilots with new media (videos, Facebook, Twitter) “Appealing websites” workshops for public and private sector (marketing, communication)
Social		Physical activity counselling as a group format User-driven development as a new way develop services
Organisational		Contact persons in health enhancing sports in public sector Collaborative network for sport and wellbeing companies Unification of ways of doing between departments in public sector Work partner pattern for social and health care services between public health nurse and physical education instructor
Temporal		New services for inactive persons Model for productization
Cultural		Cross-sectoral working groups Common steering committee between two projects (prime care organisation and third sector organisation) Networking

7 Conclusions

The results of this case study indicate that it is practical to identify the distances which may slower or even hinder innovation activities. The study suggests that realization of innovation entails linking of developments at multiple levels and interaction between multiple stakeholders. Innovation takes place in networks and is collective in its nature. It

is about moderating the collaborative process that aims at development, utilization and spreading of innovation. The collaborative process should not be regarded as a fixed path; the steps need to be continuously evaluated based on interim objectives formulated by the stakeholders.

In this case the innovation activities were based on practice-based and user-driven innovation. Innovations involve the challenge of enabling renewal based on diversity and facilitating the integration of knowledge in a creative way. Innovation potential lies in distances. Interaction between diverse knowledge bases in an organisation and with the external knowledge bases is necessary in order to experience the effect of diversity, but the presence of relevant knowledge does not imply that the inflow of new ideas into the organisation is an automatic or easy process. Especially, the role of brokerage functions was considered essential. Whilst spontaneous cooperation between organisations can occur, it appears that a brokerage intervention can help cooperation, for example, by advising on the advantages of cooperation, giving information, identifying opportunities, catalysing discussions between different actors or bringing organisations together (Shaw, 1998.)

This study has some limitations. Firstly, the role of the other researcher was not passive observer. Instead, she has participated in the project as a planner of the sessions, participant of the sessions and also facilitator of the sessions. She is aware that her internal positioning at the project has influenced the way she has interpreted the data. Secondly, there are limitations concerning generalizability of the results. This case study focuses on a single unit, a single instance, the issue of generalizability looms larger here than perhaps with other types of qualitative research. However, much can be learned from a particular case. What we learn in this case can be transferred to similar situations. It is the reader, not the researcher, who determines what can apply to his or her context. .

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Ancillary knowledge advancement of employee-driven innovation: a personal-interactive services innovation perspective.

Farag Edghiem

Liverpool Business School
Liverpool John Moores University
Redmonds Building, Clarence Street
Liverpool, L3 5UG, UK

Structured Abstract

Purpose – This study aims to explore the nature and role of knowledge relevant to service employees' individual innovative behaviour and leading to initiating innovation within the sub-sector of personal-interactive services.

Design/methodology/approach – A case study research method was applied to achieve the research objectives that examined and compared two personal-interactive service environments of two hotel properties. Semi-structured interviews were conducted along with other qualitative research methods, including; direct observation of employees, review of management archives/literature and 'micro cases' assessment.

Originality/value – The study outcome contributes to service innovation research by identifying additional implications of the nature and ancillary role of knowledge and also by unravelling four patterns of service employees' individual innovative behaviour.

Practical implications – The study recommends practical measures to encourage knowledge integration at internal and intra-organisational levels.

Keywords – Case-Study, Individual Innovative Behaviour, Personal-Interactive Services, Service Innovation, Ancillary Knowledge.

Paper type – Academic Research Paper.

1. Introduction

Innovation in services has been widely recognised as a source of competitive advantage and a key element of retaining customers' loyalty, and therefore has received significant attention from academics and practitioners alike. Arguably, this is due to the increasing competition between service firms leading to higher customer expectations and to the growing trend of introducing services by the world's dominant manufacturing firms and economies in response to the greater than ever competition from low-cost production countries.

Despite that the amount of research on innovation in services increased significantly, it is still considered relatively less explored in comparison to innovation in the manufacturing sector. In fact, the synthesis approach (Gallouj and Weinstein, 1997; Coombs and Miles, 2000; Nightingdale, 2003; Drejer, 2004; Howells, 2006; Nijssen *et al.*, 2006) that represents the efforts to bring together theories from both services and manufacturing sectors, after addressing service characteristics, is gaining more popularity. This study adopts the synthesis perspective of service innovation by considering the peculiarities of services, embedded in the high degrees of intangibility and perishability of services delivered within the hospitality sector to be investigated, and equally recognising the applicability of theories developed within the manufacturing sector at the employee's individual level.

Within innovation literature knowledge was frequently considered a key determinant of employees' ability to innovate. However, from a service innovation point of view the implication of knowledge has not been sufficiently explored and most studies in the field focus knowledge in knowledge intensive business services KIBS. This paper recognises the sub-sector differences within the service sector and intends to determine the nature and impact of knowledge from a personal-interactive service perspective.

The aim of the study is to explore the nature and role of knowledge relevant to service employees' individual innovative behaviour and leading to initiating innovation within the sub-sector of personal-interactive services. The research findings came to verify the ancillary role of knowledge to the interlinked process of idea generation and development in service innovation and to distinguish two types of knowledge as *prior* and *dependent* knowledge. The research outcome also added further insight into service employees' individual innovative behaviour by highlighting four constructs of innovative behaviour patterns related to knowledge.

2. Theoretical Background

2.1. Innovation in Services

The relationship between services and innovation has come considerably to the fore after Gershuny's (1978) study of the 'self-service economy', and by the 1980s a number of early studies finally emerged within this field to consider services innovation and the impact of technical change. These included Gershuny and Miles (1983), who argued that in fields such as entertainment, information and education, information technology presents the technical inputs for a new wave of social innovation; and the study by Barras (1986), who proposed that the process of innovation in services is preceded by the adoption of new technologies developed in other sectors.

Publications on innovation in services eventually started to grow rapidly in the 1990's, and mainly dealt with various types of new services, success factors and aspects of the *New Services Development* NSD process (Vermeulen and Van der Aa, 2003). Yet, it has been remarked at this stage that most innovation studies in service firms had not explicitly discussed how processes of other types or modes of innovation, such as architectural or organisational innovations, are conducted (Gadrey *et al.*, 1995; Gallouj and Weinsrein, 1997; Miles, 1997); and more recently Menor and Roth (2007) concluded that current strategies and tactics for developing new services are inadequate. In fact, compared with the manufacturing sector there is a considerable paucity in the literature concerned with the organisation and management of services innovation (Adams *et al.*, 2006; Drejer, 2004; Miles, 2000; Nijssen *et al.*, 2006; Spohrer, 2008; Tidd *et al.*, 2001). However, in the last decade the number of publications concerned with managing services innovation increased rapidly and the study of services innovation emerged as an important research field (IFM and IBM, 2008; Menor and Roth, 2007).

Within service innovation literature it is widely accepted that innovation involves more complicated implications; service firms develop both radical and incremental innovations in the form of existing services, changes to processes or adjustments to personnel behaviour (Rubalcaba *et al.*, 2012). In particular, four schools of thought emerged in the literature of services innovation (Droege *et al.*, 2009). The **Technologist** school was *first*, and under this perspective services innovation is dependent on technological competence gains and development in information technology (Barras, 1986, 1990). The technologist approach has been conceptualised as a reversed product

life cycle that begins with innovations and subsequently leads to totally new services (Linton and Walsh, 2008). Gallouj (2002) proposed a contrasting critical view by concluding that services innovations are frequently non-technological, such as a new form of insurance policy or developing a new area of legal expertise.

The *Second* school, the *Assimilation* perspective, assumed that the theories and concepts developed in manufacturing contexts can easily be transferred to innovation in services (Coombs and Miles, 2000; Drejer, 2004; De Vries, 2006; Nijssen *et al.*, 2006). Scholars following this approach found that differences between services and tangible products seemed to be smaller than the services and manufacturing sectors (Sirilli and Evangelista 1998; Hughes and Wood, 1999). Akamavi (2005) criticised the *Assimilation* school of thought and claimed that studies developed under this school derive their analytical frameworks from the manufacturing sector without taking into account the idiosyncrasies of services. The *Synthesis* perspective was the *Third* school of thought identified. Synthesis studies dedicated more effort to bring together innovation in both services and manufacturing sectors rather than to study each field separately (Gallouj and Weinstein, 1997; Coombs and Miles, 2000; Nightingdale, 2003; Drejer, 2004; Howells, 2006; Nijssen *et al.*, 2006), after illuminating the important elements of services innovation such as the involvement of customers (Sanden *et al.*, 2006). This approach seemed to be preferred by service innovation scholars (i.e. Den Hertog, 2010; Gallouj and Djellal, 2010; Rubalcaba, 2011; Tether, 2005; Windrum, 2009).

The *Fourth* school of thought or the *Demarcation* perspective focused on the distinctive features of services that make it difficult to transfer theories from the manufacturing to the services sector (Droege *et al.*, 2009). Den Hertog's (2000) remarkable study within the *Demarcation* stream of literature takes a conceptual perspective of services innovation by presenting taxonomy of services innovation patterns and a framework to better understand what parts of services are affected by innovation.

This study adopts the *Synthesis* perspective of service innovation by considering the peculiarities of services, embedded in the high degrees of intangibility and perishability of services delivered within the hospitality sector to be investigated, and equally recognising the applicability of theories developed within the manufacturing sector at the employee's individual level.

2.2. *Employee-Driven Innovation*

Previous studies suggest that organisations can benefit from employees' innovation and many popular studies in the management field were focused around this topic, including total quality management (Ehigie and Akpan, 2004), continuous improvement schemes (Fuller *et al.*, 2006), corporate venturing (Elfring, 2003), creative problem solving (Basadur, 2004) and organisational learning (Senge, 1990). Employees' participation is increasingly regarded as an important element to realise innovation, and previous research has suggested that employees' individual innovation is recognised as a decisive factor of an organisation's 'innovativeness'. For example, de Jong and den Hartog (2007) claimed that organisations capitalise on employees' ability to innovate, while Campbell *et al.* (1996) empirically identified a positive relationship between innovative behaviour and organisational performance, and Getz and Robinson (2003) posited that 80% of improvement ideas come from employees and only 20% come through planned innovation activities.

Despite the wide acceptance of employees' contribution to services innovation there has been little understanding in earlier research of the relationship between employees' roles and services innovation. For example, the study of Sundbo and Gallouj (2000) recognises the important role of professional employees for services innovation without analysing how those professional employees might initiate services innovation. Another early stream of research has led to the development of a comprehensive view of how employees' role may help initiate innovation. The research on employees' individual innovation has originally progressed in four main ways. It has been underpinned *firstly* in terms of cognitive styles, where Kirton (1976) measured two distinct cognitive styles as adaptors who solve problems within existing perceptual frames and innovators who restructure these frames. *Secondly*, employees' innovative behaviour has been examined in terms of personality characteristics (Hurt *et al.*, 1977), *thirdly*, in terms of innovation output (West, 1987), while *fourthly* and most lately viewed from a behavioural perspective (Janssen, 2000).

In the context of this research the concept of *Individual Innovative Behaviour* will be adopted. *Individual Innovative Behaviour* refers to the multidimensional extra-role of innovative behaviour beyond the scope of job requirements which is important for organisations' survival through initiating innovation (Tuominen and Toivonen, 2007). The reasons for adopting the Individual Innovative Behaviour perspective are, *firstly* that

the Individual Work Behaviour IWB concept has been examined primarily in the manufacturing organisations context, and therefore an alternative terminology should be applied for the services sector. *Secondly*, the Individual Innovative Behaviour concept captures more comprehensively individual based interactions and relationships between employees inside and outside the services work environment and between employees and the services customers. *Thirdly* the Individual Innovative Behaviour concept helps unravel the dominant individual role within the service provided and the individual factors that influence employees' innovative behaviour (i.e. motivation).

2.3. Knowledge and Service Innovation

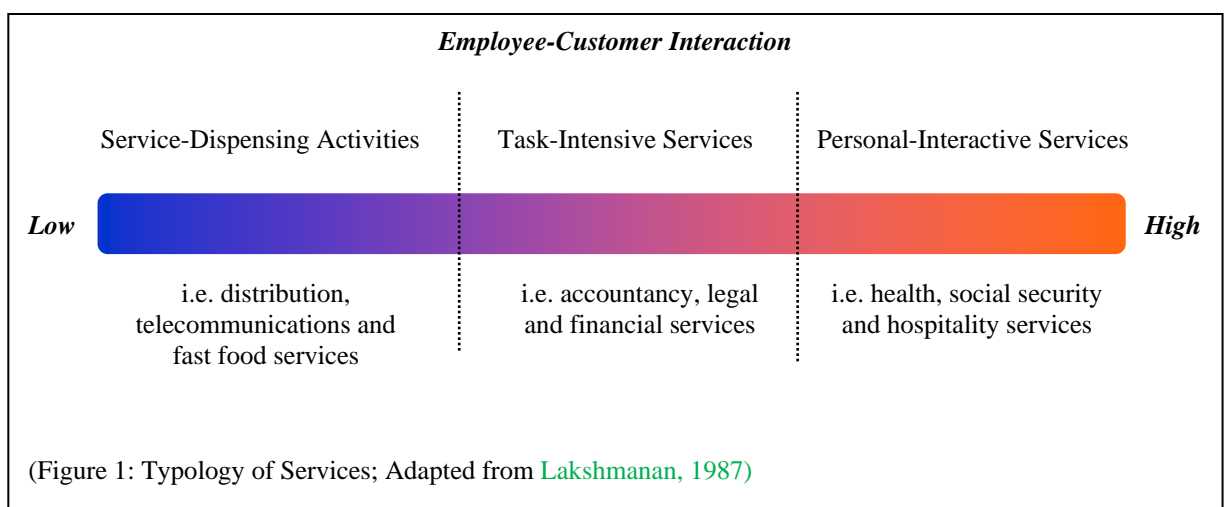
Employees' '*employability*' or intellectual capital i.e. skills, expertise and knowledge, is widely recognised as a key determinant of employees' ability to innovate (Subramaniam and Youndt, 2005). Van der Heijden (2005) conceptualised employees' employability in association with the five constructs of *Occupational Expertise, Anticipation and Optimisation, Personal Flexibility, Corporate Sense and Balance*. However, there were other attempts in the literature that conceptualised employees' repertoires of knowledge that may help them to innovate, such as *Worker's Talent Intelligence* (Glynne, 1996) that is defined by the capability to solve problems or meet task challenges.

The concern in this research is with the employees' knowledge base that supports idea generation and development. In this context it is widely accepted in services innovation literature that *Prior Knowledge* influences the *Opportunity Recognition* aspect of idea generation (Fischer, 2011). *Prior Knowledge* of customer problems and markets help draw meaningful conclusions from observed events, trends and changes (Baron, 2006; Grégoire *et al.*, 2010; Shane, 2000). Idea generation itself is widely recognised as a cognitive process involving both the retrieval of existing knowledge from long-term memory and the combination of various aspects of existing knowledge into novel ideas (Mumford *et al.*, 1991; Ward *et al.*, 1997; Nijstad and Stroebe, 2006).

Hunter and Ligon (2008) identified the ancillary role of five types of knowledge in relevance to idea generation and problem-solving: (1) *Schematic Knowledge* that is based on concepts and principles abstracted from previous experience (Phye, 1990; Sakamoto and Love, 2004) provides the basis for analogical problem-solving with the application of feature search and mapping mechanisms (Reeves and Weisberg, 1994; Hummel and Holyoak, 1997); (2) *Associational Knowledge* that appears to be acquired with less effort

and reflects regularities in experience based on probabilistic linkages between stimuli and response (Estes, 1991); (3) *Case-Based Knowledge* that entails formation of a mental model describing critical aspects of past performance (Hammond, 1990; Kolodner, 1997). In this respect knowledge is viewed as a form of contextual knowledge that provides a model for action when individuals encounter similar situations (Hershey *et al.*, 1990). Another growing body of literature recognises the significance of the Knowledge Management role in helping individual learning and sharing of knowledge, and concludes in relevant management mechanisms, for example, by applying care in organisational relationships (Von Krogh, 1998) or by creating a shared space for emerging relationships (Nonaka and Konno, 1998).

In the service sector, research began to focus more on knowledge relationship to innovation since the 1990's along with the growing interest in knowledge intensive business services KIBS contribution to Innovation (Shearmur and Doloreux, 2013). KIBS are by definition intermediate services that usually deliver knowledge or know-how and can deliver and implement systems (such as accounting or computer systems) (Muller and Doloreux, 2009) and they mainly consist of survey, consultancy, research and engineering services targeted at other businesses (Desmarchelier, 2013). However, the research on knowledge contribution to service innovation lacked consideration of other subsectors of the service industry. For instance, among the service sub-sectors highlighted in Figure (1) there is a considerable gap in the literature that addresses knowledge contribution to innovation from a personal-interactive sub-sector viewpoint.



3. Research Methodology

The application of a case study research method to achieve the research aims is strongly justified by the need to comprehend the complexities associated with human behaviour. Another justification is that the research area is empirically under-explored and therefore the nature of enquiry requires direct observation and interaction (Ghauri, 2004). The potential advantages of applying a case study research method largely include: the large theoretical and practical relevance to the research subject, the thoroughness of analysis and interpretation, and the triangulation of research methods (Scapens, 1990; Silverman, 1985; Spicer, 1992; Yin, 1994).

Case study research methodology may also entail some limitations, including the inability to provide justifiable generalisations or causal laws and the extensive length of the research period (Yin, 1994); case study research sometimes does not distinguish between what is unique to the case and what is common to the class of events as a whole (Achen and Snidal, 1989). To confine the effect of these limitations a comparative-case research method was applied to investigate two main case studies, where multiple data collection methods were applied in each case study. Semi-structured interviews were conducted along with other qualitative research methods, including; direct observation of employees, review of management archives/literature and 'micro cases' assessment. The researcher also depended on field notes and interview recording to organise the collection of data and prepare it for analysis.

Identifying an 'ideal' case study was very challenging, not only due to the difficulty in gaining access to companies' strategic information (i.e. innovation expenditure and other non-financial innovation indicators), but also due to the difficulty in identifying valid indicators for a representative model of an 'innovative' hotel company. Similarly, in the SI4S¹ project, Sundbo and Gallouj (1998) asserted that it would be extremely difficult to establish innovation indicators in the services sector. Some traditional innovation indicators such as R&D expenditure, R&D staff or other measures related to R&D, proved to be unreliable since very few services firms have formalised R&D departments, or other non-R&D indicators such as acquisition of patents, training, market research,

¹ *The SI4S project is one under the TSER programme launched by the EU commission in 1995 with the aim of developing concepts, empirical evidence, and proposals for practical action concerning the role of services in European innovation systems. The project included studies of innovation activities in services themselves as well as services firms' role in creation and diffusion of innovations in other sectors. The project started in March 1996 and ended in June 1998, with research teams from nine European countries participating in the project. These countries are Denmark, France, Germany, Greece, Italy, Netherlands, Norway, Sweden and the UK (Sundbo and Gallouj, 1998).*

number of educated people, etc. Although all the mentioned indicators may be relevant, they do not comprehensively reflect all innovation activities. Sundbo and Gallouj (1998) also concluded that no sufficient indicators had yet been identified and more work needs to be done towards identifying reliable indicators.

To overcome this problem, an alternative strategy that does not rely on probability indicators was adopted; that is, adopting *Criterion-Based Selection* strategy (Le Compte *et al.*, 1993) also known as *Purposeful Selection* (Light *et al.*, 1990) or *Purposeful Sampling* strategies (Patton, 1990). The case selection strategy was primarily based on identifying two main criteria related to the key themes generating from both reviewing the industry literature and interviewing the president of the European Hotel Manager's Association. The selection criteria depended on, (1) the history of innovation; the innovations developed in the prospect case studies (2) the corporate culture that supports innovation activities and initiatives.

4. Cases Backgrounds

4.1. Case I

Case I became one of the flagship hotel properties since the owning company was established in 2003. The company's rapid success was ascribed to investing in unique hotel properties and preserving the idiosyncrasies of each hotel property; this management policy was based on implementing uniformed management practices and services standards across the group's hotel properties portfolio, and at the same time ensuring that each hotel property had individualistic characteristics such as hotel name, structure and interior. The hotel properties also varied in terms of location, from countryside to the city centre, and also in terms of size and structure.

The company managed its portfolio of hotel properties across the United Kingdom through four designated regional management teams. Each team consisted of a regional general manager, a regional HR manager and a regional sales manager, who all reported to the company head office. At the most senior level of management, the company was controlled by a board of directors including the managing director, the finance director, the operations director and the sales director. At the local management level, the hotel manager managed 392 employees in conjunction with six other department managers. However, the regional manager also acted as a non-resident general manager of the hotel.

The original Victorian architecture of Case I hotel property has been well maintained, even after much maintenance work has been carried out over the years. The hotel's exterior architecture remains in its original design, and the main restaurants and banqueting halls have kept their authentic layout and atmosphere, even though the hotel interior has been equipped with modern technological hardware. Case I hotel property was also nominated as a centre of excellence in banqueting and events services among the company's portfolio of hotel properties. Factors like hotel location, conference halls facilities and the expertise of hotel staff in managing conferences and events are believed to have helped it achieve excellence in the banqueting and events services.

4.2. Case II

Case II hotel property is managed by one of the most renowned hotel brands and since it was established in the 1940's it has held a long standing reputation for luxury and distinguished hotel service. The group ascribes its success to maintaining guest-focused strategic orientation, and the diversity of the group brands that serve different market segments of the hotel industry. In 2014 the company managed and owned a portfolio of over 4600 hotel properties around the globe.

The corporate management structure consists of three main constructs: the Americas, Asia Pacific, and Europe Middle East and Africa. The hotel property in Case II falls within the South Europe and Mediterranean division, one of six management subdivisions that comprise the Europe, Middle East and Africa EMEA area. The company's management policy depends on limiting corporate intervention in the management of the hotel properties and delegating a considerable level of authority to the local management teams to assume daily responsibilities; the corporate management set the services standards and invest in training and educating the management executive teams who receive continuous training to conduct their duties in line with corporate systems of practice.

The case study hotel employs 463 employees including part-time contractors, and the management structure is characterised by role specialisation rather than the traditional hierarchical structure design. The highest level of the management hierarchy is the executive committee which includes six of the most senior management executives. The next level of the management hierarchy is the hotel heads of departments and their assistants and the lowest level of the management hierarchy represents the department supervisors, restaurant managers and the rest of the junior employees.

5. Presentation of Data

5.1. Ancillary Role of Knowledge

The difficulty associated with defining the term ‘knowledge’ reflected inconsistencies in respondents’ views on how to identify the contribution of knowledge to idea generation and development, where in some cases knowledge was referred to by interviewees as management guidelines or education. It was therefore an urgent requirement to brief the interviewees about the theoretical framework which identifies ‘knowledge’, and the differences between ideas, information and knowledge. Yet, evidence emerged from the two researched case studies confirming that knowledge played an ancillary role to the interlinked process of idea generation and development by, (1) inspiring individuals’ innovative behaviour to come up with new ideas, and (2) developing new ideas in coherence with the hotel’s local context and corporate standards.

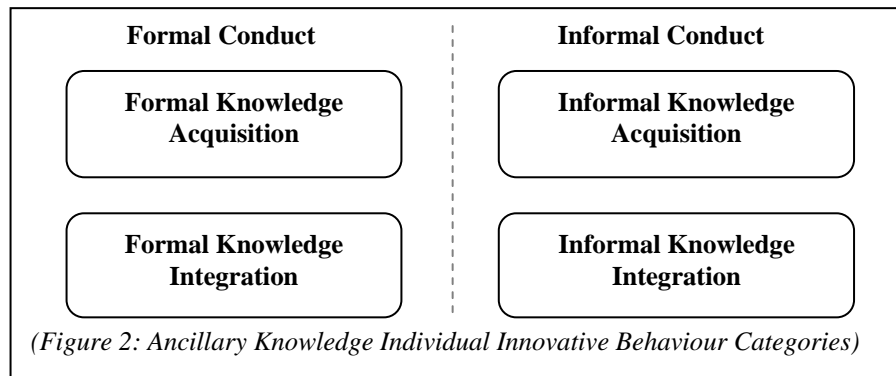
Consequently, it would be also possible to identify the ancillary role of knowledge to idea generation and development at two levels: as *prior knowledge* which is the collective experiences learnt by individuals throughout their professional and personal progression, and through their daily interaction with work and work related environments that may both lead to generating new ideas for innovation, and as *dependent knowledge* that is sought after initiating new ideas and which is normally combined with prior knowledge to help develop ideas consistently with the local environment settings. Table (1) demonstrates examples of knowledge contribution to idea generation and development.

Table 1: Examples of Knowledge Contribution to Idea Generation and Development

Knowledge Type	Idea Development Contribution
<i>Prior Knowledge</i>	<p><i>Case I</i></p> <ul style="list-style-type: none"> • The hotel manager applied prior knowledge to come up with the idea of ‘Express Check-Out’, which was implemented in the hotel he managed previously. • The front office department manager applied prior knowledge of the IT system Fidelio to implement consistent guest profile creating within his department.
	<p><i>Case II</i></p> <ul style="list-style-type: none"> • The human resources director’s work experience and prior knowledge of corporate standards helped initiating the innovation of corporate values dice toy that was placed on employees desks to remind them of the corporate values.

	<ul style="list-style-type: none"> The front office department director conducted competitor analysis of other hotels and compared systems of practice to improve front office procedures.
Dependent Knowledge	<p>Case I</p> <ul style="list-style-type: none"> The hotel manager reviewed corporate systems of practice and consulted regional management and then applied dependent knowledge to ensure reconstructing the hotel restaurants in compliance with corporate standards. The security department manager researched new premises' security systems and applied dependent knowledge to update the hotel's security installations.
	<p>Case II</p> <ul style="list-style-type: none"> The food and beverage department manager conducted competitor analysis of nearby restaurants and cafes and applied dependent knowledge to reintroduce the lobby lounge restaurant. The marketing and sales director conducted a survey on the hotel guests and applied dependent knowledge to improve the hotel beach club facilities and services.

Furthermore, the analysis of the behavioural patterns related to ancillary knowledge contribution identified four main interrelated categories; including, *formal ancillary knowledge acquisition*, *formal knowledge integration*, *informal ancillary knowledge acquisition* and *informal knowledge integration* (see Figure 2).



5.2. Formal Knowledge Acquisition

When asking respondents to describe the scope of their activities to gain knowledge prior to generating a new idea, it was extremely difficult to draw a timeline of when individuals start acquiring prior knowledge. The scope of *prior knowledge acquisition* in this context can be described as the collective life time experiences prior to the generation

of a new idea, that its extrapolation to the context of the hotel by the employees' leads to generating new ideas.

Before commencing employment, all employees were very likely to have acquired *prior knowledge* through university/college education or by other work experiences, etc., and after starting work at the hotel all employees also received induction training to be able to conduct their job roles consistently with management standards. Eventually and throughout their employment, employees were continuously offered various training opportunities to help them develop their knowledge of the hotel industry and advance their careers. The human resources Assistant Manager of Case I commented on this: *'we fully appreciate the fact that the standard of our services is dependent on how good our employees are and therefore we have carefully designed training programmes for helping our employees to continuously improve and increase their awareness of the latest developments in the hotel sector'*. In Case II other noticed forms of formal *prior knowledge acquisition* included programmes of higher levels of professional education and training, such as the corporate Continental Manager Programme, which aims to recruit new university graduates and provide them with a combination of professional training and work experience so they would be appointed to managerial positions within the company upon their completion of the programme. The human resources department in Case II additionally offered a wide range of training sessions including hotel management software, IT applications, management skills, accounting and finance, etc., and also outsourced other training and development programmes from external bodies such as the Institute of Tourism Studies.

Cross-training in other departments or in other inter-organisational hotel properties was another identified form of formal *prior knowledge acquisition*. The hotel General Manager in Case II explained: *'we work closely with other hotels in our region. Our hotel in Rome is one of the longest established hotels in the Southern Mediterranean region and Athens hotel is one of the best hotels in the same division; we aim to match with both hotels' preparations and achievements...We worked with human resources departments to arrange cross-training for our employees in these two hotels...Our employees benefit from this by learning new levels of standards in hotels that have a lot of similarities with our hotel'*. Table (2) outlines examples of formal prior knowledge acquisition.

Table 2: Examples of Formal Prior Knowledge Acquisition

<i>Formal Prior Knowledge Acquisition</i>	
<i>Micro Case 1</i>	<ul style="list-style-type: none"> ▪ The housekeeping department manager experienced difficulty in maintaining systematic order of rooms cleaning procedure while conducting work responsibilities.
<i>Micro Case 2</i>	<ul style="list-style-type: none"> ▪ The general manager identified the opportunity to generate further revenue through offering family rooms when reviewing guests' feedback.

Dependent Knowledge acquisition commenced after identifying an idea with the aim to develop the initial idea into a form of innovation. Following the identification of the initial idea and gaining management approval, employees' formal dependent knowledge acquisition takes place as mandated by the hotel management or the innovation project team. The task of acquiring dependent knowledge was identified to be delegated to individuals of more experience in a certain aspect and on contextual factors relevant to the idea. Examples of informal dependent knowledge acquisition were highlighted in Micro Cases one and two (see Table, 3).

Table 3: Examples of Formal Dependent Knowledge Acquisition

<i>Formal Dependent Knowledge Acquisition</i>	
<i>Micro Case 1</i>	<ul style="list-style-type: none"> ▪ The housekeeping department manager and the project team assessed the feasibility of the 20 steps cleaning procedure idea by training the housekeeping attendants and implementing the procedure for a trial period.
<i>Micro Case 2</i>	<ul style="list-style-type: none"> ▪ When developing the family rooms idea, guests' views and preferences were collected by inviting the hotel guests to research sessions. ▪ An interior architectural design company was consulted to provide prospective family rooms interior designs.

5.3. *Informal Knowledge Acquisition*

Voluntary informal acquisition of knowledge was highlighted throughout the research. Two types of informal knowledge acquisition were marked: *informal prior and dependent knowledge acquisition*. In relation to *informal prior knowledge acquisition*, in addition to the training provided by the human resources department, some employees elected to participate in other forms of training or experiences that were not formally organised by the human resources department. Employees' individual motivation was identified as a key determinant of *informal prior knowledge acquisition*. Factors such as

career development and self actualisation were found to be the most influential determinants that encourage informal prior knowledge acquisition behaviour among employees.

Informal acquisition of prior knowledge was encouraged by management in both cases. However, additional evidence of corporate support of employees' *informal prior knowledge acquisition* was identified in Case II, where employees were educated on how to become active seekers of knowledge through training sessions organised by the human resources department as part of the employees' personal development plans. The human resources executives helped the hotel employees identify areas of interest and development, and encouraged them to undertake the appropriate informal training and education to realise their potential. The highlighted examples of the human resources department support of employees' *informal prior knowledge acquisition* included the support of many of the hotel employees to enrol in courses provided by the local Institute of Tourism Studies by reducing work hours and approving employees' time-off requests during exams periods.

From another perspective, *informal dependent knowledge acquisition* started as early as the idea was identified by the individual. Before formally reporting the idea, employees attempted to adjust/adapt idea development to their own framework of inference. In Case I the Housekeeping Manager explained: '*if I come across an idea, say on cleaning materials, I do my own homework first and then I decide if the idea is worth reporting to the next level. I do some research in specialist magazines and online resources about the idea and based on my conclusion I make up my mind if the idea is realistic and advisable*'. Table (4) demonstrates additional examples of informal dependent knowledge acquisition highlighted in Micro Cases one and two.

Table 4: Examples of Informal Dependent Knowledge Acquisition

<i>Informal Dependent Knowledge Acquisition</i>	
<i>Micro Case 1</i>	<ul style="list-style-type: none"> ▪ The housekeeping department manager consulted the trainee hotel manager about the difficulty in maintaining order for the rooms cleaning procedure. The trainee manager provided the 20 steps cleaning procedure solution based on previous work experience. ▪ The housekeeping department manager reviewed the training literature of the 20 steps cleaning procedures provided by the trainee manager.
<i>Micro Case 2</i>	<ul style="list-style-type: none"> ▪ The hotel general manager consulted the general manager of Rome hotel on pricing structure and marketing strategy to launch the hotel's family rooms.

Informal dependent knowledge acquisition through innovation groups also emerged as another method to acquire dependent knowledge. *Innovation groups* denote the collaborative relationships between individuals to share knowledge that are created simultaneously and may include within them members of various professions and backgrounds. Employees sought to gain dependent knowledge from other group members when they experienced difficulties in acquiring knowledge by self-dependent means. The highlighted examples by the interviewees of *informal dependent knowledge acquisition through innovation groups* varied from consultation on developing innovation initiatives to ‘shadowing’ fellow group members to gain knowledge on certain aspects. An example of *informal dependent knowledge acquisition through innovation group* emerged in Micro Case 2 when the general manager in Case II consulted the general manager of Rome hotel property about the project initiative and received guidelines about the pricing structure and marketing strategy of the innovation initiative.

5.4. Formal Knowledge Integration

Despite that the formal mechanisms to transfer knowledge were designed by the company’s head office in Case I, there was no evidence of a central management structure to manage knowledge at the corporate level. The only centralised systems detected to integrate knowledge were, (1) the corporate intranet programme ‘Citrix’ that was managed by the central IT department, (2) the hotel review reports that were submitted to the head office on a weekly and monthly basis, and (3) the guest satisfaction questionnaire that was managed by Retail Eyes¹. Otherwise, managing knowledge was more of a shared responsibility between the central office managers, the regional management and the hotel departments’ managers.

In Case I, the movement of knowledge was not only directed from the hotel property to the company’s head office, rather it was transferred into three directions. One was directed from the hotel property to the head office (bottom-up), the second was directed from the head office to the hotel property (top-down) and the third flow of knowledge was moving horizontally at the bottom level. Formal bottom-up mechanisms included employees’ feedback through formal reports submitted to senior management and also employees’ feedback during the research projects conducted by the human resources

¹ *Retail Eyes is a market research, evaluation and development agency that combines technology with innovative research. Retail Eyes is a UK leading agency in helping clients in learning about their customers through novel feedback technology.*

department. Another example of bottom-up mechanisms is the transfer of knowledge through the corporate intranet (Citrix) e-mailing system, and this would also allow contacting managers at the head office level. Examples of the top-down transfer of knowledge from the central office to the hotel management, and eventually to the rest of the hotel staff, included systems of practice manuals, training sessions and the contents of the corporate intranet programme Citrix, where employees could access a large database of corporate resources.

The hotel's front office manager in Case I provided an example of the horizontal flow of knowledge that moved between different parties at the bottom level, which was the cross-training exchange between hotel properties. However, there were two types of cross-training mentioned, one was arranged locally at the hotel property by the human resources department to place employees on training in other departments, and the other type was managed by the group's training management department where employees were dispatched to 'centres of excellence' at other hotel properties.

Two centralised IT systems to interlink its hotel properties were operated by corporate management in Case II; Holidex, the central reservations system, and the corporate intranet. Yet, although the company had a dedicated department to manage customer knowledge and insight in the company's head office, there was no evidence of direct involvement in knowledge management dealings at the local hotel level by this department while conducting research. The main knowledge transfer interaction with the company's head office was through the corporate intranet interactive tools (i.e. the hotel management reports submissions). The corporate reservation system Holidex, on the other hand, interlinked the hotel properties through the guests' reservation information and the guests' profiles on the company's loyalty scheme database.

The movement of knowledge in Case II was also recognised to be moving in three directions: (1) from the hotel property to the group head office and regional management (bottom-up), (2) from the group's head office to the hotel property (top-down), and (3) moving horizontally at the bottom level. The highlighted examples of bottom-up mechanisms included the hotel management's performance reports to the group's head office, such as the Monthly Quality Assessment (MQA) report and also the hotel management feedback received via e-mail and other communication means. However, it was also recognised that communication via the corporate intranet was not restricted to

executive employees, rather it was also possible for junior staff to e-mail any of the listed corporate contacts.

The top-down movement of knowledge from the group head office to the hotel property involved the transfer of corporate systems of practice and the other corporate standards through formal channels in Case II: namely, the human resources department training and development programmes and the corporate intranet. Other methods of top-down knowledge transfer included the corporate training programmes such as the Revenue Academy and the annual meeting of the regional division directors.

The horizontal movement of knowledge on another account was highlighted by interviewees to have transferred through cross-training of employees in other departments. Other cross-training also took place between hotels within the southern Mediterranean area in the regional division, i.e. Rome and Athens hotels, where the interviewed participants in this type of training programme confirmed that they had applied the experience they had developed while cross-training in these centres of excellence to enrich their present job roles. Examples of specific cross-training experiences included front office systems of practice, Opera hotel management software, food and beverage systems of practice and events management.

5.5. Informal Knowledge Integration

Within a hotel service environment, which is a highly interactive social environment, it would be expected that the simultaneous sharing and transfer of knowledge is part of everyday work routine, and therefore it would not be possible to directly manage all aspects of employees' exchange of knowledge only through directive formal methods. However, formal knowledge management may still provide the appropriate tools and create a suitable climate to encourage knowledge sharing and transfer among employees.

At the hotel property level and in both researched cases the most dominant individual knowledge integration behaviour among the interviewed employees was transferring and sharing knowledge through informal communication. During observing employees in Case I while in the staff canteen and when operating in public areas, it was recognised that most employees at all levels communicated freely without any noticeable barriers of bureaucracy. It was also recognised when observing the hotel employees in Case II that there was a high level of openness in communication between employees of junior positions and the hotel management team. Accordingly, in both cases junior employee

respondents' answers confirmed that they were able to share work experiences and knowledge with management directors with minimal or no restriction.

The review of the statement of corporate values in Case II reflected further evidence of corporate management enthusiasm to nurture informal communication between employees. It was also recognised in Case II that the human resources department encouraged informal communication between the hotel employees by instigating initiatives such as the Social Committee. This Committee was set up by the Human Resources department to encourage social interaction between the hotel staff by organising recreation and sports events, and other forms of social gathering to promote team work, spirit and eliminate bureaucratic barriers between the hotel employees.

The other informal knowledge integration behaviour recorded in both cases was the transfer and sharing of knowledge through informal relationship networks. However, as these networks may include within them individuals from outside the hotel, there would be a risk of revealing confidential knowledge to external parties, i.e. industry competitors. Adversely, if knowledge was integrated through internal and intra-organisational networks it could be a very useful method to transfer knowledge. For instance, the interviewees who were involved in internal or intra-organisational networks explained that they could become aware of what was happening in other departments or other hotels of the company through sharing other associated employees' knowledge and experiences.

6. Discussion

This study aimed to explore the nature and role of knowledge relevant to service employees' individual innovative behaviour and leading to initiating innovation within the sub-sector of personal-interactive services. To achieve this aim an objective was set to unravel patterns of employees' innovative behaviour in relation to knowledge contributing to the interlinked process of idea generation and development. Another set objective is to review the established literature relevant to the implication of knowledge in progressing service innovation and add further insight to previous research underpinning service employees' role in initiating service innovation.

The exploration of the nature and role of knowledge in relation to employees' individual innovative behaviour leading to initiating innovation was achieved by detailed assessment of micro cases, which are critical incidents of innovation projects. The

evidence that emerged from the two cases researched distinguished between two types of knowledge as *prior knowledge* and *dependent knowledge* that together play an ancillary role to the interlinked process of idea generation and development aspects of the service innovation. As previous research has suggested, idea generation involves the retrieval of knowledge from the long-term memory, and the combination of various aspects of existing knowledge into novel ideas (Mumford *et al.*, 1991; Ward *et al.*, 1997; Nijstad and Stroebe, 2006) and postulates the importance of *Prior Knowledge* for idea generation (Baron, 2006; Grégoire *et al.*, 2010; Shane, 2000). This study also confirms the ancillary contribution of *prior knowledge* to idea generation and development and also adds a further category as *dependent knowledge* which supports the development of a new idea in accordance with context peculiarities.

The objective to unravel patterns of employees' innovative behaviour in relation to knowledge contributing to the interlinked process of idea generation and development was also achieved by highlighting four behaviour patterns. This has added insight in explaining service employees' participation in initiating innovation and addressed the behavioural perspective of innovation (Janssen, 2000) in the personal-interactive service context.

6.1. Case Comparison

In both case studies, it was remarked that prior knowledge supported idea generation and development by inspiring individuals' innovative behaviour to come up with new ideas. The acquisition of prior knowledge started before an idea was initiated and even before commencing employment at the hotel. Formal prior knowledge acquisition continued after induction training through corporate education and training. In both cases, management arranged training programmes and personal development plans after employees received the initial induction training and starting employment. However, in Case I a further diversity of programmes was offered for employees' learning and development.

It was similarly highlighted in both case studies that employees also elected to take up training programmes that were not organised by the hotel management. The perceptible difference between the two researched case studies was that the human resources department in Case II followed more consistent corporate guidelines to encourage employees' informal prior knowledge acquisition.

Dependent knowledge acquisition was recognised as another form of formal ancillary knowledge acquisition in both cases, that emerged after identifying the idea, and which is gained with the aim of developing the initial idea into a form of innovation. Formal dependent knowledge acquisition activities in both case studies were mainly management mandated and determined by the innovation project team, where the methods exercised to acquire dependent knowledge were also decided by the innovation project team.

On the other hand, acquiring dependent knowledge through informal individual means similarly developed at an earlier stage of idea generation and development in both cases. The aim of informal dependent knowledge acquisition was mainly to develop the idea initiative into a presentable form before reporting the idea to the management. Informal dependent knowledge acquisition progressed through diverse methods in both case studies; employees acquired dependent knowledge through dissimilar methods depending on contextual factors and on the type of knowledge required to develop the generated idea.

The main difference between the two researched case studies in relation to formal knowledge integration was that Case II owning company had a central department for managing customer knowledge and insight. However, while conducting the research in Case II there was no evidence detected of direct involvement by this department in managing innovation projects.

Informal communication emerged as a predominant method to integrate knowledge in both case studies. Employees shared knowledge through informal interaction with each other and with other individuals who came from outside the hotel environment. In the Case II, the Social Committee distinctly facilitated informal integration of knowledge by encouraging informal communication and innovation groups' formation. Innovation groups similarly emerged as a dominant informal method to integrate ancillary knowledge in both cases, and helped to integrate knowledge at the local, intra-organisational and external levels.

6.2. Management Implications

Amid the managements' efforts to promote teamwork and coordination between employees within the two researched case studies was the encouragement of communication and social interaction between employees. Communication and social interaction between employees was also encouraged to eliminate the traditional bureaucratic barriers that inhibit communication between the hotel management and

employees of junior positions. Furthermore, and in relation to individual innovative behaviour, the social interactive environment of the hotel services workplace implied that a large proportion of knowledge sharing was facilitated through social interaction between the hotel employees on one account, and the hotel guests and the surrounding social environment on the other.

Informal dissemination of knowledge through informal network relationships was detected in both case studies. Employees in both hotels created informal networks and links with other employees, and even with other individuals who did not work in the same hotel. The entailed advantage of informal networks was that unlike formal mechanisms, knowledge integration was facilitated with less bureaucratic barriers and more diversity in knowledge sources.

It is proposed that forming informal innovation networks should be encouraged at two levels: (1) at the corporate level to interlink employees from the hotel property and other employees from other company associated hotels, and employees from regional management and head office, and (2) at the hotel property local level to interlink the hotel employees with individuals from the surrounding environment. The management role in encouraging the creation of informal networks would not be expected to achieve much progress by directly mandating these networks, rather it would be the management's support and appreciation of building ties and relationships that will create the appropriate environment to form innovation networks.

Maintaining the essence of the previous discussion, it is expected that direct management intervention in processing informal communication and integration of knowledge may not always be realistically attainable; rather the management role could be more effective in creating an incubating environment for informal communication. The following practical steps are proposed to encourage informal knowledge integration:

i. Cross-training

The valuable opportunity to share knowledge through cross-training should be effectively exploited at both inter-hotel and intra-organisational levels; the interaction between employees during cross-training proved to allow direct integration of knowledge, and also encourages forming informal innovation networks. Fundamentally, it is advisable to increase cross-training sessions at the intra-organisational level and

broadening up the trainee selection criteria to include members of executive and non-executive positions to create innovation networks with more diversity among its actors.

ii. IT Integration

Integration of ideas and knowledge through corporate intranet was another dominant method throughout the research. The utilisation of information technology integration was mainly to disseminate corporate literature and standards on the one hand, and to upload management performance reports on the other. Further investment in the corporate cyber infrastructure to allow informal interaction between employees at both the intra-organisational and inter-hotel levels is recommended.

The inadequate usage of corporate intranet by non-executive employees within the two researched case studies should be increased by the appropriate means to increase informal interaction and communication between employees. A suggested method to realise this objective is by creating corporate Internet blogs and social interactive Internet web pages, and also by creating the incentive for employees to communicate with each other through such methods.

6.3. Research Limitations

The applied research methodology was the most appropriate to achieve the aims of this research; the complex relationships and patterns related to the case studies required closer assessment and observation that were best attained through case study methodology. Further thorough examination was needed to obtain detailed explanations of events and behaviour patterns related to employees' innovative behaviour, and this was best possibly achieved by applying qualitative research methods. Yet, there were also drawbacks and limitations to consider when appraising the validity of the research methodology used, and some of these limitations may be considered as traditional or unavoidable. In general, the limitations associated with the research methodology can be highlighted under two headings: the *Problem of Sampling* and the *Problem of Generalisation*.

Despite that the sampling strategy adopted a balanced approach in selecting employees from all levels of the management hierarchy, criticism may still be raised in both studies over the selective criteria, based on interviewing employees involved in critical incidents or innovation projects. The critical viewpoint would raise the concern

that the selective criteria may produce a biased outcome and therefore may advocate for random selection of interviewees.

On another account, the involvement of the human resources departments in short-listing the appropriate interviewees in both case studies may be perceived as another reason to raise additional concern over the biased selection of interviewees. Despite that, it would have been extremely difficult for the researcher to identify the most suitable interviewees without the relevant information provided by the human resources departments, and despite this, it could still be argued that the human resources departments would only provide the information that would reflect employees' efficiency.

The problem of generalisation is one of the classical problems associated with case study methodology at large. The precept of this critical view is the inability of case study research to provide justifiable generalisations or causal laws (Yin, 1994). Despite that case study methodology may generally provide thorough and useful insights in exploring complex human behaviour patterns, its findings are very often unique to the population researched, and sometimes do not distinguish between what is unique to the case and what is common to the class of events as a whole (Achen and Snidal, 1989).

The application of comparative case study methodology and the triangulation of evidence by investigating micro case studies and implementing other triangulation methods are very likely to strengthen the validity of findings in this research. However, reservation and criticism may still arise in regard to producing universal generalisations and causal laws based on investigating a limited number of case studies.

7. Conclusions

The outcome of the research distinguished between two types of ancillary knowledge: *Prior Knowledge* and *Dependent Knowledge*. *Prior Knowledge* consisted of the previous collective life time experience that helps individuals identify ideas for innovation, while *Dependent Knowledge* is contextual and acquired with the aim of developing the identified idea into a form of services innovation. The relationship between knowledge and the interlinked process of idea generation and development was discerned as inseparable.

Four patterns of ancillary knowledge related behaviour were identified to support idea generation and development during the conduct of research: *Formal Ancillary Knowledge Acquisition*, *Formal Ancillary Knowledge Integration*, *Informal Ancillary Knowledge*

Acquisition and Informal Ancillary Knowledge Integration. It is important to mention that not all employees equally participated in the four mentioned activities, the level of involvement and participation varying from one context to another depending on individual and motivational factors.

The review of previous literature reveals significant paucity in research on knowledge implicated within service innovation. Most relevant studies address the relationship between knowledge and service innovation from knowledge intensive business services KIBS perspective and less evidently consider other subsectors of the service industry, such as personal-interactive services that involve a significant level of interaction between employees and service customers.

The study makes the following contributions; first it introduces a theoretical framework related to the nature and ancillary role of knowledge in personal-interactive services. A novel classification of two types of knowledge is presented for future assessment and research in service innovation. Secondly, the study provides new insight into the relationship between knowledge and service innovation in personal-interactive services that have been mainly addressed in knowledge intensive business services KIBS.

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Appendices

Micro Case I: 20 Steps Cleaning Sequence

The '20 Steps' cleaning sequence is a system of practice implemented by the housekeeping department to clean the hotel rooms. The main objective for applying this system of practice was to enable better control and efficiency of room service attendants' performance when cleaning rooms.

According to the housekeeping department manager, *'before we had the 20 Steps cleaning sequence, we had problems with applying some kind of order for how should the room service attendants clean the hotel rooms. Some attendants were really good and finished cleaning rooms in shorter time, while others needed more training and attention. The problem was that despite we trained the attendants to follow cleaning guidelines, each attendant used his own way of cleaning. Therefore there was a need for some kind of system to use for measurement and correction'*.

By having a structured order for the cleaning steps it was easier to estimate the time the attendants spent on each step, and then identify the weakest areas of performance. It was also possible for the housekeeping department manager to make sure that the attendants followed the right cleaning order by reviewing the room cleaning record sheets signed by the room attendants and the housekeeping supervisors. Both the department manager and one of the housekeeping supervisors confirmed that after applying the '20 Steps' cleaning system they experienced less complaints from the hotel guests and more efficiency in how the attendants carried out room cleaning.

The idea for the '20 Steps' cleaning sequence came from a trainee hotel manager, while he was attending a training programme at the hotel before joining another hotel property as a general manager. The housekeeping department manager and the trainee general manager connected through idea/knowledge exchange relationship (innovation group), when the housekeeping department manager sought advice from the trainee manager about the problems she had with room cleaning.

The trainee manager suggested the '20 Steps' cleaning system that he knew about while he was previously working for another hotel company, and provided the housekeeping manager with further details in the form of training literature and other printed material (prior knowledge). The housekeeping department manager raised the issue with the hotel manager during the heads of departments' weekly meeting, and the management team appointed a project team including the hotel manager, the trainee manager, the housekeeping department manager and two housekeeping supervisors. The project team decided to delegate the trainee manager to train the room service attendants on the '20 Steps' cleaning system, and after completing the training the system was implemented for a trial period. The cleaning system was eventually approved by the hotel general manager after the housekeeping supervisors reported positive results.

Micro Case II: Family Rooms

Family rooms were designed to accommodate hotel guests accompanied with their children; the rooms were larger than the typical hotel room size and included one double bed, two children's beds and a baby cot upon request. The children's entertainment section of these rooms included Lego toys, a Sony Play Station console connected to a flat screen TV that could also be used to view a package of children's TV channels. The adults' section of the room had its own flat screen TV, a laptop work station and a larger than average refrigerator that was also used to preserve children's drinks and snacks.

The idea of family rooms came to the fore after numerous requests were received expressing the hotel guests' need for children's beds to be placed in the standard deluxe rooms instead of having to split the family between two rooms and having to pay for an extra room. The options available to the hotel guests accompanying children were to either book a hotel suite (minimum cost €700 per night) or book one of the suite apartments that were booked for a minimum period of seven days and did not have all the amenities of the hotel rooms.

The general manager of the hotel took notice of the guests' requests and concluded that there was an opportunity to convert some of the hotel's executive suites into larger rooms to accommodate family guests with children. According to the hotel general manager, *'we have realised that a large proportion of our guests were family holiday makers accompanied by their children. In the typical case a family of four people, two adults and two children, had to be split between two rooms. Some guests requested to include children beds in the same room, but that was only possible if they were accompanied by only one child due to the size of the room. The executive suites that we had weren't selling very well at that time so we thought why don't we make use of some of the suites and convert them into bigger rooms for families'*.

The general manager of the hotel advised the rest of the hotel's executive committee members in the weekly meeting about the rising demand for children's extra beds and proposed converting 15 of the hotel's executive suites into family rooms. The decision then was made to appoint a project team to study the feasibility of the general manager's idea and it was agreed that it would be very important to take into consideration guests' insights in the design of the family rooms. The project team included the hotel general manager, the revenue manager, the maintenance department director, the sales and marketing department director, and two other employees to undertake the guest insight research.

The sales and marketing department director suggested inviting family hotel guests to attend brainstorming sessions for the proposed room designs. A selected sample of returning guests and loyalty programme members were invited to attend the sessions and were asked to participate in making comments on a number of prospective room designs prepared by an interior architectural design company. In addition, the hotel general manager informally consulted the general manager in Rome hotel about the general pricing structure of the Family Rooms and the appropriate marketing channels and market sector to be targeted.

The guests' preferences and remarks were considered in the final room design and a proposal of the room layout, room booking price and a marketing communication strategy for the family rooms was introduced to the hotel's management team, where the proposal was thoroughly

Understanding Eco-Innovation Evolution: A patent Analysis in the field of Low-Carbon Technologies

Vito Albino

Department of Mechanics, Mathematics and Management
Polytechnic of Bari
182 Viale Japigia, Bari, 70126, Italy.

Lorenzo Ardito*

Department of Mechanics, Mathematics and Management
Polytechnic of Bari
182 Viale Japigia, Bari, 70126, Italy

Rosa Maria Dangelico

Department of Computer, Control and Management Engineering
“Sapienza” University of Rome
26 Via Ariosto, Roma, 00185, Italy.

Antonio Messeni Petruzzelli

Department of Mechanics, Mathematics and Management
Polytechnic of Bari
182 Viale Japigia, Bari, 70126, Italy.

* Corresponding author

Structured Abstract

Purpose – We aim at offering a deeper and more complete perspective on eco-innovations’ development in the field of low-carbon technologies, across different types of technological classes, geographical areas, industries, and considering a large time period. Accordingly, we aim at providing a comprehensive and unique overview of the evolution, and related policy initiatives, of a wide category of eco-innovations, namely low-carbon technologies. These are playing a crucial role in the current socio-economic agenda, given their capability of improving energy security, emission reduction, environmental protection, and economic growth.

Design/methodology/approach – We employed patent data to investigate the main dynamics characterizing the evolution and development of eco-innovation. Specifically, we searched for patents granted at the U.S.PTO. and belonging green energy technological classes, as identified by the IPC Green Inventory. Thus, we identified 131,809 patents filed from 1946 to 2010. For each patent, we then collected most relevant

bibliographic information. By using this unique database, we depicted eco-innovations' development trends and identified countries and organizations more involved into these innovative activities. Furthermore, we related these descriptive statistics to low-carbon technologies evolution with relevant national and international environmental policies and programs, hence building a comprehensive picture of the main environmental actions undertaken over time.

Originality/value – To our knowledge, this study is the first one that depicts a comprehensive scenario of eco-innovation evolution. Furthermore, it is based on a wide dataset allowing us to address this issue in such a complete and deep manner. Indeed, it covers all the main technological categories and their subclasses in the energy field. Thus, compared to previous studies, we have more deeply analyzed the differences among various types of eco-innovation. In addition, we collected patents filed from 1946 to 2010, hence tracing the entire history of energy eco-innovation's development starting from its origins. Furthermore, the considered patents are granted to organizations localized all over the world. Thus, not being referred to a bounded geographic region, this study captured the differences among countries' innovative capabilities.

Practical implications – This study allows both policy makers and companies to better understand the complexity characterizing the eco-innovation evolution in the field of low-carbon technologies, hence highlighting political and commercial determinants of their development, as well as how and to what extent countries and organizations have addressed their innovative efforts towards sustainability objectives. Accordingly, it provides new insights to set out future directions for eco-innovations' development. Particularly, it is suggested to plan adequate investments in research and development activities and technology transfer programs, as well as to establish new energy policies in order to set a political and economic environment by which technical, economic, and political knowledge could be better integrated in order to follow both environmental, business, and social needs.

Keywords – Eco-innovation; patents; low-carbon energy technologies; environmental sustainability; environmental programs.

Paper type – Academic Research Paper

1. Introduction

During the last years, the concept of eco-innovation (e.g., Rennings 2000) has attracted an increasing attention across many countries all over the world as a mean to address both economic and environmental priorities (Linton 2013). Since the Brundtland Report (WCED 1987), where the concept of sustainable development was first presented, an increasing demand for a new vision on innovation was claimed (OECD 2012; Rennings 2000). In addition, following the Brundtland Report, environmental protection should not be considered as a limit to the economic growth, but rather as a necessary condition for a long term development. Moreover, technology is deemed as the basis of

the economic growth, providing the means to act smarter and more sustainably, hence fostering the transition towards an environment-oriented lifestyle and low-carbon systems in industrial sector such as transport, energy, and waste treatment (European Commission 2006; McJeon et al. 2011). Thereby, technology seems to play a strategic role by influencing environmental impacts, risks, and costs (Kotha and Orne 1989; Shrivastava 1995; UNEP 2003), as revealed by a number of initiatives undertaken by international organizations, such as the Organisation for Economic Co-operation and Development (OECD) and the United Nations, which have recently introduced programs to deeply study the eco-innovations' development. For instance, in 2008 the OECD launched the "Green Growth and Eco-innovation" project, with the aim to better understand how innovation can result into new technological and systemic solutions for facing global challenges and leading the industrial system towards a sustainable growth (OECD 2008, 2010; Linton 2013;).

In this paper, we aim at studying the evolutionary trends of a specific type of eco-innovation, which has been demonstrated to play a key role in fostering sustainable development and business innovation (Sun et al. 2008), namely low-carbon energy technologies. Nowadays, these technologies are recognized as fundamental means to reduce the cost of stabilizing atmospheric carbon dioxide concentrations and lower the final cost of meeting environmental policy objectives (McJeon et al. 2011; IEA 2012), as well as to improve energy security, emission reduction, environmental protection, and economic growth (Nuttal and Manz 2008; Harmon and Cowman 2009; Palma and Coletta 2011). Nevertheless, although increasing environmental programs and initiatives, the diffusion of low-carbon energy technologies still remains limited, being largely dependent on public intervention (Johnstone, Haščík, Popp 2010; Demirel and Kesidou 2011). In this context, while several scholars have devoted their attention to define, classify, and measure eco-innovations (e.g., Demirel and Kesidou 2011; Kesidou and Demirel 2012), to our knowledge, a complete picture of the eco-innovative efforts undertaken by both companies and countries over time is still lacking. Thereby, this paper aims at developing a comprehensive overview of the low-carbon energy technologies' evolution. To this aim, we contribute to the extant literature by building a unique database of 131,801 patents granted at the United States Patent and Trademark Office (U.S.PTO) from 1946 to 2010 and belonging to the green technological classes "Nuclear power generation", "Alternative energy production", and "Energy conservation", as described by

the International Patent Classification (IPC) Green Inventory classification. For each patent, we retrieve several data, such as assignees and inventors details, technological classes, backward citations, scientific references, and forward citations. Then, we present an overview of patents' development trends and identify countries and organizations mainly engaged in these innovative activities, as well as describe the most relevant actions undertaken by both private and public organizations in the eco-innovation evolution process. Finally, we provide some insights on the most valuable patented inventions in the field.

The paper is structured as follows. In the next section, we discuss the use of patent data as proxy for analyzing technology development and present a brief literature review on eco-innovation. Then, the third section presents the data collection methodology and the sample. The fourth section contains descriptive analyses on the patenting activity and possible explanations for these results. Finally, discussion, implications, and conclusion are presented.

2. Theoretical Background

2.1. Defining eco-innovation

The big global challenges posed by the growth rate of the human-induced climate change, as well as the sustainability goals recently set, such as Europa2020 targets (European Commission, 2010), have led to the need to redefine the concept of innovation (Rennings 2000; OECD 2012). In fact, the term “innovation” is generally referred to the implementation of a wide range of new products, processes, or organizational methods (OECD 2005) without focusing on the related environmental impacts. Differently, sustainability issues aim at boosting innovative activities towards sustainability objectives (Rennings 2000; OECD 2012). Indeed, despite it has been widely recognized that innovation is the central issue in economic prosperity (Hargroves 2005), nowadays innovation is more and more considered as the key factor to pursue sustainable development targets while continuing to promote competitiveness as well (Nidumolu, Prahalad, Rangaswami 2009; OECD 2011). Accordingly, the concept of eco-innovation has rapidly gained much attention across both policymakers and researchers.

In the literature, different definitions of eco-innovation have been proposed and different terms have been adopted interchangeably (e.g., eco, green, environmental, or

eco-friendly innovation). Nevertheless, despite a wide range of definitions, some common features emerge, highlighting that an eco-innovation is an innovation that primarily contributes to reduce environmental impacts and open new sustainable pathways in the market (e.g., Arundel and Kemp, 2009; Fussler and James, 1996; OECD, 2009a). In particular, several debates on eco-innovations have focused on topics that directly address environmental technologies (European Commission 2004; Stern 2007), recognized as the keys to guarantee the co-existence of economic growth and environmental progress (Shrivastava 1995; OECD 2000), in turn defined by the European Commission (European Commission 2004, 2) as “[...] all technologies whose use is less environmentally harmful than relevant alternatives. They include technologies to manage pollution (e.g., air pollution control, waste management), less polluting and less resource-intensive products and services (e.g., fuel cells) and ways to manage resources more efficiently (e.g., water supply, energy-saving technologies)”. Specifically, technologies aimed at reducing Greenhouse Gas (GHG) emissions and energy consumption, as well as technologies devoted to restructure the global energy system (e.g., solar cells, electric engines) have been deemed to play a crucial role in fostering sustainable development and business innovation (e.g., Messeni Petruzzelli et al. 2011). Accordingly, in this paper we analyze a specific type of eco-innovation, namely low-carbon energy technologies, discussing their evolutionary trends across countries and organizations and the impact exerted by related policy initiatives and events on their emergence and development.

2.2. Patents as measure of eco-innovation

In the last years, both academics and policymakers have made an increasing use of patent data as a source of information for analyzing innovation activities. Indeed, patents have a close link to economic relevant inventions (Dernis and Guellec 2001), as well as they have been recognized as strongly correlated with other indicators of innovative activity, such as R&D expenditures and new product introduction (e.g., Comanor and Scherer 1969; Griliches 1990; Hagerdoon and Cloudt 2003). Furthermore, patent data are publicly available for a long time series and provide a number of valuable information on the technological content, geographical location of assignees and inventors, and citations made and received by the patent.

Accordingly, in the literature, there are many examples of using patent data to study eco-innovations (e.g., Oltra, Kemp, de Vries 2010) and their evolution. For instance, Pilkington and others (2002) used a sample of 268 U.S. patents in the IPC class “Electric propulsion with power supplied within the vehicle” (IPC code B60L/11) in order to analyze the development of the electric vehicle. Brunnermeier and Choen (2003) provided evidences on the increased development of eco-innovations by U.S. manufacturing firms, as reflected by patent count, in response to the increment in pollution abatement expenditures, especially in internationally competitive industries. Sun and others (2008) analyzed the temporal and spatial distribution of eco-patents in China. In particular, the authors found that the development of environmental technologies is particularly relevant in the East of China, where they have shown an increasing application of new patents, although still lagging in a global perspective. In addition, Oltra and Saint Jean (2009) used patent applications in order to understand the competition among companies in the development of engine technologies for low emission vehicles. The OECD (2011) included patent data in its study to analyze environmental technologies’ diffusion and transfer. Finally, Leu and others (2012) studied the patenting activity in the field of bio-fuel and bio-hydrogen energy from 2000 to 2011 through the use of patent bibliometric analysis. These studies, however, offer a partial scenario to policymakers and companies in explaining the main dynamics underlying eco-innovation evolution. Principally, they refer to small samples of patents, which could be not so relevant to bring out significant results. Furthermore, they refer to a bounded geographic area or a limited time period, which cannot allow to depict a complete scenario of innovative efforts in eco-innovations’ development. Finally, most studies focus their attention to a specific sector or technological class, so limiting the generalizability of their outcomes.

Our paper extends previous studies through the creation of a wide and unique database that collects all patents related to eco-innovation activities in the energy field by including all the main technological energy-related categories and their subclasses. Hence, this allows us to more deeply analyze the differences across various types of eco-innovation. In addition, our database collects patents filed from 1946 to 2010, hence giving us the possibility to trace the entire history of eco-innovation’s development in the energy field starting from its origin. Furthermore, the considered patents are granted to organizations spread all over the world, thus making us able to capture differences among countries and

organizations' eco-innovative capabilities. Finally, we also offer a nuanced picture of breakthrough eco-innovations in the energy field.

3. Data and Methodology

We employ patent data to investigate the main dynamics characterizing the development of eco-innovations, as well as their breakthrough nature. Differently from previous studies, we refer to the IPC Green Inventory in order to collect patented technologies providing environmental benefits, rather than adopting other less rigorous approaches as those based on keywords (Oltra and Saint Jean 2009; Leu, Wu, Lin 2012). These, in fact, may suffer from a number of drawbacks, as unobserved heterogeneity and failure to capture the dynamism of the technologies under investigation, making these search strategies less reliable than the employment of wide and largely accepted technological classifications. The IPC Green Inventory was launched in 2008 by the World Intellectual Property Organization (WIPO) in the attempt to create a concordance between the IPC classification and Environmentally Sound Technologies (ESTs), as defined during the Rio Earth Summit in 1992 (Agenda 21, Chapter 34). Accordingly, the IPC Green Inventory takes into account seven different technological classes, in turn divided into hierarchical sets of subclasses. Each subclass is linked with the most relevant IPC code(s), as identified by a panel of experts¹. In particular, we considered the classes related to the energy field, namely, “Nuclear power generation”, “Alternative energy production”, and “Energy conservation”. This approach allows us to rely upon consistent and rigorous criteria to identify low-carbon energy patents and provides a large sample upon which conducting our analyses.

Then, we searched for patents granted at the U.S.PTO. and belonging to the selected technological classes. Thus, we identified 131,809 patents granted from 1946 to 2010. For each patent, we collected relevant data, such as title, filing date, issue date, number of claims, number of backward, forward and scientific citations, inventors and assignees' details (name, city, state, and country), and technological fields. To identify breakthrough eco-innovations we used patent forward citations, which have been widely adopted in the literature to assess innovation value and impact (e.g., Singh and Fleming, 2010). Indeed, patent citations are largely employed to evaluate differences in patent quality, especially

¹ See <http://www.wipo.int/classifications/ipc/en/est/>

in large datasets where in-depth qualitative evaluations of individual patents are very hardly (NREL 2011). Nevertheless, the literature has questioned the use of forward citations, by noticing that older patents are more likely to be cited than younger ones (e.g., Hall, Jaffe, Trajtenberg 2001), hence calling for solutions to avoid such a bias. Accordingly, we calculated the citation rate per year in order to reduce the effect of patent age. Furthermore, comparing the samples sorted by citation rate and number of forward citations (top 1, 3, and 5 percent of our sample), we found at least in the 90% of cases the same patents for each category, hence increasing our confidence in the selection criteria. To conduct out analyses we considered the top 5% most cited patents as breakthrough technological innovations (e.g., Singh and Fleming 2010).

4. Analysis and Results

In this section, we provide a comprehensive overview of eco-innovation evolution in each technological class, by focusing on the development trends of patented low-carbon energy technologies. Specifically, we used patent count as a measure of the innovative effort (Zoltan, Anselin, Varga 2002; Singh, 2008), the average number of scientific citations to approximate the willingness of inventors to build upon science (e.g., Narin, Hamilton, Olivastro 1997; Meyer 2000; Czarnitzki 2001; Callaert et al. 2006), the number of forward citations as a proxy of the quality and subsequent impact of an invention (e.g., Singh and Fleming 2008), the main assignee information to analyze development trends at organization level, and, finally, the main inventor state in order to proxy the geographical origin of an invention (Sharif 1986; Deyle and Grupp 2005). As time scale, we used the filing year, since it better captures the invention development period than the issue year (Verspagen and Loo 1999). However, the time lag between application and issue may be even large. Hence, patents filed more recently generally have less likelihood to be granted at the time of data retrieval. Thus, the last ten year analysis is used more for comparison than for an actual trend evolution analysis. Finally, we also referred to major environmental programs and geopolitical circumstances in order to better understand evolutionary trends of low-carbon energy technologies as the result of national and international policies, as well as to highlight historical events and private sector initiatives that may have fostered such innovations.

4.1. Nuclear power generation

This main class is divided into two different subclasses. However, the second subclass (“Gas turbine power plants using heat source of nuclear origin”) has only a negligible contribution in explaining the nuclear energy eco-innovation evolution, as revealed by the low share of patents (0.3% of the total amount in the field). Thereby, we analyze “Nuclear power generation” technologies without differentiating the two subclasses.

Figure 1 presents the patenting application activity since 1946, as measured by patent count per year, both globally and per different geographic regions (U.S., Europe, Japan, and BRIC - Brazil, Russia, India, and China). The global trend (indicated by “ALL”) shows a sharp growth of the number of patents in the 1970s. Furthermore, almost all the analyzed countries contribute in the “Nuclear power generation” technological development in its first coming, except for BRIC. This trend could be explained by examining geopolitical issues occurred in those years. In fact, while nuclear energy and nuclear weapons technologies were closely related to military aspirations during World War II, since mid-1950s some governments started to reorient countries’ resources towards the development of nuclear power plants for commercial purposes. Thus, such commercialization efforts pushed organizations in protecting their inventions to gain greater profits. In addition, in 1967 the Arab-Israeli War (also known as Kippur War) caused a serious petrol crisis, when the Organization of Arab Petroleum Exporting Countries (OAPEC) proclaimed an oil embargo. Thereby, Western countries increased their investments in nuclear power, in order to face such an energy crisis (Anadon 2012). A number of reactors, in fact, came about all over the world. To name few examples, in 1971 diverse commercial nuclear power plants were in full operation in the U.S.. Also European countries, such as France, Italy, Germany, and UK, saw the birth of many reactors in those years. Particularly relevant was the action taken in place by the French Prime Minister Pierre Messmer in 1974, when he declared the so named “Messmer Plan” with the aim of generating from nuclear power the whole France’s electricity need (Sovacool, Victor, Valentine 2012).

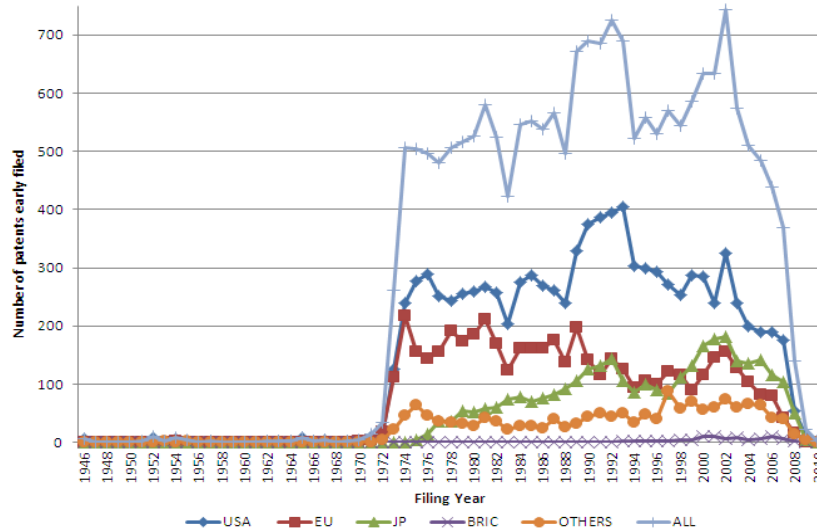


Figure 1. Trend of “Nuclear power generation” patent applications

Furthermore, the graph depicts an alternate patenting activity trend across the countries during the period from 1976 to the mid-1990s. Particularly, it reflects that patenting activity in Europe fell down immediately after 1988, whereas it grows in the U.S. and especially in Japan, which assumed a predominant innovative role in this field. Explanations may be identified in a number of different reasons that caused some concerns in the use of nuclear power, such as the reduction of the oil price in the early 1980s and some nuclear accidents, like the Three Mile Island incident in Pennsylvania in 1979 and the well-known Chernobyl disaster in 1986. Nevertheless, at global level the effects produced were not the same. In fact, while some countries drastically reduced their attention towards nuclear power and R&D efforts in the field, others continued to invest. For instance, nuclear energy was totally abolished in Italy by a public referendum in 1987. Moreover, at the end of 1989 the UK government stopped the build of nuclear stations, until a review of UK nuclear policy would be carried out, and in August 1986 Germany approved a resolution to abandon nuclear power within ten years. Differently, other nations still promoted nuclear energy. Indeed, the project International Thermonuclear Experimental Reactor (ITER) represents an important signal in that direction. ITER was a research and engineering project signed in 1985 by Soviet Union, the U.S., Japan, and European Union and launched in 1988 with the aim to have a full

scale production of electricity from power plants. Nowadays, the projects is still working and includes also South Korea (since 2003), India (since 2005), and China (since 2007).

Finally, Figure 1 depicts another increase in patenting activity starting from 1996, which seems to highlight a renewed interest in the nuclear power in Europe, Japan, and some other countries (e.g., South Korea and Israel). This probably finds its roots in the rise of developing economies that started investments in such a direction. Indeed, that period is recognized as “nuclear renaissance” just because of a new interest in the nuclear power industry driven by the rising of fossil fuel prices and environmental concerns (Nuttal 2005). Thereby, despite some incidents happened around the world, a third generation of reactor was developed during these years. In addition, in 1999, in the U.S. the Nuclear Energy Research Initiative (NERI) was established in order to foster collaborative researches in high technological nuclear solutions. Further, President George W. Bush signed the Energy Policy Act in 2005, which made significant changes in nuclear policy, fostering utility companies to establish more nuclear plants to cope with the country’s growing energy demand (Public Law 109-58 2005). More recently, other countries started nuclear energy programs, such as China, South Korea, and India that, as above mentioned, joined the ITER project. Finally, several states, particularly from Africa, are currently carrying on nuclear power programs in this “nuclear renaissance” scenario, mainly pushed by abundant uranium resources (OECD and IAEA 2006).

In Figure 2, we examined the global patent share across countries by trying to highlight the other relevant contributors. As noted in the previous graph, the three main actors are represented by the U.S., Japan, and European countries. Within European countries, France and Germany are the most innovative. Looking for other contributors, we checked for the BRIC innovative efforts, due to their significance in the current and future economic scenario. However, the analysis points out that they are still not so relevant in R&D activities in this specific field. Finally, we highlighted two other important actors, namely South Korea and Israel. While it is reasonable that South Korea may be involved in developing nuclear technologies due to its entry in the ITER project, Israel has no nuclear power plants, hence making these technologies mainly originated from researches conducted in the military field.

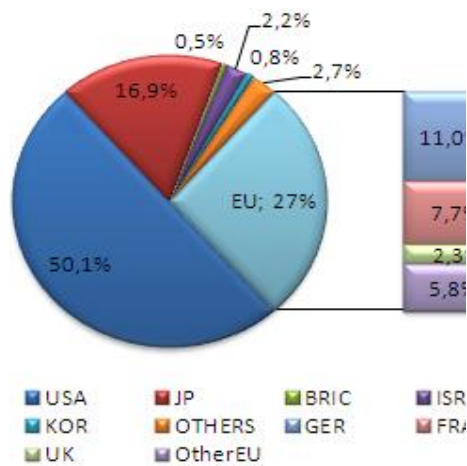


Figure 2. "Nuclear power generation" eco-innovation patent share by geographic area

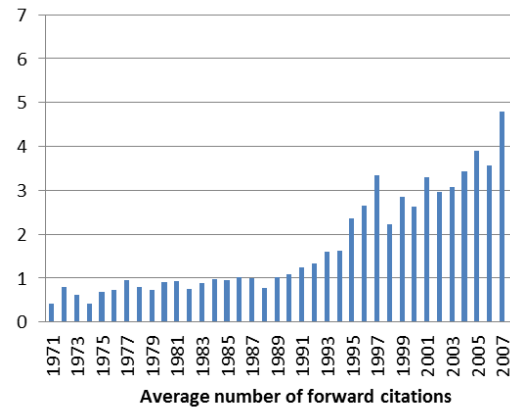


Figure 3. "Nuclear power generation" scientific citations analysis

By analyzing the citations' rate of scientific documents made by all patents, it turned out an interesting aspect of the innovation activity. Specifically, by looking at the graph shown in Figure 3, where the y-axis reports the average number of scientific citations made by all patents in a specific year, it is possible to note that, before 2002, inventors tend to cite only patent documents. Differently, recently, references made to scientific literature have grown. Thus, it is possible to observe how from 2002 organizations have changed their approach in research activities, shifting to a closer relationship between theoretical and applied research than in the past. In turn, this may depend on the strengthening of the link occurring between science and technology. This is in accordance with previous studies that highlighted the positive influence of basic science for economic growth (Jaffe 1989; Adams 1990) and new technologies' development (Narin, Hamilton, Olivastro, 1997). Main explanations have been recognized in the key role of science to foster technological advances by providing new technological ideas (Brooks 1994) and expanding firms' absorptive capacity, hence underscoring how the interplay between science and technology significantly impact on both individuals and organizations capability to successfully innovate (Dasgupta and David 1994; Cockburn and Henderson 1998; Fleming and Soreson 2004; Cassiman, Veugelers, Zuniga 2008). In particular, looking at nuclear technologies, this linkage could be referred to the need of new

materials and chemical processes that can meet safety and efficiency goals (U.S. Department of Energy 2006).

Figure 4 reveals the top ten organizations in terms of number of granted patents, operating both in public and private sectors. Each bubble identifies an organization and its dimension represents the number of its successfully filed patents. Furthermore, in each bubble it is inserted the flag of the country where the organization is located. In addition, other two measures were employed to enrich the analyses. In particular, the first one (x-axis) aims at indicating when an organization has undertaken the major efforts in developing nuclear technologies. Thus, we calculated the average year in which each company has filed its patents. The second one (y-axis), instead represents the quality of the inventive efforts as measured by the average number of forward citations in order to estimate the impact of organizations' innovations. Results point out two main aspects. First, as we mentioned earlier in the paragraph, public sector, mainly represented by the U.S. government and the Commissariat à l'Énergie Atomique, has a significant role in supporting and pushing these types of power generation method. The effort devoted by public organizations is largely focused in the first period of nuclear power commercial use, whereas later in time private companies have assumed a major role. This trend confirms the importance of public research in exploring innovative technological solutions, hence opening the doors towards their subsequent exploitation by the private industrial sector (e.g., Adams 1990; Mansfield 1991; Cohen, Nelson, Walsh 2002; OECD 2007). Second, high valuable patents are mainly owned by actors located in the U.S. and their innovative activity is concentrated before the 1990s; whereas after this cut-off point (maybe related to the Chernobyl accident) the development of nuclear solutions is quite homogeneous across Europe, U.S., and Japan, while the innovative quality and impact seem to decrease.

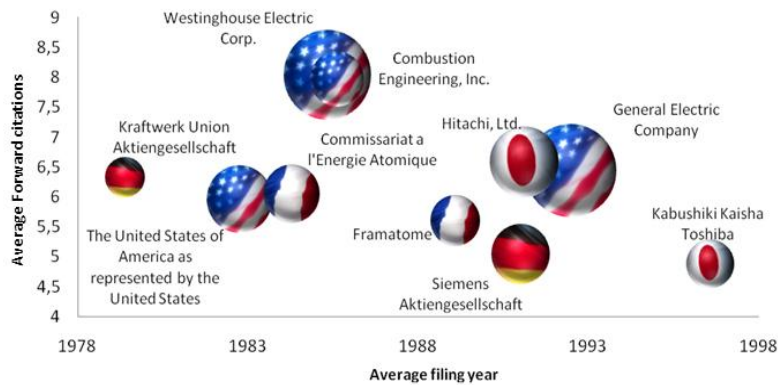


Figure 4. Top ten organizations in the “Nuclear power generation” class in terms of patent intensity (as represented by bubble size), period of the highest patenting activity (x-axis), and outcome quality (y-axis)

Finally, we also showed the temporal period when breakthrough eco-innovations in the “Nuclear power generation” class were filed, as well as their geographical distribution. Specifically, Figure 5a reveals that high valuable innovations are owned almost totally by the U.S. and European countries, being these pioneers in the adoption nuclear plants for commercial purposes. Furthermore, Figure 5b shows that breakthrough eco-innovations were all filed between 1955 and 1976, hence depicting a reduction of the innovation value after this period. A possible explanation may be related on the necessity to make previous solutions safer rather than develop really new ones. Indeed, organizations tended to be more focused on the exploitation of existing technological solutions in order to extend life and reliability of current reactors, enable nuclear energy to meet climate change goals, develop sustainable nuclear fuel cycles, and manage nuclear waste (I-NERI 2001).

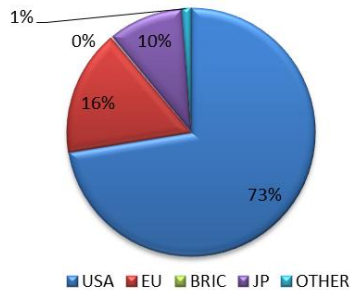


Figure 5a. “Nuclear power generation” breakthrough patent share by geographic area

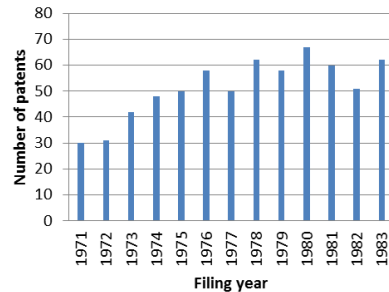


Figure 5b. “Nuclear power generation” breakthrough eco-innovation’s development trend

4.2. Alternative energy production

The IPC Green Inventory recognized 13 subclasses related to the “Alternative energy production” class. Firstly, we present the patenting activity as a whole without discerning the different subclasses. Then, we provide a brief analysis for each of them.

As shown in Figure 6, the global patenting activity (indicated by “ALL”) in the alternative energy field presents three clear different trends. It grew in the early 1970s. Then, it shows a slow decrease till the end of 1980s, after which a still growing trend is visible. As we noted in paragraph 4.1, the initial growing trend could be explained by considering the oil price shock triggered by OAPEC oil embargo that contributed to create awareness about the limits of global resources in respect of energy. Indeed, this concern attracted funds and concerted efforts for the development of new solutions through which untapped renewable resources may be harnessed on a large scale to partially replace the use of fossil fuels. The R&D expenditures for renewable resources were, in fact, equal to \$65 million in 1974, while they reached a peak of about \$2 billion in 1980 (Sellers 2004). In addition, Figure 6 depicts a common trend for each country under analysis.

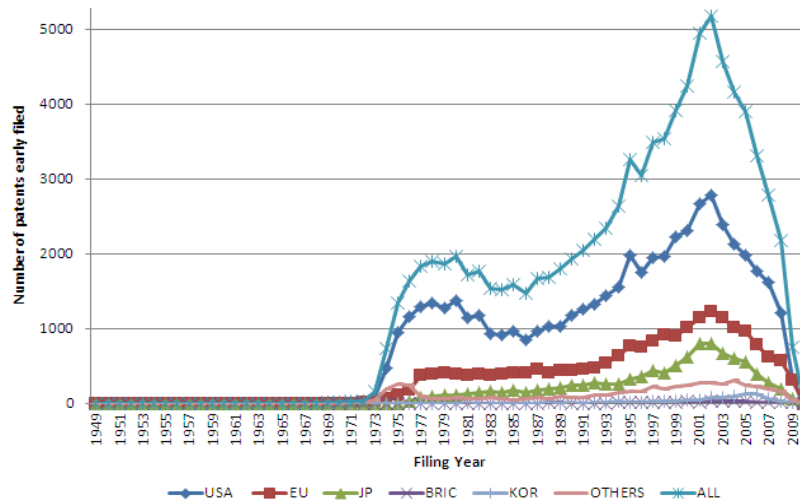


Figure 6. Trend of “Alternative energy production” patent applications

Nevertheless, the enthusiasm towards renewable energy went on through the mid-1980s, but after the oil prices fall, a season of stagnation lasted for almost two decades. As a result, R&D efforts collapsed to less than a third by 1987 (Sellers 2004). Furthermore, as we also showed in paragraph 4.1, the period from the mid-1980s to mid-1990s saw the pursuit of the investments made in nuclear power (Jacobson and Johnson 2000). Thereby, especially in the U.S., which more than other countries suffered from the oil embargo, after the Kippur war (1973), the innovative efforts towards alternative energy solutions drastically decreased. Finally, the increasing trend characterizing the last two decades can be reasonable explained by the perceived growing economic opportunities and the rising attention on climate change, as well as the scarcity of crude oil in the West countries. Indeed, several actions were made by different countries and organizations. For example, in 1988, the United Nations established the International Panel on Climate Change in order to assess the scientific, technical, and socio-economic information for understanding the risk of human-induced climate change. Furthermore, following what emerged during the United Nations Conference on the Human Environment (1972) on global environmental problems, several conferences took place in order to address the challenges of sustainable development and foster new innovative efforts regarding the improvement and renewal of national energy systems as well. To name some examples, the United Nations Conference on Environment and Development

(1992) addressed issues related to environmental, social and economic sustainability. Particularly, as an outcome of the conference, it was signed the Agenda 21, which highlighted the relevance of conservation and management of resources, as well as the importance of using and diffusing technologies with good environmental performances in several sectors, especially referring to energy issues. More recently, the Johannesburg Declaration on Health and Sustainable Development (2002) stressed over the concept of sustainable development and was particularly aimed at triggering actions to access “[...] to reliable, affordable, economically viable, socially acceptable and environmentally sound energy services and resources, taking into account national specificities and circumstances” (UN, 2002). Other international treaties, such as the Maastricht Treaty (signed in 1992), with the attempt to promote stable growth while protecting the environment, the Amsterdam Treaty (signed in 1997), and the ratification of the well-known Kyoto Protocol in 1997, further set the basis for a change in the energy system.

Figure 7 shows the leading countries in patenting alternative energy technologies. It emerges that the U.S., Europe, and Japan represent the most innovative countries. Differently, India, China, and Brazil are not among the top patenting countries, despite they strongly rely on clean energy (Lewis 2007; Levi, O’Neil, Segal 2010). This may suggest that those countries mainly adopt technology transfer systems, such as the Clean Development Mechanism defined in the Kyoto Protocol, and knowledge spillovers from developed countries to adopt alternative energy technological solutions, rather than being directly engaged in their creation (Koefoed and Buckley 2008; Schneider, Holzer, Hoffman 2008).

Figure 8 shows the linkage between basic and applied research. The graph depicts that, before 1991, patent references are mostly directed to patent documents. Differently, later on a high propensity in citing also scientific publications emerges. This is in accordance with some policy interventions taking place in those years. For instance, since the early 1990s the U.S. Department of Energy fostered basic research in the energy field to enhance technological development (EIA 1998). Moreover, starting from the same years, the Framework Program for Research and Technological Development, created by the European Union, funded projects in order to support and encourage research and technological development in the energy field. More recently, the International Science Panel on Renewable Energies and the Energy Innovation Hubs were established in order

to integrate worldwide research centers that combine basic and applied research and provide analysis and strategic guidance for renewable energy R&D activities.

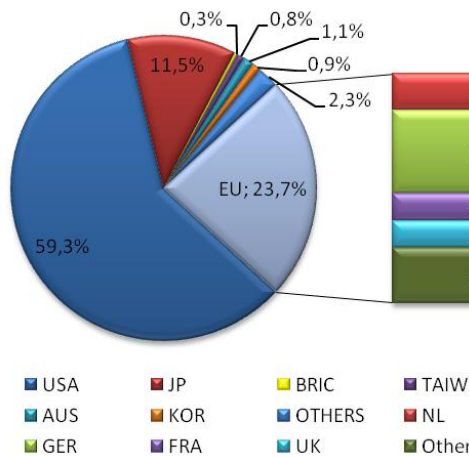


Figure 7. "Alternative energy production" patent share by geographic area

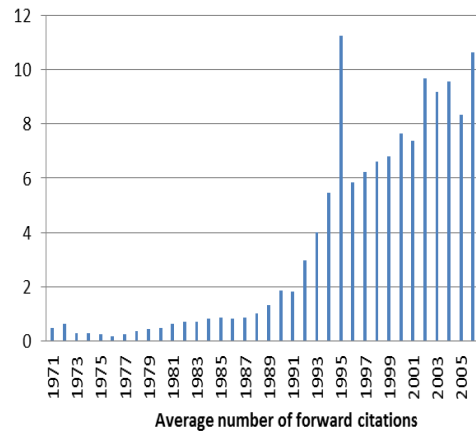


Figure 8. "Alternative energy production" scientific citations analysis

Following the same criteria used in the previous paragraph, we examined the top ten assignees by looking at the number of granted patents (see Figure 9). Firstly, the chart shows that, despite governments foster eco-innovative actions, no national institution seems to strongly affect the patenting activity in this class. Secondly, companies have mainly produced high cited patents at the beginning of the development phase, despite later a greater amount of technological solutions has been patented. For instance, it emerges that Pioneer Hi-Bred International Inc. and Monsanto Technology LLC present low quality inventions, despite they patent a lot compared to Hitachi Ltd. and Shell Oil Company. Explanations may depend on the fact that nowadays companies are exploiting established technologies instead of developing new ones. Finally, the figure also reveals that the University of California appears among the top ten organizations, hence confirming the fundamental role of research-based organizations (e.g., Saxenian 1994; Fabrizio 2009; Messeni Petruzzelli 2011). Figures 10a and 10b present where and when breakthrough eco-innovations have been developed, respectively. The former highlights that innovative efforts made in the U.S. figured out as the most relevant. The latter

confirms that the most valuable patents were filed between 1973 and 1979, representing the first stage of the technology’s development.

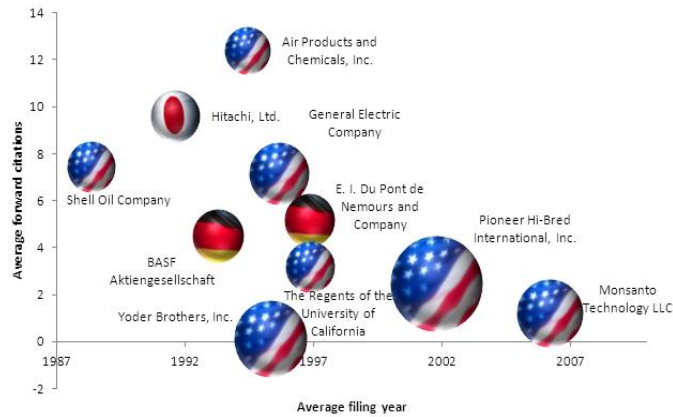


Figure 9. Top ten organizations in the “Alternative energy production” class in terms of patent intensity (as represented by bubble size), period of the highest patenting activity (x-axis), and outcome quality (y-axis)

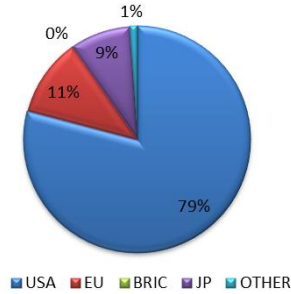


Figure 10a. “Alternative energy” breakthrough patent share by geographic area

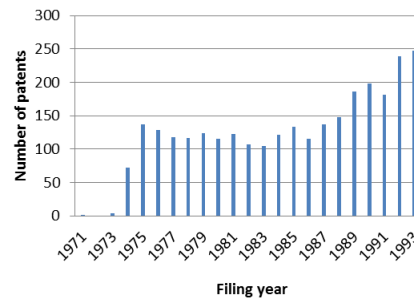


Figure 10b. “Alternative energy” breakthrough innovation’s development trend

We extended the analysis of “Alternative energy production” technologies by considering their specific subclasses. Specifically, we divided them into two different categories by distinguishing the term “renewable” from the wider “alternative”. Accordingly, we referred to renewable energy innovations as those that rely on resources that can be totally replaced or are always naturally available, as well as are practically inexhaustible (Gicquel 2011), as sunlight, wind, water, and geothermal heat. Differently, we considered non-renewable energy innovations as those solutions that

allow the production of energy without the undesirable consequences of the burning of fossil fuels, but still require physical and chemical processes. Tables 1a and 1b show the different subclasses of renewable and non-renewable energy technologies, respectively, and the related innovative activity both globally and within different geographic areas. Looking at Table 1a, it is worthy of note that renewable energy technologies only account for the 26.14% of all inventions and that the 18% of them is related to solar energy technologies. Furthermore, analyses depict that each country contributes in a similar way to the development of these innovations. Indeed, for each subclass, the U.S., Europe, and Japan are the leading innovative countries, while a scant contribution is provided by BRIC, Taiwan, Australia, and South Korea. Table 1b points out the relevance of bio-fuel technologies (46.73% of the overall eco-innovations) in the “Alternative energy production” technology portfolio. Probably, this is due to the need of replacing fossil fuels with solutions that do not suffer from the number of limitations linked to the production of energy by renewable sources, such as the variability of energy supply (Masini and Menichetti 2012) and the high level of required investments (Painuly 2001). In addition, innovative efforts’ distribution across countries is similar to that seen in Table 1a except for “Fuel cells” and “Geothermal energy” classes, where Japan is more innovative than Europe. This could be explained considering that most active geothermal resources are usually found along major plate boundaries where earthquakes and volcanoes are concentrated. Thus, Japan is actually a better candidate for this solution. In addition, the high development of fuel cells technologies was triggered by a government funded demonstration project involving multiple manufacturers, such as Panasonic, Toshiba, and Eneos, which was dedicated to supply the commercial market by installing over 5000 residential fuel cell systems to provide heat and power in homes. Nowadays, in fact, thousands of residential fuel cell systems are being sold in Japan (IPHE 2010).

Table 1a. Total patent share and percentage of patents owned by country for “renewable” technologies

<i>RENEWABLE TECHNOLOGIES</i>	<i>Patent share</i>	<i>U. S.</i>	<i>JP</i>	<i>EU</i>	<i>BRI C</i>	<i>TAIW AN</i>	<i>A U S</i>	<i>KO R</i>	<i>OTHE RS</i>	<i>Total by geographic area</i>
<i>Hydro energy</i>	4.23	55.38	14.09	23.53	0.42	1.44	0.73	1.65	2.75	100
<i>Ocean thermal energy conversion</i>	0.09	82.93	2.44	13.41	0	0	0	0	1.22	100

<i>(OTEC)</i>										
<i>Wind energy</i>	2.23	62.16	4.72	26.51	0.70	2.28	0.84	0.89	1.89	100
<i>Solar energy</i>	18.26	63.68	14.49	15.04	0.23	1.92	0.95	1.60	2.08	100
<i>Geothermal energy</i>	1.33	72.70	11.04	8.26	0.35	2.35	1.74	0.87	2.70	100
<i>Total</i>	26.14									

Table 1b. Total patent share and percentage of patents owned by country for “non-renewable” technologies

<i>NON-RENEWABLE TECHNOLOGIES</i>	<i>Patent share</i>	<i>U.S.</i>	<i>JP</i>	<i>EU</i>	<i>BRIC</i>	<i>TAIWAN</i>	<i>AUS</i>	<i>KOR</i>	<i>OTHERS</i>	<i>Total by geographic area</i>
<i>Bio-fuels</i>	46.73	57.23	7.57	29.74	0.36	0.30	1.64	0.50	2.66	100
<i>Integrated gasification combined cycle (IGCC)</i>	0.23	62.09	9.00	25.12	0.47	0	0	0	3.32	100
<i>Fuel cells</i>	9.61	55.27	26.06	14.51	0.24	0.49	0.38	2.03	1.01	100
<i>Pyrolysis or gasification of biomass</i>	2.37	60.28	6.57	29.28	0.37	0.28	0.61	0.23	2.38	100
<i>Harnessing energy from manmade waste</i>	11.13	65.77	10.25	20.84	0.22	0.54	0.40	0.76	1.22	100
<i>Other production or use of heat (OPoUH)</i>	0.58	52.38	24.00	19.05	0.38	0.19	0.19	1.14	2.67	100
<i>Using waste heat</i>	3.19	57.23	7.57	29.74	0.36	0.30	1.64	0.50	2.66	100
<i>Total</i>	73.86									

Following our distinction between renewable and non-renewable innovations, Figures 11a and 11b show how eco-innovations in the “Alternative energy production” class evolved. To better present these trends, we took into account the time period between 1970 and 2010, excluding the previous phase during which only 20 patents were filed. Figure 11a describes the evolutionary trend of technologies for producing energy from renewable sources. In particular, it reveals that all of them present an U-shaped trend, hence highlighting that, despite their environmental advantages, these technologies have not been used for a long time. In fact, their growing trend is visible during the oil shock, due to the need of new sources of energy, and, after that a number of environmental programs, such as the Kyoto protocol, have fostered the use of less polluting electricity production technologies. In particular, while “Hydro energy” and “Wind energy”

solutions initially received only a marginal attention, in the last few years the interest towards their use seems increased. For instance, in 2005 the Global Wind Energy Council was launched to provide a credible and international representative forum for the entire wind energy sector. Differently, Figure 11b depicts a steady growing development trend for all the different technological classes (except for “pyrolysis or gasification of biomass” that probably reached its peak in the maturity phase in the early 1990s). This trend may be reasonable due to the fact that those solutions have been principally promoted by the environmental concerns came up in the late 1980s to replace oil-based energy sources.

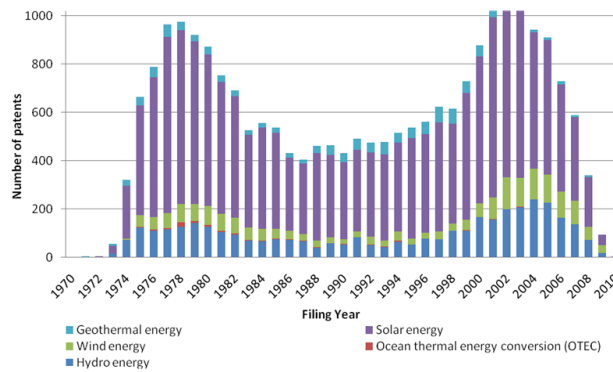


Figure 11a. "Renewable" technologies' development trend

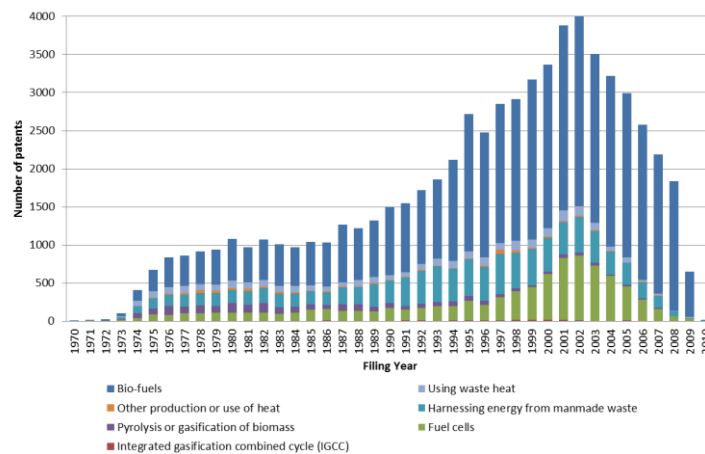


Figure 11b. "Non-renewable" technologies' development trend

4.3. Energy conservation

Reducing carbon emissions, as well as bridging the energy gap between energy production and consumption, let energy conservation practices receive an increasing attention in several countries (ES 2012). As made in the previous paragraph, we first present the patenting activity as a whole. Then, we provide a brief analysis for each subclass.

Figure 12 presents the patenting application activity since 1946, both globally and per different geographical regions. It shows that, before the late 1980s, the interest towards energy conservation technologies is not comparable with the innovative efforts made between 1970 and 1986 in the “Alternative energy production” and “Nuclear energy” fields (see Figure 1 and 5, respectively). In fact, only in the U.S., after the oil crisis, there is presented a slow growth of the innovative effort in energy conservation technologies, whereas a time of stagnation is depicted from 1976 till the end of 1980s. This could be explained by considering that, differently from the solutions developed in the other two technological classes, in this case innovative efforts are directed towards the reduction of energy consumption, rather than the exploitation of new energy sources. Thereby, the main exogenous shocks have probably not determined, at the global level, an analogous attention towards conservation energy issues. Indeed, only in the U.S. there were some government initiatives toward energy conservation, thus promoting spending on research, new laws, incentives, as well as the introduction of novel solutions (Wulfinghoff 2000).

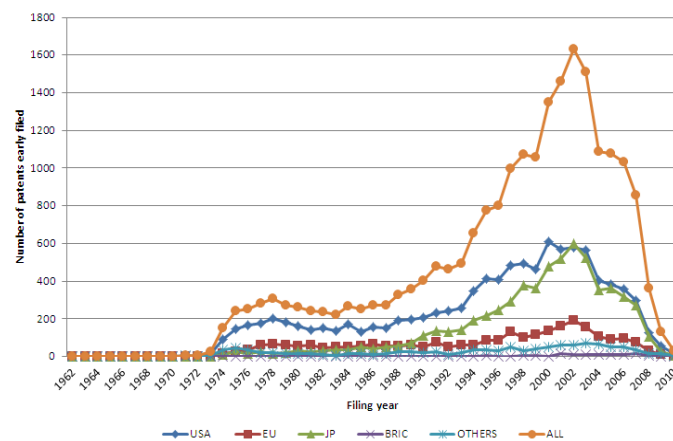


Figure 12. Trend of “Energy conservation” patent applications

By considering the years from 1985 to 2000, Figure 12 shows that “Energy conservation” patenting activity revealed a sharp growth rate, even higher than that characterizing the “Alternative energy production” one. This is especially true for the U.S. and Japan. Accordingly, the number of patents granted in the “Alternative energy production” class in that period had an increase of 150%, while the number of patents granted in the “Energy conservation” class raised of 250%, thus suggesting that the relevance of energy conservation started under the banner of environmental protection and resources scarcity problems, as highlighted during several international conferences and in related documents, such as the 1972 Stockholm Conference on the Human Environment and the Brundtland Report (WCED 1987). Indeed, the growing trend could be explained by referring to several policy initiatives taken place starting from late 1980s in response to those concerns. For example, in the U.S. a collaboration of manufacturers and energy efficiency advocates resulted in the 1987 National Appliance Energy Conservation Act, which set specific Federal energy conservation standards for many household products (Gillingham, Newell, Palmer 2006). A further energy efficiency legislation was represented by the 1992 Energy Policy Act (Public Law 102-486 1992), which extended standards for other products, like motors, lamps, commercial heating, and cooling equipment, in order to improve the overall energy efficiency. In addition, in Japan from 1993 to 2008, after the Earth Summit held in 1992, a series of amendments were enacted so as to deal with global environmental issues and set energy conservation goals². In particular, the New National Energy Strategy in 2006 and the Basic Energy Plan in 2007 specified that a clear technology strategy was mandatory, especially to identify a roadmap regarding long term technology development. In Figure 13 another interesting finding emerges. Specifically, Europe doesn’t seem to have significantly invested in energy conservation technologies. In fact, it is possible to notice that relative few efforts have been devoted in this area compared to the other technological domains previously discussed. Differently, U.S. and Japan’s patenting activities reveal a noteworthy attention paid towards energy conservation technologies, similar to that demonstrated for the production of renewable energy. Figure 13 also reveals that other countries like South Korea and Taiwan have invested considerable resources for the development of these solutions, differently from what occurred for alternative energy technologies. This may be

² <http://www.asiaeec-col.eccj.or.jp/contents02.html>

explained by taking into account that energy conservation technologies, such as low energy lighting lamps or new solutions for buildings' energy efficiency, result more marketable (Lopez-Pena, Perez-Arriga, Linares 2012), hence reducing R&D investments' risks while assuring good environmental performances. In addition, especially for Japan, energy conservation solutions are probably the best way to cope with an increasing energy demand relying only on the imports of fuel resources. In fact, despite Japan relied on oil and gas imports to meet about the 60% of its energy needs in recent years, it is shown that from 2000 to 2010 self-produced resources were less than the 1% of those consumed (EIA 2012). As highlighted for the other two categories, even in this case inventors rely also on non-patent literature in developing "Energy conservation" technologies (see Figure 14). This could be explained by looking at the actions discussed in the previous paragraph, even though this behavior appears to be more recent in this technological class than in the "Alternative energy production" class.

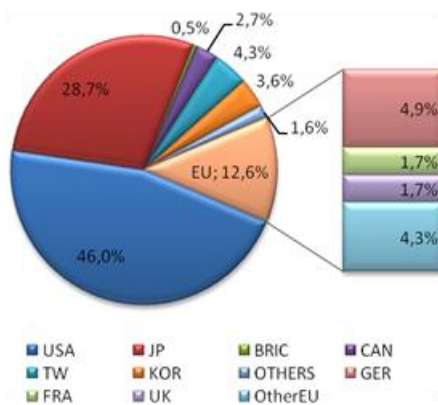


Figure 13. "Energy conservation" patent share by geographic area

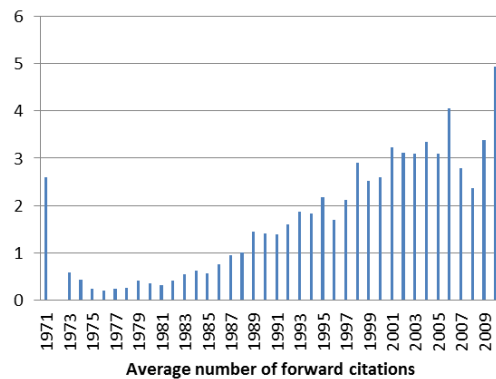


Figure 14. "Energy conservation" scientific citations analysis

Figure 15, showing the leading organizations in terms of number of patents owned, provides other important findings. First, European organizations are not classified in the top ten rank. Second, Japanese firms present a significant patenting activity, especially referring to recent years. However, their invention quality, as measured by forward citations, is lower than that characterizing the U.S. companies. Finally, the U.S. Eastman Kodak Company, commonly known as Kodak, behaves differently from the other

companies. In fact, it seems the only organization undermining the Japanese leadership in terms of both quantity and quality. Probably, it is the only firm that is trying to move towards new technological trajectories, thus developing high impact and valuable solutions. Figures 16a shows the distribution of breakthrough inventions among the analyzed regions. It reveals that the U.S. companies hold the majority of high quality patents, probably because of the Japan's late entry in the patenting activity. Interestingly, despite the little efforts showed, European countries have generated a higher number of breakthrough eco-innovations in the field than Japanese firms. In addition, Figure 16b also reveals that highly cited patents were filed between 1971 and 1982, thus revealing that despite innovative activity in those years was not so relevant in terms of quantity of patented technologies, it set the basis for future developments in the in the "Energy conservation" class.

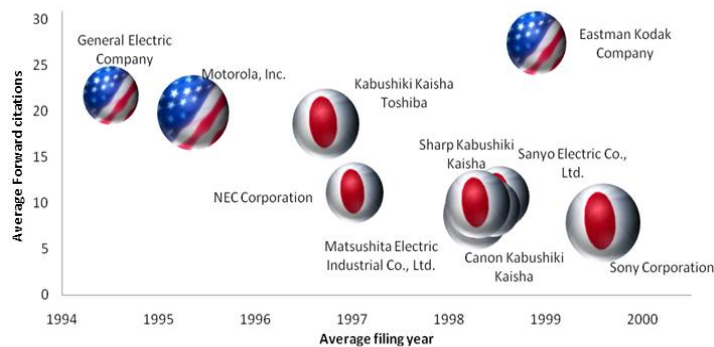


Figure 15. Top ten organizations in the "Energy conservation" class in terms of patent intensity (as represented by bubble size), period of the highest patenting activity (x-axis), and outcome quality (y-axis)

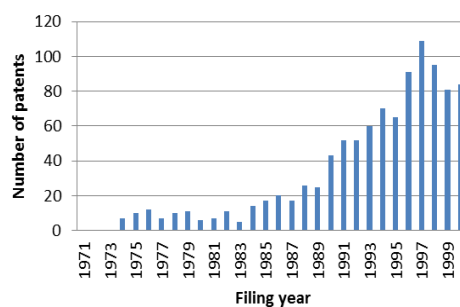
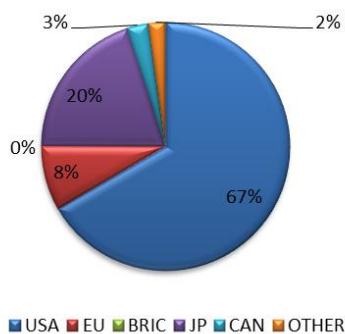


Figure 16a. “Energy conservation”
breakthrough patent share by
geographic area

Figure 16b. “Energy conservation”
breakthrough innovation’s development trend

Table 2 presents “Energy conservation” subclasses. It shows that, differently from the other two main classes, U.S. does not always own the majority of patents in each category. Indeed, the number of patents in the “Low energy lighting” and “Measurement of electricity consumption” subclasses owned by Japan exceeds the number of patents granted by U.S.. This may be due to the fact that in the last energy plan the Japanese government actively promotes the use of LED lighting to replace the traditional style incandescent bulbs and other related initiatives (IEA 2010), which include technologies for measuring energy consumption, likely to have stimulated innovative efforts in these two subclasses.

Table 2. Total patent share and percentage of patents owned by geographic area for “Energy conservation” technologies

	Patent share	U.S.	EU	JP	BRIC	CAN	TAIWAN	KOR	OTHERS	Total by geographic area
Storage of electrical energy	30.47	49.71	9.50	27.11	0.74	3.20	4.65	3.27	1.82	100
Power supply circuitry	2.08	61.33	11.78	16.00	0.44	1.33	6.22	1.56	1.33	100
Measurement of electricity consumption	1.74	35.88	11.61	47.49	0	1.58	0.53	1.58	1.32	100
Storage of thermal energy	4.20	62.84	21.17	10.47	0.44	1.43	1.21	0.88	1.54	100
Low energy lighting	40.01	30.57	10.20	44.03	0.37	1.30	6.21	5.94	1.39	100
Thermal building insulation, in general	20.45	66.65	20.15	4.76	0.34	5.39	0.71	0.39	1.62	100
Recovering mechanical energy	1.05	65.35	18.86	5.26	0.44	5.26	1.32	0.44	3.07	100
Total	100									

Finally, Figure 17 shows temporal trends in patenting activity for each subclass. It highlights that only “Low energy lighting” and “Storage of electrical energy” had an increasing trend. On the contrary, the other categories provide a little contribution to the overall trend.

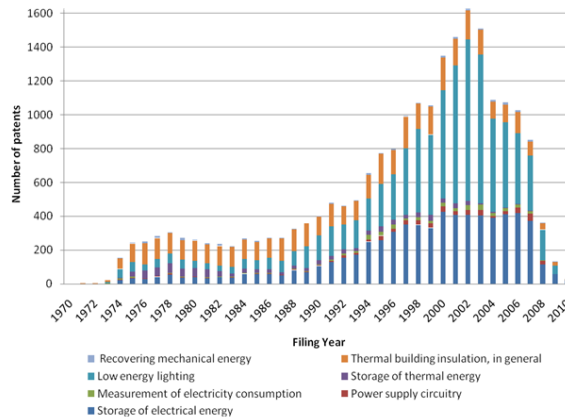


Figure 17. "Energy conservation" subclasses evolution

5. Discussion and Implications

This paper analyzes the evolution of eco-innovations in the energy field, specifically focusing on low-carbon energy technologies, by investigating patenting activity trends both globally and in specific geographic areas. To our knowledge, this study is the first attempt to depict a comprehensive scenario of eco-innovations evolution in the field of energy. Furthermore, this paper tries to explain evolutionary trends as a result of related country policies and historical events that may have fostered the development of such innovations. To this aim, a unique database of patented inventions filed at the U.S.PTO. between 1946 and 2010 and belonging to the "Nuclear power generation", "Alternative energy production", and "Energy conservation" IPC technological classes has been created and analyzed. Several interesting findings concerning the dynamics and distribution of low-carbon energy technologies emerged.

First, the global evolutionary trends of eco-innovations show the key role played by geopolitical circumstances. In fact, the eco-innovative activity increases with the highest growth rate during the petrol crisis period and in the early 1990s, as a result of the global warming awareness, except for few technological categories, as "Pyrolysis or gasification of biomass", "OTEC", and "Storage of thermal energy". This highlights that governments' strategies and energy programs set important frameworks and initiatives to foster and sustain eco-innovation development (Popp 2006). The main example is represented by the substantial contribution in developing nuclear power solutions provided by the U.S. government and the French Commissariat à l'Énergie Atomique,

which appear in the top ten patents' assignee classification in the nuclear energy class. A further example is given by Japan, which developed a governmental plan fostering the use of LED lighting and became the leading country for low energy lighting. Nevertheless, as shown through the analysis of the leading innovative organizations, private companies own the majority of the developed eco-innovations. Thereby, this reveals that commercial activities have an important role in the eco-innovation's development. This is in line with previous studies (e.g., Teece 1986; Henderson 1993), which highlighted how economic motivations act as the key driver in enabling the innovation process, hence making profit organizations as central actors. Furthermore, this is also the result of the strategic relevance assumed by climate change issue in business competition (Porter and Reinhardt 2007), which has in turn significantly influenced and oriented firms' innovation strategies. Second, data analyses depict a great discrepancy between subclasses in each main technological area. In fact, some of them represent less than 1% of the total amount of patents developed within a specific class. In particular, what is worthy to note is that, although certain subclasses include hot technologies upon which current debates are focusing, this does not necessarily corresponds to a higher patent share, such as in the case of "Alternative energy production". In fact, patent analyses demonstrate that wind, geothermal and hydro technologies represent only the 8% of the total amount of granted patents, despite their widely recognized important role in the next future as effective and sustainable technologies (ISPRES 2009). Nevertheless, the current wholesale rate is certainly far from the required level. By taking into account what occurred for the development of some low-carbon technologies, such as nuclear plants and solar cells, the eventual push to full commercialization through the use of effective demand pull policies, which in turn allow the creation of new markets by protecting emerging technologies from the competition with established designs, may significantly foster their spread and boost innovation (e.g., Nill and Kemp 2009), hence again highlighting how commercial opportunities can enhance innovative efforts (Teece 1986).

Third, our study sheds new light on the major inventing countries in the field under investigation. Specifically, innovation in low-carbon energy technologies is mostly generated in U.S., which accounts for more than a half of the total inventions. The innovative performance of Japan is also particularly impressive, since in a number of subclasses, such as in solar energy and low energy lighting technologies, it ranks equal to or better than Europe. Other countries, such as South Korea, Canada, Taiwan, and

Australia, present significant contributions in the patenting activity only in some particular technological fields. For instance, Canada owns the 5% of all patents in the thermal building insulation category and the 3% of breakthroughs in the energy conservation class, while it does not contribute to the development of renewable energy technologies at all. Furthermore, South Korea and Taiwan primarily focus on energy conservation solutions. Looking at BRIC, it seems that they are still far from intensive innovative activity, despite their environmental awareness as well as the use of eco-innovation solutions are growing (Lewis 2007; Levi, O'Neil, Segal 2010). Nevertheless, it should be noticed that our analysis looks at the trends of patents filed until 2010. During more recent years, BRIC investments in low-carbon energy technologies have significantly grown (e.g., PEW 2010; Lema, Berger, Schmitz 2012), thus suggesting an increasing tendency to patent which will likely be evident in next years. Another important result emerges from the analysis of scientific-based citations. Specifically, in recent years, the number of patents which are also based upon scientific literature is growing. This indicates that the international initiative aimed at strengthening the role and the appliance of scientific knowledge to support sustainable development are becoming effective (Agenda 21 Chapter 35). Thus, inventors are probably more deeply focusing on scientific research than in the past, hence making use of scientific knowledge to increase their understanding of environmental problems and creating suitable technological solutions (e.g., Fleming and Soreson 2004). Finally, we analyzed breakthrough eco-innovations developed in the three different technological areas. Results show that for "Alternative energy production" and "Nuclear power generation" classes breakthroughs' development occurred in the earliest stage of eco-innovation evolution and that it is limited within few years. Reasonable explanation lies in the fact that knowledge about using wind, water, sun, or nuclear power dates back to earlier than 1970s, but it was never fully exploited due to the widespread use of carbon and petroleum. Nevertheless, from the early 1970s, resource scarcity problems and environmental concerns attracted funds and shifted global attention towards new forms of energy generation. Hence, new business opportunities have emerged, pushing organizations towards the development of valuable solutions to successfully compete in these new markets. Similarly, "Energy conservation" breakthroughs were developed early in time, but in a longer period compared to the other two classes. This could be explained by considering that energy efficiency needs emerged as a new concept under the banner of resource scarcity issues, thus needing more time to

develop effective actions and technologies. It should be noticed that these results may also be related to the choice of our measure for identifying breakthrough eco-innovations, as described by forward citations. Indeed, early filed patents have less likelihood to be cited, hence being not fully recognized and appreciated by our proxy.

In terms of managerial and policy implications, our suggestions are threefold. First, our study highlights that the development of eco-innovations is due to both private and public efforts. Thus, we encourage corporate executives and policymakers to invest in strengthening their networks, by which technical, economic, and political knowledge could be better integrated in order to follow both business and social needs, as well as integrate all the competences needed to address the complexity characterizing eco-innovation development (Messeni Petruzzelli et al. 2011). Second, our study shows that different types of low-carbon energy technologies have been developed in response to environmental and geopolitical concerns. As a result, companies and policymakers are engaged in the development of different types of eco-innovations, which are, however, very difficult to be fully studied, assessed, and regulated. Thereby, a centralized organism that looks over the intensity and dynamics of their applications and their interaction with the society is needed. Furthermore, clear national policies on eco-innovations should be underpinned by international agreements through which all countries commit to take action to reduce their environmental impacts and can keep pace with the ever-changing technologies that are developed. Third, since environmental problems, such as pollution and climate change, are global externalities, with consequences all over the world (irrespective of who generated them), the development and the diffusion of eco-innovations is a global issue. Thereby, transferring appropriate solutions by taking into account specific local needs, as well as ensuring their effective implementation, can help to address global environmental problems and reach sustainability targets. This is especially true for developing countries where the assimilation, adaptation, and maintaining of the imported technologies are essential conditions to support sustainable development (UN 2012).

6. Limitations, Future research directions, and Conclusion

This study has some limitations that should be acknowledged. First, the innovation process is described by means of patents, which do not represent the whole innovative

portfolio. Indeed, some innovations are not patentable and patents do not always represent the most suitable appropriation mechanisms (Levin et al. 1987; Bessen 2006). Furthermore, the rate at which new innovations are patented varies across industry (e.g., Bessen 2006; Gittelman 2008). Second, comparisons at global scale raises some biases since the value of patents vary across countries and the characteristics of appropriation regimes significantly affect the propensity to patent (Archibugi and Pianta 1996; OECD 2009b). Third, we focused on a specific type of eco-innovation, as technological eco-innovation, although other kinds of eco-innovations, such as organizational and business ones, can be recognized and investigated (e.g., Kemp and Pearson 2008).

In addition to address these limitations, future research should place more emphasis on eco-innovation commercialization. We highlighted the relevance of commercial activities to spread those technologies. Thereby, empirical studies on how firms' capabilities, technological characteristics, and environmental circumstances interact in order to bring those technologies to the market are needed. Furthermore, the economic impacts of eco-innovations are still not fully measured. Here, further research should be conducted in order to map out the diffusion of eco-innovations and related socio-technical changes, as well as to assess their main macro-economic impacts. Moreover, scholars could focus their attention on investigating which policies have more effectively influenced eco-innovations' development, thus providing policymakers with more detailed insights. In conclusion, we believe that this study has taken the literature one step further in the on-going debate on the evolution of eco-innovations and hope that this work may stimulate further theoretical refinement and empirical investigation in this relevant area of research.

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Managing open innovation with scientific and business partners: the mediating role of organizational practices and collaborative mindset in fostering ambidexterity

Valentina Lazzarotti *, Raffaella Manzini

School of Industrial Engineering
Università Cattaneo
Corso Matteotti 22

Anna Nosella

Department of Managerial Engineering
University of Padova,
Stradella San Nicola, 3, 36100, Vicenza, Italy

Luisa Pellegrini

Department of Electrical Systems and Automation
University of Pisa

** Corresponding author*

Abstract

Open innovation literature suggests that firms can improve their innovation performance by learning from users, customers, suppliers, universities, research centers. However, the success of such new paradigm is still debatable and literature is searching for its determinants. In particular, the firms' internal organizational context seems to be crucial to explain the success or failure of open innovation: firms which attempt to leverage partners' knowledge must design an appropriate internal organization, made of organizational practices and human resources attitudes. Despite this assumption, the firm internal context is still poorly investigated as concerns its role to support open innovation success. Therefore, the aim of this study is to explore the relationships among collaboration behavior, organizational practices, internal collaborative attitudes, thus investigating firms capacity to reach high levels of innovative performance through an open approach. Our study, relied on a survey research developed in Finland, Italy and Sweden, suggests that collaborations with different typologies of partners should be carefully managed, through the development and implementation of organizational and HR practices, in order to foster ambidexterity. In this way both the scientific network (made up of organizations that are not permanently linked in a direct economic sense) and the business networks (made up of partners who belong to a common supply chain or are situated at the same level of a supply chain) allow the achievement of exploitative and explorative innovations: in the former case, only the use of an appropriate and formal set of collaborative practices and employees' attitude towards openness leads to the development of ambidexterity.

Key words: open innovation, innovative performance, ambidexterity, managerial and organizational practices, collaborative mindset

1. Introduction

Open innovation literature (Chesbrough, 2003) suggests that firms can improve their innovation performance by learning from users, customers, suppliers, universities, research centers. However, the success of such new paradigm is still debatable (Laursen and Salter, 2006) and literature is searching for its determinants. In particular, the firms' internal organizational context seems to be crucial to explain the success or failure of open innovation (Foss et al. 2011): firms which attempt to leverage partners' knowledge must design an appropriate "internal organization" made of organizational practices and human resources (HR) attitudes. Despite this assumption, the firm internal context is still poorly investigated as concerns its role to support open innovation success.

At the same time, scholars on organizational learning have mainly investigated the role that internal drivers have in fostering ambidexterity, defined as the ability of firms to pursue exploratory and exploitative innovation simultaneously (He and Wong, 2004). At the moment there are only few attempts to analyse how the combination of internal mechanisms and collaboration behavior leads to the achievement of ambidexterity (Raisch and Birkinshaw, 2008; Schamberger et al., 2013), even if it is recognized that it is a particularly fruitful area for further research (Lichtenthaler and Lichtenthaler, 2009).

Therefore, the aim of this study is to explore the relationships among collaboration behavior (i.e. openness with two different typologies of subjects, named scientific and business partners), organizational practices, internal collaborative attitudes and ambidexterity, thus investigating firms capacity to reach high levels of innovative performance through an open approach. We attempt to understand why some companies are able to extract value from collaborations and others are not, by investigating whether the firm's internal context mediates the relationship between collaborative behavior and firm's ambidexterity.

2. Literature review and hypothesis

The theoretical foundations of our work can be found in the apparently recent stream of literature about the open innovation paradigm (Chesbrough, 2003), but in effect

grounded in the more longstanding strand focused on knowledge management, intellectual capital, human resource management (HRM) and innovation.

2.1 Openness and firms' internal context

A contingency perspective (Smith and Lewis, 2011) suggests that models with a different degree of openness exist and that they are all strategically valuable (Chesbrough, 2003). However, literature claims also that they show a growing complexity with the increasing of the degree of openness (Enkel and Bader, 2012; Dahlander and Gann, 2010; Foss et al., 2011). Complex collaboration with many partners calls also for the involvement of various individuals and departments, able to exchange information and thus characterized by appropriate socio-psychological features or mindset (Hillebrand and Biemans, 2004; Cabrera and Cabrera, 2005; Jolink and Dankbaar, 2010). Moreover, managing different sources (actors) of knowledge requires high levels of coordination and thus more sophisticated (and more intensively applied) project management systems (Foss et al., 2011). Therefore, it can be supposed that higher levels of openness need a higher level of propensity to collaborate and to share knowledge as well as a high intensity of organizational procedures in order to achieve innovative performance, as the following hypothesis states:

Hp 1 The more the focal firm collaborates with business partners, the higher its collaborative mindset will be.

Hp 2 The more the focal firm collaborates with scientific partners, the higher its collaborative mindset will be.

Hp 3 The more the focal firm collaborates with business partners, the higher its use of collaborative organizational practices/mechanisms will be.

Hp 4 The more the focal firm collaborates with scientific partners, the higher its use of collaborative organizational practices/mechanisms will be.

2.2 Firms' internal context and ambidexterity

Knowledge management and intellectual capital literature has shown the crucial role of social capital (in particular of its relational dimension) in favoring knowledge sharing and innovative performance within the company (Subramaniam and Youndt, 2005; Cabrera and Cabrera, 2005; Cabello-Medina et al., 2011) and among companies (Jolink and Dankbaar, 2010). Firms which are already used to internally cooperate, thanks to high

levels of internal communication skills, are also inclined to be flexible and to share information with external partners (Hillebrand and Biemans, 2004; Foss et al., 2011). Individual communication skills aimed to internally cooperate as well as close and frequent interactions between R&D and other functions serve to interpret, to evaluate, to disseminate and to apply new knowledge acquired from external partners, by allowing better integration and coordination of different bodies of knowledge (Hillebrand and Biemans, 2004). In other words, people who are already used to communicate and internally cooperate are likely to be more receptive and able to foster different types of learning (i.e. explorative and exploitative), creating the premises for all the facets of innovative performance. Accordingly, we suppose a beneficial effect provided by internal communication and interactions on innovative performance achieved in collaboration. Thus, we state that:

Hp 5 The presence of a collaborative mindset will lead to higher levels of ambidexterity.

The literature analysis has highlighted the crucial role of the organizational capital (i.e. structures, processes and systems) and the related HRM practices in creating a context which favour knowledge sharing and exchange (and thus innovative performance) within the company (Gittell, 2000; Cabrera and Cabrera, 2005; Yang and Lin, 2009; Cabello Medina et al., 2011; Camelo-Ordaz et al., 2011), but not only: appropriate roles, structures, procedures and systems are also relevant to allow effective knowledge flows when innovation is carried out in collaboration (Ritala, 2009; Jolink and Dankbaar, 2010; Petroni et al., 2012). Following in particular those studies which call for further investigation when the number of partners and the relationship complexity are increasing as in the case of open innovation (Foss et al., 2010; Foss et al. 2011; Brunswicker and Vanhaverbeke, 2011; Ihl et al., 2012), we know that systems to manage collaborations (e.g. project management techniques as milestones, scheduled meeting among partners, goals and plans that are formalized or written down, active management involvement, etc.) reduce the likelihood that people will deviate from established behavior; enhance the causal links among tasks and thus increase the likelihood that people will identify opportunities for transformation of new external knowledge (Nonaka, 1994; Zollo and Winter, 2002); allow to identify best practices so as to facilitate knowledge application (Lin and Germain, 2003; Thuc Anh et al., 2006; Lawson et al., 2009). In sum, managerial and organizational mechanisms, put together, create a conducive context which enables

firms to share, exchange and transform knowledge and foster different types of learning (i.e. explorative and exploitative), creating the premises for all the facets of innovative performance. Thus, in general we state that:

Hp 6 The use of collaborative organizational practices/mechanisms will lead to higher levels of ambidexterity.

2.3 Openness, firms internal context and ambidexterity

Supposing that antecedents enable innovative performance from collaborations, we make a step forward wondering what would happen if they were not existing or well-operating, which means to investigate their mediating role between openness and innovative performance. Foss et al., (2011) find that customer interaction enhance innovative performance only *through* the operating of some organizational practices. This allows supposing that, without the beneficial operating of such practices, customer interaction does not improve innovative performance. Hillebrand and Biemans (2004) find that, *without* internal communication and cooperation, organizations are unable to implement the externally acquired knowledge throughout the organizations. Supported by the fact that the success (in terms of innovation performance) of open innovation is still debatable (Laursen and Salter 2006; Rothaermel and Deeds, 2006) and that what happens within the company (i.e. firms' internal organization and social context) is crucial to explain the success or failure of open innovation (Dahlander and Gann, 2010), we state the following:

Hp 7 The collaborative mindset mediates the relationship between business partners and ambidexterity.

Hp 8 The collaborative organizational practices/mechanisms mediate the relationship between business partners and ambidexterity.

Hp 9 The collaborative mindset mediates the relationship between scientific partners and ambidexterity.

Hp 10 The collaborative organizational practices/mechanisms mediate the relationship between scientific partners and ambidexterity.

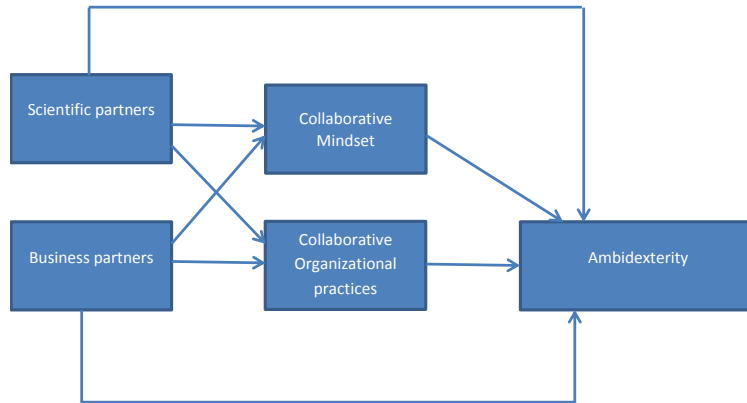


Figure 1 summaries our hypotheses as follows:

3. Research Method

3.1 Sampling and data collection

3.2 Measure and operationalization

We utilize a 7 point Likert-type scale with end points of “strongly disagree” and “strongly agree” to measure the items of all variables. The exact wording of the employed items is shown in Appendix A.

Business partners (BP) and scientific partners (SP) take inspiration from the works of Faems et al. (2005), Laursen and Salter (2006) and Faems et al (2010), which employ two different constructs to measure external partnership, since relationships with customers and suppliers differ from those with universities and research institutes. Thus, the independent variable scientific partners refers to the presence of collaboration with research actors such as universities and research institutes, while the independent variable business partners refers to collaborations with industrial actors such as customers, suppliers, competitors and other firms.

The measurement scale for the first mediation variable, i.e. collaborative mindset (CM) has got theoretical foundations in the Nahapiet and Ghoshal (1998) social capital conception and, in particular, in its internal relational aspect. Antecedents are then practically operationalized by following suggestions by Hillebrand and Biemans (2004), Subramaniam and Youndt (2005); Ritala et al., (2009); Lawson et al., (2009); Yang and Lin (2009); Cabello-Medina et al., (2011), focusing attention on individual communication skills (e.g. capacity of listening and paying attention to others; employees'

propensity to collaborate, interact and work in groups to solve problems; close and frequent interactions between R&D and other functions).

The measurement scale for the second mediation variable, i.e. collaborative organizational practices (COP) is defined following Subramaniam and Youndt (2005), Jansen et al. (2005), Lin and Chen (2006), Yang and Lin (2009) and Volberta et al. (2010): the attention is focused on the existence of procedures and systems used to manage collaborations.

According to Gibson and Birkinshaw (2004) and Gupta et al. (2006), the dependent variable ambidexterity is calculated as the multiplicative score between explorative and exploitative innovations. Explorative innovation (EXP) and exploitative innovation (EXPL) are measured using 3 items each, adapted from Jansen et al (2006). The respondents indicate the extent to which they agree or disagree with six statements about the extent to which collaborations have performed, over the last three years, against the objective of generating respectively new or improved innovations.

3.3 Statistical procedure

This study used the two-stage structural equation modeling (SEM) approach suggested by Anderson and Gerbing (1988), using AMOS 21 with maximum likelihood (ML) estimation. In the first stage, the validity and reliability of the measurement model were assessed and in the second stage the structural model was analyzed.

4.1 Measurement model: validity and reliability

To improve content validity we employed previously validated scales and pre-tested the questionnaire following recommendations by Forza (2002). More specifically the instrument was pre-tested using a panel of firms, selected in order to represent the investigated subsectors. Minor changes were made to the questionnaire, thanks to the suggestions emerged during the pre-test phase.

Confirmatory factor analysis was performed to examine if all measures were psychometrically sound. In all cases, the items load well on the constructs they were intended to measure with little evidence of cross loadings. Convergent validity was assessed using standardized parameter loadings of the measurement items on their respective constructs. All standardized parameter loadings were significant (p-value <

0.01) and ranged from 0.45 to 0.8, with most of the items greater than 0.6 (see appendix 1).

Construct reliability was assessed via Cronbach's alpha and composite reliability (Shah and Goldstein, 2006). Typically, values of 0.6 or higher for Cronbach's alpha (Nunnally, 1978) are considered to be adequate. In addition, composite reliability (Bagozzi and Yi, 1988) values for all constructs meet the threshold value of 0.6. As reported in Table 1, all constructs exceed this value. Overall, these results show that the theoretical constructs exhibit good psychometric properties.

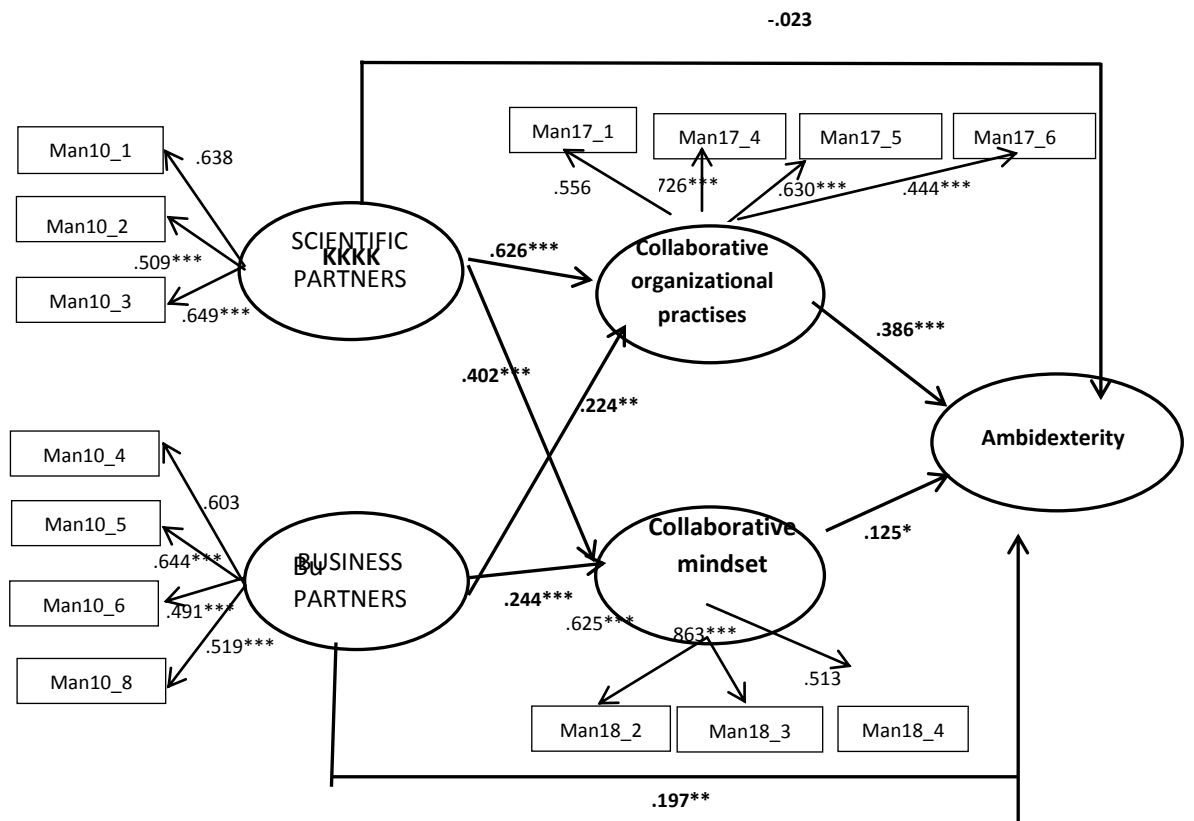
Discriminant validity was assessed checking whether, as shown in Table 1, all pairs of constructs have construct intercorrelations that are less than 0.7 (MacKenzie et al., 2005). Finally, unidimensionality was evaluated by the overall model fit that can be tested using the comparative fit index (CFI), incremental fit index (IFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and normed chi square (i.e. χ^2 per degree of freedom) (Bryne, 1989; Hair et al., 2006). Indices (CMIN=376.115;DF=155;CMIN/DF=2.427;CFI=0.904;IFI=0.905;TLI=0.882;RMSEA=0.059) show that the models fit the data well and, hence, establish unidimensionality.

Table 1: descriptive statistics, validity and reliability measures

	BN	SN	CM	CO P	EX T	EX P
Business partners (BP)	-					
Scientific partners (SP)	.677	-				
Collaborative mindset (CM)	.481	.643	-			
Collaborative org. practices (COP)	.352	.460	.594	-		
Innovative exploration (EXT)	.407	.375	.333	.382	-	
Innovative exploration (EXP)	.417	.378	.419	.612	.682	-
Mean	3.294	2.856	4.038	3.206	3.884	4.129
Standard deviation	1.192	1.381	1.123	1.195	1.331	1.269
Cronbach alpha	.654	.628	.712	.688	.809	.719
Composite reliability	.741	.742	.697	.719	.812	.730

5. Results

The final structural equation model with standardized regression weights and standardized error, depicted in Figure 2, has the following fit values: CMIN = 293.55, CMIN/DF = 3.537, NFI = 0.799, IFI = 0.847, TLI = 0.804, CFI = 0.845, and RMSEA = 0.078. All hypotheses were supported. The overall fit statistics of the structural model are on the commonly accepted thresholds and, therefore, demonstrate acceptable fit.



Notes: Numbers in bold are related to the structural model
 *Significant at 5%, **significant at 1%, ***significant at 0.1%
 No p-value means that the parameter has been fixed at 1

Figure 2: Standardized Estimated path model

The hypothesis 1-2-3-4 predict that both business and scientific partners positively impact on collaborative organizational practices and collaborative mindset. As shown on figure 2 and table 2, all the coefficients are positive and significant, thus supporting the

hypothesis. Moreover, we find evidence supporting both hypothesis 5 (the use of collaborative organizational practices/mechanisms will lead to higher levels of ambidexterity) and hypothesis 6 (the use of collaborative mindset will lead to higher levels of ambidexterity). The last four hypothesis predict that the internal context (collaborative mindset and collaborative organizational practices) mediate the relationship between business and scientific partners and ambidexterity. We used the decomposition of effects results, in which the total effect of an independent variable on a dependent variable is disaggregated into its indirect and direct effects (Tabachnick and Fidell 1996). Table 2 reports the direct and indirect effects for all paths.

Table 2: Standardized structural estimates of the structural model.

<i>PATH</i>	<i>Model</i>
Direct Path	
<i>BP → CM</i>	.244***
<i>BP → COP</i>	.224**
<i>SP → CM</i>	.402***
<i>SP → COP</i>	.626***
<i>CM → AMB</i>	.125*
<i>COP → AMB</i>	.386***
<i>BP → AMB</i>	.197**
<i>SP → AMB</i>	-.023
Indirect Path	
<i>SP → AMB</i>	.292**
<i>BP → AMB</i>	.117*

When taking into consideration the indirect effects, a significant indirect effect indicates that a relevant quantity of the independent variable's total effect on the dependent variable happens via the hypothesized mediators. Particularly, collaborative mindset and collaborative organizational practices fully mediate the relationship between scientific partners and ambidexterity while they partially mediate the relationship between business partners and ambidexterity. In sum, the overall model supports the idea that the effect of establishing business and scientific networks on ambidexterity is mediated by the right internal context; in other words, having employees with a collaborative mindset and putting in place collaborative organizational practices make it possible to fully exploit the potential of the external partnerships.

5.1 Robustness check

In order to conduct robustness check, we compared the hypothesized model to other models to determine which model fits the data best (Paulraj et al., 2008). Thus, our proposed model was compared to rival models to assess whether it provides the best fit. In our proposed model (Model 1), CM and COP partially mediate the relationship between our independent variables and ambidexterity. A second full mediation model was tested in which we cut the direct paths from BP and SP to ambidexterity (model 2). A third direct model was assessed in which we considered the direct paths from BP, SP, COP, CM to ambidexterity. The following table 3 shows the results of the three models:

Table 3: robustness check

	Partial mediation (Model 1)	Full mediation (Model 2)	Direct model (Model 3)
SP to AMB	-.023		.053
SP to CM	.402	.394***	
SP to COP	.626	.613***	
BP to AMB	.197		.235***
BP to CM	.244	.260***	
BP to COP	.224	.271***	
CM to AMB	.125	.163**	.160**
COP to AMB	.386	.431***	.378***
CMIN/DF	3.537	3.561	5.269
CFI	.845	.840	.727
TLI	.804	.802	.670
IFI	.847	.842	.730
NFI	.799	.793	.687
RMSEA	.078	.079	.102

As shown in Table 2, the proposed model (Model 1) fits the data well considering the model fit indices (CFI TLI, IFI, RMSEA) of the other two models. Particularly, the more restricted full mediation model fits the data in a worse way than the partial mediation model, as indicated also by the RMSEA. Additionally, all the indexes for the direct effects model are worse than those for the partial mediation model. Taken together, information provided by the comparison of the direct effects and partial mediation models shows that the former do not fit the data as well as the latter. So we can assert that data support the partial mediation hypothesis. Additionally, we used the bootstrap method to test for the significance of indirect effects.

6 Discussion and conclusions

Overall, the results show that our hypotheses are supported. First, we find further evidence in line with literature suggestions on a positive relationship between the context (managerial and social) and the degree of openness. Collaboration with different types of partners requires people able to exchange information and thus characterized by appropriate socio-psychological features or mindset (Hillebrand and Biemans, 2004; Cabrera and Cabrera, 2005; Jolink and Dankbaar, 2010). Moreover, managing different sources (actors) of knowledge requires high levels of coordination and thus more sophisticated (and more intensively applied) project management systems (Foss et al., 2011).

Second, the social and managerial context factors are able to improve innovative performance from collaborations. As concerns the former, our results confirm that people who are already used to communicate and internally cooperate are likely to be more receptive and able to foster different types of learning (i.e. explorative and exploitative), creating the premises for all the facets of innovative performance (Hillebrand and Biemans, 2004). A complementary role is exerted by the managerial factors, creating a conducive context which enables firms to share, exchange and transform knowledge and thus fostering innovative performance.

Third, and particularly significant, is our finding showing that the use of collaborative organizational practices and the creation of a collaborative mindset mediate the relationship between both collaboration with business and scientific partners and ambidexterity. When taking into consideration the indirect effects, a significant indirect effect indicates that a relevant quantity of the independent variables' total effect on the dependent variable happens via the hypothesized mediators. Thus, our findings extend Foss et al., (2011) evidence ("that customer interaction enhance innovative performance only through the operating of some organizational practices") to a situation in which innovation is carried out with different types of partners (i.e. open innovation). In addition, our evidence extends that of Hillebrand and Biemans (2004), specifically focus only on suppliers and customers: high levels of internal collaborative mindset are crucial also when companies are engaged in collaborations with several partners. Thus it seems to be confirmed that what happens within the company (i.e. firms' internal organization and social context) is crucial to explain the success or failure of open innovation

(Dahlander and Gann, 2010). Particularly, data support full mediation for scientific network and partial mediation for business network.

This study contributes on the debate on both open innovation and ambidexterity literature in at least two important ways. First, it sheds light on how firms reap the benefits of their partnership, showing that firms can leverage partners' knowledge and foster innovation performance by designing an appropriate internal context.

Second, it shows that ambidexterity can be achieved through the combination of external and internal factors: establishing scientific and business partnerships requires the creation of both a collaborative mindset and collaborative organizational practices which in turn lead to the generation of ambidextrous innovative performance. Consequently, this paper answers to the recent literature's call for more empirical research that links a "firm's exploitative and exploratory strategies with its collaboration behavior" (Schamberger et al, 2013), thus showing that ambidexterity can be achieved not only by intra organizational settings, but also through the establishment of a portfolio of alliances.

As practical implications, the study suggests that collaborations with different typologies of partners should be carefully managed, through the development and implementation of organizational and HR practices, in order to foster ambidexterity. In this way both scientific and business networks lead to the development of exploitative and explorative innovations: in the former case, only the use of an appropriate and formal set of collaborative practices and an employee's attitude towards openness leads to the development of ambidexterity.

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Appendix

Table 4: measured items in detail

Label	Item	St. path loading
	<i>Indicate the extent to which your firm has collaborated with the following stakeholders over the last 5 years:</i>	
Man10_1_1	Universities and research centers	.615
Man10_2_1	Innovation intermediaries	.548
Man10_3_1	Government agencies	.675
man10_4_1	Customers	.539
man10_5_1	Suppliers	.550
man10_6_1	Consumers	.508
man10_8_1	Companies operating in other industries	.637
	<i>Agreement on firm's organizational and managerial actions regarding collaboration with external partners in innovation activities:</i>	
man17_1_1	We formally assess the trade-offs between internal development and external acquisition	.575
man17_4_1	We formally assess the performance and results of collaborative projects	.734
man17_5_1	We have a reward and incentive system to recognize the benefits of collaborative innovation	.645
man17_6_1	We use Internet-based systems to facilitate the search of potential partners	.452
	<i>Agreement with respect to your firm's staff involved in technological innovation:</i>	
	We set our staff creative and challenging objectives	
	We are open to technologies/knowledge generated outside the company	
man18_3_1	We allocate resources for our staff continuous professional development	.778
man18_4_1	<i>Innovative performance (ambidexterity)</i>	.569
	Reduce innovation risks	
man18_5_1	Reduce new product/process development cost	.682
	Reduce time to market	
	Introduce new or significantly improved products or services	
man21_1_1	Introduce new or significantly improved process of producing our products or services	.735
man21_2_1		.838
man21_3_1	Opening up new markets	.730
man21_4_1		.719
man21_5_1		.764
man21_6_1		.578

Social companies as an innovative and sustainable way of solving social problems. A case study from Spain

Alessandro Greco *

Department of Mechanics, Mathematics, and Management
Politecnico di Bari
Viale Japigia, 182 – 70126 Bari, Italy

Gustavo Morales Alonso, Ana M. Vargas Pérez

Departamento de Ingeniería de Organización, Administración de
Empresas y Estadística
E.T.S.I. Industriales, Universidad Politécnica de Madrid
c/ José Gutiérrez Abascal, 2. Madrid

Iciar Pablo Lerchundi

Instituto de Ciencias de la Educación(ICE)
Universidad Politécnica de Madrid
C/ Profesor Aranguren, 3. 28040, Madrid

Antonio Messeni Petruzzelli

Department of Mechanics, Mathematics, and Management
Politecnico di Bari
Viale Japigia, 182 – 70126 Bari, Italy

** Corresponding author*

Structured Abstract

Purpose – In the current context of economic crisis, there is an increasing need for new approaches for solving social problems without relying upon public resources. With this regard, social entrepreneurship has been arising as an important solution to develop social innovations and address social needs. Social entrepreneurs found new ventures that aim at solving social problems.

The main purpose of this research is to identify the general profile of the social entrepreneurs and the main features of social companies, such as geographic scope, profit or non-profit approach, collaborative networks, decision making structure, and typologies of customers that benefit from their social actions.

Design/methodology/approach– The present research is based on both primary and secondary sources of data, that were used to perform both qualitative and quantitative analyses. Specifically, we selected two Spanish social entrepreneurs networks, as “Ashoka Spain” and “HUB Madrid”, on the basis of their representativeness of Spanish

social entrepreneurs. A survey was developed and distributed among the entrepreneurs members of the mentioned networks. This survey covers several aspects, such as the socio-demographic profiles of social entrepreneurs and the main features of their companies. Finally, the results from the statistical analyses were discussed with a panel of experts through personal semi-structured interviews.

Originality/value –The conducted research shows general features of social entrepreneurship in Spain. Among the obtained results, it is worth noting the orientation of the companies towards a self-sustaining model without donations and public transfers, the prevalence of women in human resources within companies, the trend towards the creation of global and not local businesses, the prevalence of profit approach over non-profit approach, the adoption of participatory decision making structure, the tendency to establish collaboration with private sector over public sector, and the strong social vocation of entrepreneurs over the perception of business opportunity as motivation inspiring social entrepreneurship initiatives.

Practical implications– Results point out that social companies in Spain tend to focus their activities on customers who have their access to basic services and products covered. On the contrary, people belonging to the lower Bottom of Pyramid (BOP) are mainly left unattended by social companies, receiving only the help of the public authorities. Future studies could extend the research through a cross-cultural validation in different countries.

Keywords –Social Entrepreneurship, Social Entrepreneur, Social Innovation, Bottom Of Pyramid, Case Study.

Paper type – Academic Research Paper

1 Introduction

The field of social entrepreneurship is growing rapidly and it is attracting attention from many sectors. The term itself shows up frequently in the media, it is referenced by public officials, it has become common on university campuses, and it refers to use of entrepreneurial principles and behaviour in order to create social value and generate positive social change by providing economic return (Martin et al., 2007).

The phenomenon of globalization produced an exponential increase of capital, ideas, and products flow, contributing to an unparalleled expansion in products and services consumption. In turn, globalization caused also deep-seated environmental and social problems (Fisac et al., 2011).

Often, public intervention is inefficient in dealing with this kind of problems, due to the heavy bureaucracy and the instability of governments that make difficult the continuity of actions that aim at generating a positive social impact.

It is precisely this type of context that encouraged the development of entrepreneurial initiatives aiming at providing an effective solution to social and environmental problems.

Social entrepreneurs and social companies are the main actors of this kind of initiatives and of social innovation within the current globalization context.

There are many currents of thought and theories focusing on how social companies and social entrepreneurs should behave to create a positive social impact, on what should be their organizational structure, on how they should support their social mission, and on how they may procure resources and assets.

Accordingly, this research aims at understanding the way of behaving of social companies and social entrepreneurs, and particularly the main features of social companies, such as their geographic scope, their profit or non-profit approach, their use of collaborative networks, and their decision making structure. Additionally, attention is also paid to the motivations and general profile of social entrepreneurs, as well as to the typologies of customers that benefit the most from these social actions.

In this research, data were collected from two Spanish social entrepreneurs networks, namely “Ashoka Spain” and “Hub Madrid”, being representative of Spanish social entrepreneurs networks. A survey was developed and distributed among the members of the mentioned networks, and they were used to perform a statistical analysis. Moreover, semi-structured interviews with a panel of experts, were used to support the analysis of the results.

The reminder of the paper is organized as follow. In Section 2 we discuss the theoretical background. In Section 3 we portray social innovation as result of network and collaborative systems. In Section 4 we offer a description of the two social entrepreneurs networks from that data for the research were collected (“Ashoka Spain” and “Hub Madrid”). In Section 5 we present the research methodology. In Section 6 we discuss the findings of the research. Finally, in Section 7, conclusions and directions for further researches are provided.

2 Theoretical background

2.1 Social Economy

Organizations and various actors acting in social entrepreneurship context tend to be considered as active parts of an economic sector called social economy. In particular, the majority of social companies belongs to this sector or had their origin inside it (Defourny et al., 2012). The behavior of individuals belonging to this sector do not obey only to market rules, but it is influenced by purely social factors and logics.

Social economy is commonly considered as the third sector of the economy (Monzon et al., 2008; Social Economy Lisburn, 2013) since the two other economic sectors are generally considered the private business sector, which is motivated by profit, and the public sector, which is managed by governments (Monzon et al., 2008).

Moreover, social economy can be defined as that part of the economy that is composed by established organisations with volunteer members, board of directors and management committees whose activities are oriented to generate local benefits; it is composed by communities' organizations and businesses, managed by local people, that work for the welfare of the communities and marginalized groups (Social Economy Lisburn, 2013). Social economy includes those organizations that are driven by the principle of reciprocity in pursuing both economic and social objectives, often through social control of capital (BALTA, 2013). Therefore, social economy is promoted by private and formally organized companies, having autonomy of decision and freedom of membership, created to match the needs of their members by producing goods and providing services, as insurance and financial services. Moreover, within these companies, decision making and any distribution of profit and surplus among the members are not related to the stakes owned by each member, each of which has one vote (Monzon et al., 2008). Thus, we identify two social economy sectors: (i) the market or business sector; and (ii) the non-market sector (Monzon et al., 2008). The market sector is populated by cooperatives and mutual societies, business groups controlled by cooperatives, and some non-profit institutions that provide services to other companies that are part of the social economy. In turn, the non-market sector includes associations and foundations, although may also be found organisations with other legal forms according to the typologies considered non-market producers by national accounting policies (Monzon et al., 2008).

According to a report presented by the Social Economy Lisburn (2013), social economy sectors may be classified in: (i) the community sector, which includes organizations working at local or community level, usually small, modestly funded and largely dependent on voluntary rather than paid work, as vigilance services, small associations of communities, small support groups; (ii) the voluntary subsector, which includes non-profit organizations having a formal constitution, independent from governments and autonomous, and operating with a significant degree of voluntary involvement, ashousing cooperatives, large charity organizations, large community associations, national organizations of the countryside; (iii) the social companies sector, which includes companies having primarily social objectives whose surpluses are reinvested for the social aim within the enterprise or within the community, rather than being used to maximize profit for shareholders and owners, as cooperatives, building societies, credit unions (Social Economy Lisburn, 2013).

2.2 Social Company

Social companies are private organizations dedicated to solving social problems, serving the disadvantaged, and providing socially important goods and services that were not adequately provided by public agencies or private markets (Dees, 1994).

These organizations combine innovation, entrepreneurship and social purpose and seek to be financially sustainable (Haugh et al., 2004).

The main feature of social companies is that social mission prioritises social benefit above financial profit (Haugh et al., 2004; Mair et al., 2005).

Social companies may be profit or non-profit organisations (Hayden, 2010; Mataix, 2013; Schwab 2013). However, there are currents of thought that consider as social companies only for-profit entities, excluding foundations and non-profit associations (Andreu, 2013; Parra, 2013); other considering as social companies only non-profit entities, adopting, hence, a non-profit business approach (Defourny et al., 2012).

A typical feature of social companies is their propensity to reinvest all the surplus, if any, in favour of their social actions (Haugh et al., 2012; SEUK, 2013) or to adopt a policy of restriction in dividends distribution (Defourny et al., 2012). However, according to some currents of thoughts social companies could also seek the return of invested capital in favour of shareholders (Andreu, 2013).

Concerning the issue of the economic sustainability, there are significant differences between two existing traditions of social company: (i) the Anglo-Saxon tradition, according to which social companies should achieve their economic sustainability by adopting a strategy of own incomes generation; (ii) the continental European tradition, according to which social companies can sustain their business by using also hybrid resources provided from public and civil sector, such as private donations, public donations, public subsidies and volunteer human resources (Fisac et al., 2011).

These traditions differ also in the importance and emphasis given to the role of the entrepreneur in the dynamics of the social companies. Anglo-Saxon tradition emphasizes the central role of the entrepreneur and the importance of his leadership. Instead, the European tradition emphasizes the collective and participatory dynamics that should characterize the nature of the social companies, especially in the decision-making processes (Defourny et al., 2012).

2.3 Social Entrepreneur

The social entrepreneur differs in several features from the traditional entrepreneur who fits perfectly within the market dynamics and whose main purpose is the profit generation (Dees, 2001).

Bill Drayton, founder of the largest network of social entrepreneurs in the world, Ashoka, defines the social entrepreneurs as individuals offering innovative solutions to the most pressing social problems, people who pursue a social objective, and that, to achieve it, use methods traditionally associated with the business world (Sanchez, 2011).

The main feature that distinguishes the social entrepreneur from the traditional business-oriented entrepreneur is the priority he attributes to the social purpose and to the creation and sustenance of social value (Dees, 2001). Therefore, the social purpose must be the single objective pursued by social entrepreneur, he should not seek any form of return on invested capital (Leadbetter, 1997; Peredo et al., 2005) . However, according to other currents of thoughts, the social entrepreneur may balance social purposes with profit purposes (Boschee, 1998), also combining them (Shwab, 2013). Accordingly, the generation of profit and wealth may be part of the model that the social entrepreneur embrace, but they must be the means to achieve the social goal, not the objectives (Dees, 2001).

The social entrepreneurs perceive the opportunities to cover unsatisfied social needs and they are able to bring together the necessary resources, such as people, capital, and facilities (Dees, 2001; Mair et al., 2005), and use them to solve social problems and to drive social innovation and change in various fields (Shwab, 2013).

3 Social innovation as result of network and collaborative systems

The result of the activities of social entrepreneurs and social companies is often referred to as social innovation (Phills, 2009).

Social innovation is defined as any new and useful solution to a need or a social problem, which is better than existing approaches (e.g., more effective, efficient, or sustainable) and for which the created value brings benefits to the society as a whole, rather than to private individuals (Phills, 2009), or its generated social utility is at least as important as the return on investment (Lorca, 2013). The new solutions can be a product, a production method, a process, a technology, a service, a market, a model, but also a pragmatic approach, a principle, an idea, a rule, a social movement, an intervention, or a combination of them (BEPA, 2010; Murray et al., 2010) that meet social needs, improve acting abilities of society, and create new social relations and collaborations.

The supply of products and services that meet those needs are often not guaranteed by the market or by the government, and that is why there is space for the actions of private social sector forces, such as social companies and social entrepreneurs, to create social improvements.

Usually the social entrepreneurs and social companies, in order to give positive outcomes to their ambitions of social innovation, shall interact with a very complex system that includes different actors, such as public institutions, traditional businesses, and civil society and its organizations (Davies et al., 2012). In fact, collaborations between entities belonging to different sectors have the purpose to obtain and share resources from multiple agents (Montgomery et al., 2012). These resources may be material and non-material resources, as financial, cognitive, cultural, and institutional (Montgomery et al., 2012). Moreover, social companies may also use collaboration in order to share ideas and create support networks to achieve the social change goal (Montgomery et al., 2012). A collaborative system composed by local government authorities, non-governmental organizations, local communities, financial institutions, infrastructure manufacturers and other types of traditional businesses is necessary for the

“Strategies for the Bottom of Pyramid”. These are social entrepreneurship models adopting the purpose of offering products and services to the Bottom of Pyramid (BOP), which is composed by the 4 billion people of the world population (about half of the total world population) whose purchasing power is less than 1,500 \$ per year (Prahalad et al., 1999).

In recent times, the perception of the need for a strong collaborative network in order to give positive result to social change ambitions led to formation of entrepreneurs networks, such as Ashoka and Hub Madrid networks.

4 Ashoka and Hub Madrid

4.1 Ashoka

Ashoka is the largest social entrepreneurs network in the world, with about 3,000 members in 70 countries (2013, 07 10), who put into practice in global scale their ideas of worldwide systemic change (Ashoka, 2013c). It was founded in 1980 by Bill Drayton and provides financing services to start-ups, professional support services and connections to a global network that extends around the business and social sectors (Ashoka, 2013c). Moreover, Ashoka offers a platform for people devoted to social change. Ashoka's purpose is the creation of “changemakers” by providing people all over the world the skills and connections that they need to achieve their intentions for social change. The operational approach of the Ashoka network is based on three points. First, Ashoka offers support to social entrepreneurs, by identifying main social entrepreneurs and invests on them and helps them to achieve the highest possible social impact. Second, Ashoka promotes the collaboration between social entrepreneurs groups and networks to make social impact faster and more widespread, by engaging entrepreneurs communities and developing effective collaboration models that could create social changes in many areas. Third, the network cares about the infrastructures construction for the citizen sector, because a global network of "changemakers" requires means and support systems to generate sustainable social solutions. Accordingly, Ashoka creates the necessary infrastructures, such as access to social financing, connections with the academic and business sectors, and structures for collaborations that allow to create social and financial value (Ashoka, 2013a).

Ashoka defines its business model as an hybrid value chain (Ashoka, 2010). This is a business model based on a commercial partnership between firms and civil sector organizations (such as neighbourhood associations, foundations and cooperatives), that leverages the capabilities of each actor to enable the provision of needed goods and services to low-income populations in a more cost-effective way. In this model, the businesses' benefits are the access to new markets and the customers base expansion. Additionally, civil sector organisations take advantage from the partnership because they increase their social impact through generation of new income sources for their programs and expand their range of offered services. Conversely, low income populations improve their living conditions because they can satisfy their basic needs and see the emergence of new economic opportunities. Through the hybrid vale chain the limitations that constrain the potential social impact of civil sector organizations (constrained by their dependence on donations and their limited ability to operate) and businesses (constrained by their limited knowledge of local consumers and local resources, and by their lack of confidence all inside of the local context) may be overcome by combining and sharing their complementary strengths. In particular, the strengths of civil society organizations are: the ability to understand the needs of low-income consumers, the confidence of the local population towards them, the ownership of consolidated infrastructure and networks within these territories, the ability to define feasible solutions based on the context, and the ability to mobilize communities and other stakeholders such as local governments and financial institutions. Instead, the strengths provided by the firms are the ability to operate on a large scale, the ability to develop processes efficiently, the possession of a good reputation and the strength of a recognized brand, the capacity for investment, the capacity to find new investors, and the ability to strategically plan and manage monetary flows (Ashoka, 2010).

4.2 Hub Madrid

Hub Madrid is part of an international community of entrepreneurs and social innovators called Hub, with 31 co-working spaces around the world and a professional network composed of more than 5,000 members (2013, 7 10). Thus, Hub Madrid is a co-working space, a meeting place for social entrepreneurs and social innovators, located in Madrid city centre and created in 2009 (Hub Madrid, 2013a). It was conceived with the purpose to facilitate collaboration and cooperation between social entrepreneurs by

making available a physical, and not just virtual, space within which they exchange ideas, inspire each other, share knowledge, resources and dreams, develop new ideas and new projects having the ambition to promote positive social change (Hub Madrid, 2013b). Even in Hub Madrid, as for Ashoka, collaboration among people who want to spur social change is considered essential in order to realize projects, meet goals and support social innovation. In Hub Madrid network there are about 230 entrepreneurs and professionals acting in different projects related to various areas, from social change and sustainability, to technology, culture and education (2013, 7 10). The work in Hub Madrid is oriented towards the creation of an entrepreneurial ecosystem that is strengthened through the creation of networks and through the collaboration with non-profit organizations, businesses, educational institutions, NGOs, and public institutions. Among the events organized in Hub Madrid there are trainings, meetings, dinners and many events that stimulate creativity and collaboration (Hub Madrid, 2013a).

Hub Madrid is the one headquarter of Hub community in Spain, and its members operate in many areas of Spain, not only in Madrid area.

5 Methodology

5.1 Survey

In order to collect the data needed for the study, we developed a survey which was distributed among the social entrepreneurs members of “Ashoka Spain” and “Hub Madrid”, as representative of Spanish social entrepreneurs. The survey was developed with the purpose to identify the main features and characteristics of individuals and companies involved in social business, especially with regard to the contrasting issues, previously discussed, about existing conceptions and theories concerning social companies. Thus, the survey aims at highlighting the social business models that are actually put in practice by social entrepreneurs.

A first group of questions in the survey covered general aspects, such as entrepreneur age, foundation year, headquarter location, employees number, and percentages of volunteer and female employees in the social company. A second group of closed questions covered other aspects, such as profit or non-profit approach of the company, dividends sharing policy, geographic scope, collaborative networks, and typologies of customers that benefit from these social actions in regard to their location with respect to

the BOP. Finally, the last group of questions was based on a Likert scale ranging from 1 to 5, through which the entrepreneur was called to carry out an assessment about other aspects, such as motivations of his commitment in entrepreneurial social actions, financing sources used by his company, and decision-making system adopted.

5.2 Statistical analysis methodology

The data collected have been used to obtain data about trends within the studied sample and to subsequently perform a statistical analysis. In particular, Pearson chi-square (χ^2) test and Mann-Whitney U test were applied to verify the existence of significant trends differences within the sample with respect to the examined aspects. The results of the statistical analysis were tested with 95% level of significance (Johnson et al., 1998).

Pearson χ^2 test was used for the analysis of qualitative data, collected by questions that did not require a quantitative assessment, such as the questions of the first group requiring a non-numerical response, and the second group of questions of the survey .

Mann-Whitney U test was used to analyse quantitative data, such as the numerical data of the first group of questions and the data collected in the third group of questions of the survey, because they corresponded to quantitative variables that could assume a value ranging from 1 to 5, in accordance with the adopted Likert assessment scale.

5.3 Experts interviews

The results of the statistical analysis were discussed with a panel of experts through personal semi-structured interviews. The interviews were used to support the interpretation of survey's results.

In particular, we interviewed Catalina Parra who developed broad knowledge of the dynamics of social entrepreneurship, on the basis of her wide direct field experience. Especially, she is president and founder of "Fundación Hazlo posible", a foundation having the purpose to innovatively promote interaction and social participation in charitable initiatives using new technologies; she is president and founder of "Asociación UEIA", a non-profit association having the main purpose to promote entrepreneurship, social action and technology as a platform for new projects related to the social context in order to make them viable and sustainable entrepreneurial initiatives over time; she is also co-president and co-founder of "Philanthropic Intelligence", a consultancy organization

that promotes and facilitates better philanthropy among Spanish families and individuals, with the purpose of enabling people having significant assets to realise their philanthropic projects.

We also interviewed Jaime Moreno, due to his global experience and knowledge in the field of social companies. Especially, he was a visiting scholar in Grameen Danone in Bangladesh, that is one of the most popular and successful model of social company in the world, and he is social entrepreneur and co-founder of "Integra-e, inclusión social a través de la tecnología", that is an organization operating in Spain, that trains young people who have left school and are in social exclusion risk in leading web development technologies and in fostering neighbourhood micro-entrepreneurship.

We also interviewed Carlos Mataix, due to his specific knowledge as expert in social innovation and social entrepreneurship, being these among his main specific working areas; he is professor at "Universidad Politecnica de Madrid" and director of "Innovation and Technology for Development Centre", that is a space and a collaborative network that combines scientific, critical and reflective thinking, with practical knowledge to find solutions to the challenges of the lack of sustainability and equity in the current global context.

6 Findings

6.1 General findings

In the sample, the average age of the social entrepreneur resulted 38 years old, that is consistent with the overall average age of the Spanish entrepreneurs, which is a little over 38 years (GEM, 2012). 58% of Spanish social entrepreneurs operates through for-profit companies and the remaining 42% operates through non-profit companies (Figure 1).

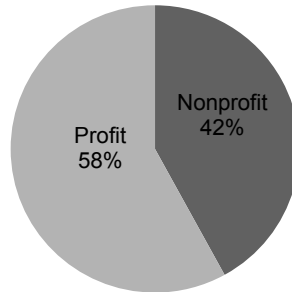


Figure 1: *Percentage proportion of profit and non-profit social companies.*

Within the for profit companies, the 40% of them distributes dividends among its members, and the remaining 60% does not distribute dividends.

Results concerning the composition of human resources employed showed that the 58% of social companies employees are women (Figure 2), that is a higher percentage with respect to the overall business sector in Spain where women are the 48% of employees, according with the “Informe sobre la Brecha de género en la empresa” (Report on gap gender in Companies, conducted in 2010) (El Pais, 2013).

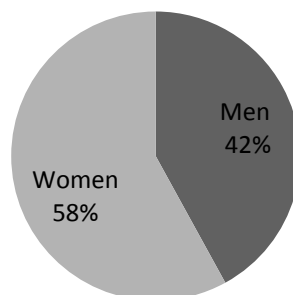


Figure 2: *Average percentage of women and men employed in social companies.*

According to Mataix, the prevalence of women over men among social companies employees, common to non-profit sector trend, is due to the traditional family structure in Spain, which drives women to prefer part-time jobs without gaining more money than men. According to Moreno, this trend occurs because women have an empathy and altruism sense different than men, and they get involved in social initiatives because they are supportive, instead men are motivated by their own innovating spirit and by the

emotions that social actions can generate in them, because social activities excite them and make them feel good.

Moreover, it was found that the 59% of social companies employs volunteers, the remaining 41% does not use volunteer employees (Figure 3).

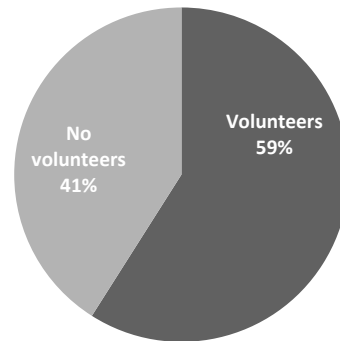


Figure 3: Proportion of companies using and not using volunteer employees.

Among companies employing volunteers, the average portion of volunteer over total employees was 51%. By applying the χ^2 test, we found a statistically significant difference between profit and non-profit companies in using volunteer employees, in particular non-profit companies have a larger propensity to use volunteer employees than profit companies (Table 1).

Table 1: χ^2 test: independent variable: profit/non-profit company; dependent variable: collaborations and volunteer employees use (* $p < 0.05$).

		Volunteer employees	
		No	Yes
Non-profit	Observed	3	11
	Expected	5.8	8.2
Profit	Observed	11	9
	Expected	8.2	11.8
df		1	
χ^2		3.832*	

The data regarding the typology of customers showed that the proportion of social companies serving customers that do not have access to basic goods and services is 25%. According to Moreno, this is due to the fact that in Spain basic needs, such as health and education, are covered enough. On the same line of thought is Parra, that associates this outcome to the specific social situation in Spain, in comparison with country having different social conditions, that does not stimulate the launch of social entrepreneurship initiatives oriented to the BOP.

Analysing the data regarding the geographic scope of social companies, we noticed that 54% of companies has global scope of operations, 16% operates at continental level, 16% operates in a single country, and the remaining 14% limits their activity to a local context (Figure 4).

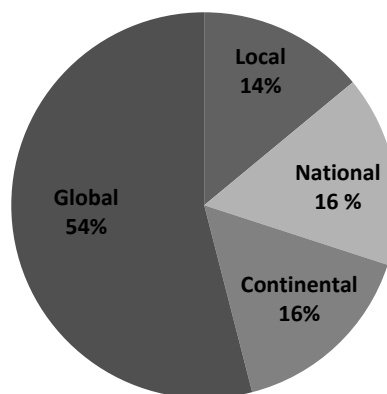


Figure 4: *Percentage of companies operating in local, national, continental and global scope.*

The χ^2 test highlighted a statistically significant difference in the geographic scope of less recently incorporated and more recently incorporated companies; in particular, more recent companies have larger scope, with a major propensity to act in continental and global contexts (Table 2).

Table 2: χ^2 test: independent variable: company foundation year; dependent variable: operative scope (* $p < 0.05$).

		Foundation year	
		≤ 2010	> 2010
More Countries	Observed	20	5
	Expected	16.7	8.3
One Country	Observed	4	7
	Expected	7.3	3.7
df		1	
χ^2		6.545*	

6.2 Social entrepreneur motivations

We spotted that social entrepreneurs establish their initiatives due to social vocation. The survey also showed that pure business opportunity and the need to find employment are less prominent motivations in inspiring social entrepreneurship initiatives (Figure 5).

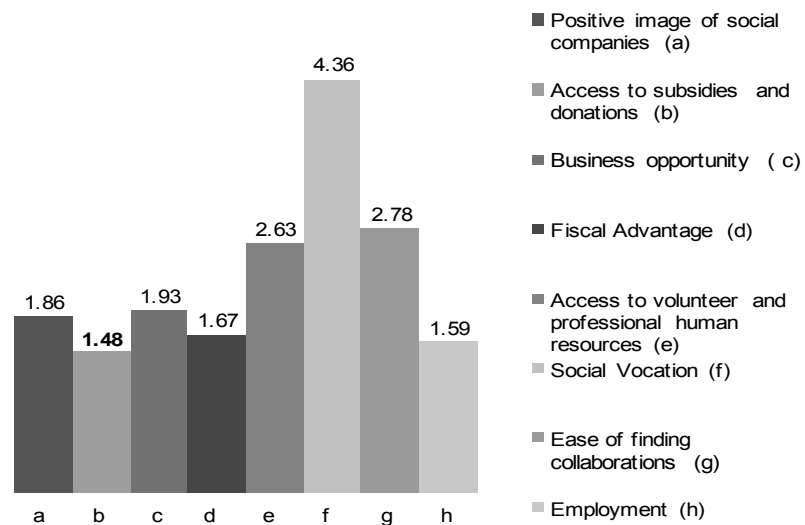


Figure 5: Average rating (1-5) of the importance of the different motivational factors in order to launch initiatives of social entrepreneurship.

This result is in contrast with the overall trend of Spanish entrepreneurship; in fact, according to the report of Global Entrepreneurship Monitor (2012), a large part of entrepreneurial activities in Spain was motivated by unemployment and by the need to create a job for the entrepreneur, that is the so-called phenomenon of “self-employment” (GEM, 2012). According to Mataix, the entrepreneur who seeks to employ himself does it in more accessible and faster return areas rather than in social entrepreneurship.

6.3 Financing system

Survey’s answers indicate that the most spread funding source among social companies is the income generation through their operating activity. The use of other financing sources, such as public donations and subsidies, and private donations is less spread (Figure 6).

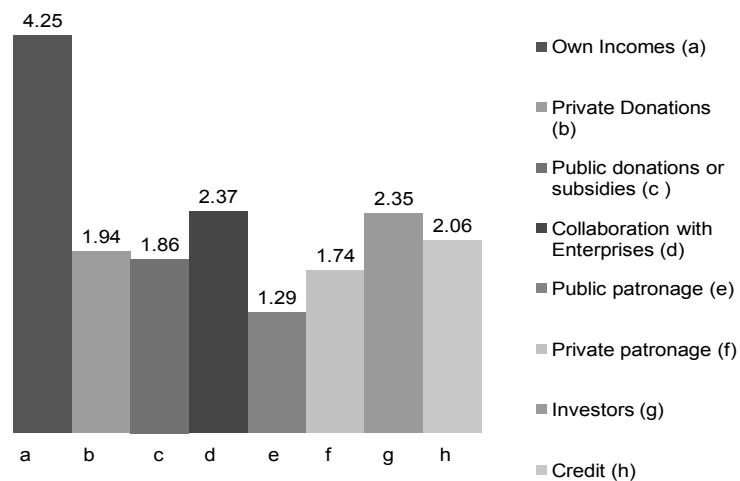


Figure 6: Average rating (1-5) of the use of the different financing sources.

By applying the Mann-Whitney U test (Table 3), we found significant deviations from this general self-sustaining model with regard to social companies that serve BOP people. Their main financing source is not the income generation through the operative activity, instead they rely more on public donations and on subsidies and private donations (Table 3).

Table 3: Mann-Whitney U test. Independent variable: served people; dependent variable: financing sources (1-5). Results having p value <0.05 were considered statistically significant.

Financing	Mean		U	p
	Served people			
	Covered basic needs	Uncovered basic needs		
Own incomes	4.65	3	16	0.018
Private donations	1.6	3.5	16.5	0.023
Public donations or public subsidies	1.45	3.75	14	0.012
Collaboration with companies	1.75	3.25	21.5	0.12
Public patronage	1.3	1.5	34.5	0.458
Private patronage	1.7	2.75	28.5	0.267
Investors capital contribution	2.35	2.33	27.5	0.8
Crédit	2.21	2.41	16.5	0.207

According to Mataix, there are social companies that act with extremely vulnerable groups and they can operate only if they are sustained by subsidies. Basically, this is what happens with social companies serving a weak segment such as the BOP.

6.4 Collaborative system

We found that 74% of social companies has collaborative relationship with NGOs, 56% with public institutions, 38% with public companies, 74% with private companies, 59% with civil society organizations, and 24% has generated a joint venture (Figure 7).

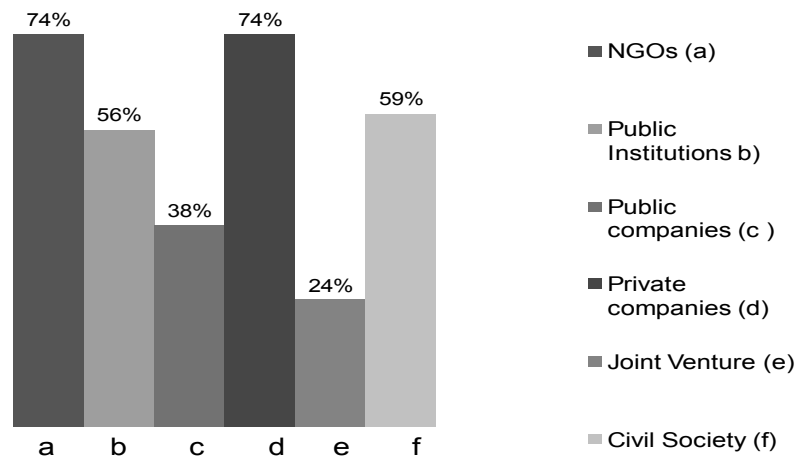


Figure 7: Percentage of social companies that collaborate with each one of the indicated entities.

By applying the χ^2 test, we noticed significant difference between profit and non-profit companies collaborative systems. In fact, non-profit companies have larger propensity to collaborate with public sector (public institutions and public companies) than profit companies (Table 4).

Table 4: χ^2 test: independent variable: profit/non-profit company; dependent variable: collaborations (* $p < 0.05$).

		Collaborations											
		NGOs		Public Institutions		Public Companies		Private Companies		Joint Venture		Civil Society	
		No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Non-profit	Observed	4	11	3	12	6	9	3	12	3	5	7	13
	Expected	4	11	6.6	8.4	9.3	5.7	4	11	4.5	3.5	11.2	8.8
Profit	Observed	5	14	12	7	15	4	6	13	16	10	12	2
	Expected	5	14	8.4	10.6	11.7	7.3	5	14	14.5	11.5	7.8	6.2
df		1		1		1		1		1		1	
χ^2		0.001		6.333*		5.384*		0.577		1.434		8.591*	

We also found a significant larger propensity to collaborate with public institutions among social companies serving BOP people (Table 5).

Table 5: χ^2 test: independent variable: served categories; dependent variable: collaborations (* $p < 0.05$).

		Collaborations											
		NGOs		Public institutions		Public companies		Private companies		Joint venture		Civil society	
		No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Covered basic needs	Observed	6	13	11	8	12	7	8	11	17	2	8	11
	Expected	5.8	13.2	9.1	9.9	12.4	6.6	7.4	11.6	15.7	3.3	7.4	11.6
Uncovered basic needs	Observed	1	3	0	4	3	1	1	3	2	2	1	3
	Expected	1.2	2.8	1.9	2.1	2.6	1.4	1.6	2.4	3.3	0.7	1.6	2.4
df		1		1		1		1		1		1	
χ^2		0.068		4.439*		0.204		0.406		0.584		0.406	

The rationale of this is that this kind of companies, in order to sustain their social actions, generally, need not only financial resources from public institutions, but also other resources such as facilities that can be provided by public administrations (Mataix, 2013).

6.5 Decision making structure

The data analysis revealed that social companies tend to use a democratic decision making system. Their decision-making processes are primarily managed through a totally participatory system, in which all the members of the company actively participate, and, secondly, by a collective governing organ. From the analysis, we do not spot emerging tendencies regarding the centralization of the decisions in the person of the entrepreneur

or a single manager, or adopting a decision making structure depending on the capital contributions of each member of the organization (Figure 9).

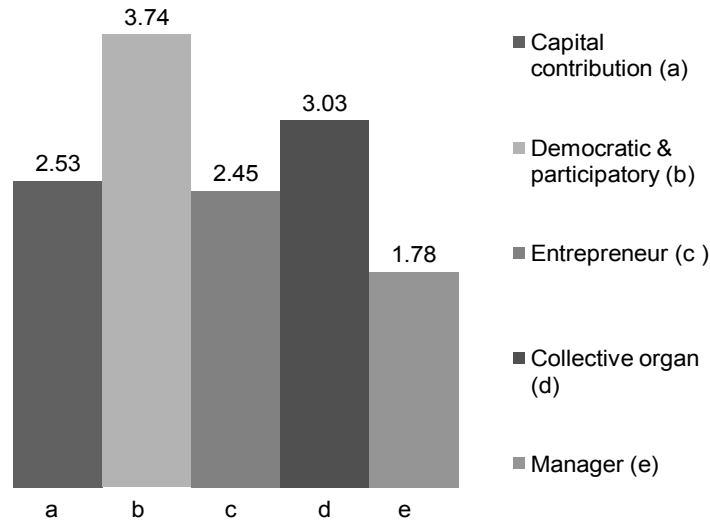


Figure 9: Average rating of the importance of different factors in decision-making system.

7 Conclusions

The available scientific literature deals with the conceptual definition of social entrepreneurship, i.e. types of activities and business susceptible of being termed social, or focuses on particular case studies of individual social company. Contrarily, in this research insights about the general characteristics of subjects and companies involved in social business in Spain are given. In this research, by taking data from a sample of social entrepreneurs, we do not restrict the sample to define the way of acting of a specific company, but we obtain general guidelines that are common to social companies and social entrepreneurs, independently from the specific social field in which they operate.

The purpose of this research is to identify the main features of social companies, such as profit or non-profit approach, geographic scope, financial sources, collaborative networks and decision making structure. To complement the study, attention is also paid to the motivations and general profile of social entrepreneurs, as well as to the type of customer that benefit from these social actions, with respect to the BOP.

The research methodology is based on the data collected from the members of two Spanish social entrepreneurs network, namely “Ashoka Spain” and “Hub Madrid”. A survey was developed and distributed among the entrepreneurs members of the mentioned networks. Finally the results from the statistical analyses have been discussed with a panel of experts through semi-structured interviews. Several interesting results emerged.

First, the results of the research reveal that the generation of social entrepreneurship activities is generally motivated by the entrepreneurs’ social vocation and not by the perception of a business opportunity in this field or the self-employment need.

Second, the majority of social companies are for profit companies and have a low tendency to distribute dividends among their members. Concerning the financing system adopted, it is worth noting the orientation towards a self-sustaining model, without donations and public transfers. This result may be due to the current crisis that reduced the availability of subsidies and donations. Moreover, from our results, the preference to adopt collaboration with private sector over public sector emerges as a significant trend.

Regarding the composition of employed human resources, the results show that social companies make a wide use of volunteer employees. A peculiar feature of social companies is also the prevalence of women over men among employees.

Concerning the scope of the social companies, the creation of global and not local businesses is spotted as a favored trend.

Results regarding the decision-making system reveal that in social companies a democratic and participatory decision-making system is adopted.

Finally, results point out that social companies in Spain tend to focus their activities on customers who have their access to basic services and products covered. On the contrary, people belonging to the lower BOP are mainly left unattended by social companies, receiving only the help of the public authorities.

Of course, our study features some limitation that necessitate further research. Especially the study was limited to the analysis of those data collected from social entrepreneurs members of Hub Madrid and Ashoka Spain, therefore future research could extend the research through a cross-cultural validation in different countries. In particular, the developed survey could be distributed among members of Hub community and Ashoka network external to the Spanish context in order to conduct a more global analysis.

Acknowledgements

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Enhancing Sustainability in Finance: Throughput Model focused decisions

Waymond Rodgers *

College of Business
University of Hull/University of Texas, El Paso
UK/US

Arne Söderbom

University of Halmstad
School of Business, Halmstad Sweden

Graeme Reid

College of Business
University of Hull, Hull UK

** Corresponding author*

Structured Abstract

Purpose – The purpose of this paper is to provide a conceptual financial analysis process model that depicts intangible assets for researchers and practitioners that can assist them to enhance their understanding of valuation issues.

Design/methodology/approach – We propose an approach a theoretical/conceptual framework described as “The Throughput Model”

Originality/value –This methodology puts in evidence the processes that decision-makers use to select different types of information, which supports their position, and have ignored other information, which does not support their position. Also, the model is useful in depicting latter stages of investment bankers and financial analysts’ processes, such as judgment, that are implemented in supporting individuals’ positions.

Practical implications – The outcomes of the application of the Throughput Model helps uncover the observations and values that investment bankers and financial analysts rely upon when taking positions on issues.

Keywords – Intangible Assets, Valuation, Throughput Modelling.

Paper type – Academic Research Paper

1. Introduction

The typical financial analysis model has changed primarily due to the shift from industrial age method of valuing assets to the knowledge age method. As such, valuation has become more volatile as a result of organizational assets becoming more “intangible.” Due to this “intangible nature” of assets, ethical complexities and issues have arisen since unseen assets (e.g., copyrights, patents, knowledge products, etc.) are easier to confiscate than tangible assets (e.g., equipment, machines, tools etc.). Hence, this paper focuses on a *Throughput Model* that serves to improve the investment bankers or financial analysts’ propensities in dealing with sustainability issues in Finance (Foss and Rodgers, 2011). Moreover, the Throughput Model implements the value of knowledge and how it can be modelled to address the following financial concerns that may impede sustainability:

- a. Extraordinary leverage and increasing returns;
- b. Fragmentation, leakage, and the need for refreshment;
- c. Uncertain value; and,
- d. Uncertain value sharing.

2. Throughput Modelling Paradigm

The central insight of the *Throughput Model* approach is that perceptual inputs can be influenced by ethical considerations. This ethical insight is depicted as part of “perception” in Figure 1. *Perception* involves the process of individuals framing their problem solving set or philosophical view of the world (Rodgers, 1997). Further, Rodgers (2009) argued that perception represents a person’s expertise, classifying and categorization of information. For example, an investment banker may effectively implement cognitive heuristics by discussing about and delivering financial products to customers when other potential customers are in the same vicinity thereby influencing investment deals.

Ethics can be considered as a set of moral principles or values with the express intend to reduce harm (Rodgers, 2006). We each have such a set of values, although we may or may not have considered them explicitly. Philosophers, moral leaders, religious institutions, and others have defined in many instances ideal sets of moral principles or values. Examples of pre-set moral principles or values at the implementation level contain laws and regulations, church doctrine, codes of business ethics for professional groups

such as notary publics, and a code of conduct within distinct organizations. Quite a few individuals bifurcate or separate ethics and morality. Nonetheless, in this paper, we adopt what other philosophers tend to use that is ethics as a general term referring to both moral beliefs and ethical theories (Rodgers and Gago, 2001).

Information stage (Figure 1) includes the set of financial and non-financial information available to a decision-maker for problem solving purposes. The financial information includes liquidity (e.g., current assets/current liabilities), profitability (e.g., net income/sales), leverage (e.g., debt/equity), as well as market performance (e.g., price-earnings ratio). Whereas, non-financial information can be divided into three sub-groups of intangibles assets, namely, includes human, organizational, and relational assets (Rodgers, 2003).

Human assets include abilities, attitudes, perceptions of employees; as well as their motivation commitment and adaptability to the organization. These assets also captures individuals' knowledge has and can generate to help an organization. Human capital is critical since it is the source of innovation and renewal, whether from creative activities or a list of quality suppliers. Areas that at the cornerstone to manage human capital are:

- a. capturing a database of employee competencies;
- b. capable knowledge transfer systems enabling the needed knowledge or skill when required.
- c. implementing an evaluation and incentive system tied to the acquisition and application of competency that supports the organization's strategic objectives.

Organizational assets include intangible assets such as brands, copyrights, patents, trademarks, culture, and process capability. In addition, organizational capital contains knowledge that has been retained in knowledge repositories including the structure, processes, and culture of an organization. Moreover, knowledge sharing and knowledge transfer requires structural intangible assets such as distribution channels, communication systems, laboratories, competitive and market channels, which converts employee's knowhow into the property of an organization.

Finally, relational assets include but are not limited to knowledge of and acquaintance with communities, competitors, customers, governments, and suppliers in which the organization performs. Further, relational assets promote the brand value obtained by a

customer from conducting business with a supplier of goods and/or services. Brand value, which is part of relational assets rely upon the following components:

- a. the sustainability feature that an organization puts back into the economy;
- b. partnering and joint venturing;
- c. the license to operate in society;
- d. reputation among customers and suppliers; and,
- e. stakeholder value as influenced by an organization's ethics.

The *judgment* stage (Figure 1) contains the process individuals' implement to analyze incoming information (financial and non-financial), as well as the influences from the perception stage. From these sources, rules are implemented to weigh, sort, and classify knowledge and information for problem solving or decision-making purposes. Finally, in the *decision choice* stage (Figure 1) an action is taken or not taken. The next subsections discuss the major concepts of perception, information, judgment and choice in much more detail.

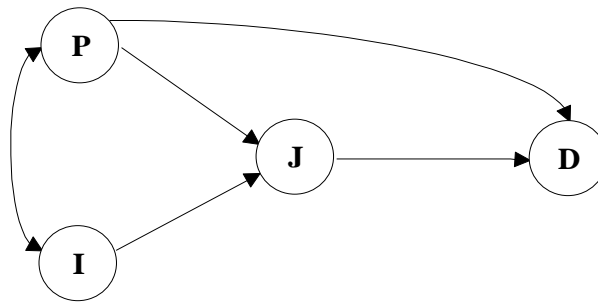


Figure 1 - Throughput Modeling Diagram
Where P= perception, I= information, J= judgment, and D= decision choice.

In relationship to $I \rightarrow P$, information influences and can reshape a person's ethical perspective as part of perception. This reshaped perceptual frame may provide a person with a modified or new ethical perspective in problem solving or decision making. $I \rightarrow J$ infers no inference from an individual's perception. That is, in a problem solving task, the information is processed or retrieved from memory and acted upon by decision rules as practiced or implemented in one's profession (such as an investment banker or financial analyst). These decision rules are encoded in the judgment stage in the model. These rules provide guidance in sorting, arranging, ranking and rating of financial and non-financial information before a decision choice or action is taken. Finally, the relationship $I \rightarrow J$

does not imply an incorrect learning or memorization of the person regarding financial and non-financial information. But, $P \rightarrow I \rightarrow J$ or $I \rightarrow P \rightarrow J$ could lead to a bias judgment. Of course time pressures, uncertain information, unstable environment and the expertise of the decision-maker contribute to whether or how many biases can distort the judgment stage.

The diagram can of course be easily further enhanced by the inclusion of the idea of auditing the financial statements which are being used. The auditor is working to ensure that the accounts show a ‘true and fair view’ and they also comply with the appropriate legal requirements. The ‘auditor’ would be set between the Perception / Information link and the Judgement as shown in Figure 2. The model then becomes more innovative in that it has the capability of ensuring that the information being used by an individual to make decisions is presented in an appropriate manner. The presence of the auditing link also removes the time pressures, uncertain information and unstable environment mentioned above since by definition the audit uses time and enables reflection by the auditor. The auditor themselves has other issues. The valuation of intangibles is a complex area and the carrying value of the asset can have a significant effect on the presentation of financial statements. Consideration must be made of the audit work undertaken.

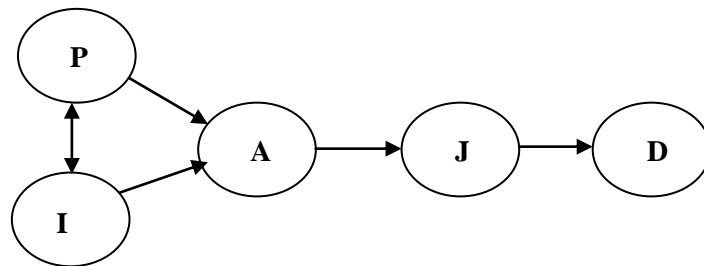


Figure 2 - Audit Modifier in Throughput Modeling
A = Audit

3. Conclusions

In summary, the *Throughput Modeling* begins with individuals stating their views of what should be done. The advantage of this approach is that it helps decision-makers understand why individuals have selected some information, which supports their position, and have ignored other information, which does not support their position. This

approach helps uncover the observations and values that investment bankers and financial analysts rely upon when taking positions on issues. Also, the model is useful in depicting latter stages of investment bankers and financial analysts' processes, such as judgment, that are implemented in supporting individuals' positions. In sum, the model should help to better understand financial risk while addressing the following:

1. Insiders trading risk,
2. Higher costs of capital,
3. Misallocation of capital due to intangibles over or under evaluation,
4. Decreased incentives for entrepreneurs and knowledge workers, and
5. Increased volatility.

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Changing the Change: E.M.E.M. A Dynamic Model for Sustainable Change

Lynes Patrick Ph.D.

Department of FEP
University of Montréal
3744 Jean Brillant, Montréal, Canada H3C 3J7

Structured Abstract

Purpose – This article proposes a global model for change that takes into account the organic reality and diversity of operating methods of individuals in order to favour the flexibility and adaptability necessary to establish a regenerative work climate and build a sustainable development strategy within enterprises.

Design/methodology/approach – We propose an empirical and phenomenological approach

Originality/value –This methodology puts in evidence the limits of pursuit of short-term profitability and the doing *more with less* mindset that produces an excessive demands on worker's capacity for change. In the current context of economic crisis, we observe flagging momentum for these specialized operating methods which imperil employees' health and the medium-term profitability of businesses.

Practical implications – The outcomes of the application of the E.M.E.M. Model offer a global guideline for individuals and human resources management to evaluate the risks with results from asking always more efforts and performance from the employees.

Keywords – E.M.E.M., organizational change, managerial change, over-adaptation of employees, sustainable development.

1 Introduction

The challenges posed by ideological, economic, technological and ecological changes are complex (Thureau-Dangin, 2012) to the point of calling into question our concept of humanity (Guillebaud, 2001). Individuals and organizations alike seek both to adapt to new paradigms and to maintain their cohesion while undergoing this dynamic of change. To do so, they rely on information or experiences that have previously proven useful and seek ways to adapt them to the new strategic challenges they face. This generates new operational models that should offer solutions to overcome our personal or organizational obstacles.

Unfortunately, these models often exhibit major shortcomings. Namely, they are based on premises that no longer hold true (ex: the availability and abundance of primary resources, overestimation of the principle of doing more with less). Or, they develop idealistic operational models which seem logical and efficient at first glance but fail to fully consider the human realities they should serve and thus meet with strong resistance when they are applied on the ground (Frietag, 1995, Lynes, 2007). Finally, the operationalizing of these idealistic models is more suited to generalized applications that deny the imperfect realities they seek to improve, deprived as they are of the flexibility and adaptability required to pursue the process of change (de Gaulejac, 2005; Lynes, 2007; Taylor, 1992).

Our continually changing world forces us not only to find new solutions but also new ways to apply them (Bouchard, Bos, 2006). In the context of this paper, I propose to present a global model for change that takes into account both the diversity of individual needs and the flexibility and dynamism we need to adapt to new contemporary realities.

2 The ultimatum of short-term profitability

The economic crisis provoked among others by the market meltdown appears to be tough to shake off. The recovery is proving stubbornly slow, exerting considerable pressure and instilling a sense of urgency within enterprises. Embroiled in a context of economic uncertainty, enterprises are terrified at the prospect of posting a poor quarterly earnings report which could unnerve investors and threaten a severe devaluation of their stock price. Moreover, with an aim to remaining profitable and competitive or simply surviving the crisis, companies engage in an intense pursuit of new short-term strategies. Occasionally, to dress up their balance sheet, they must hastily sever positions, increase reliance on sub-contractors and intensify employee workloads.

This short-term profit optimization approach has indeed led to the identification and correction of certain lapses, helped improve employee performance and maximized the gains offered through the implementation of new technologies. These operating methods, which have now been in use for several years, are however starting to show signs of flagging momentum. A ceiling can be reached in the pursuit for new ways to always do more with less. This approach calls for reliance on traditional top-down management methods which impose directives without consultation or preparation, reducing the autonomy, freedom to take action and possibilities for acceptance of change by those who

must submit to it. Consequently, this constant focus on short-term returns exposes employees to a climate of unrelenting urgency and permanent stress that overtaxes their capacities to adapt. To use an analogy, just as the acceleration of natural resource exploitation increases the ecological footprint; growing demand for the short-term profitability of enterprises menaces their medium-term survival and mortgages their workers' health.

In fact, over the past several years, worker absenteeism due to mental health and adaptability issues has been escalating. Within enterprises and organizations, insurers observe that they have become the primary reasons for sick leave and that they generally require more time for rehabilitation. Professional fatigue is a progressive syndrome brought about by prolonged exposure to work-related stress. This stress can result from external objective factors (the enormity of the task, unrealistic goals, lack of available resources, etc.) or internal factors (feeling unappreciated, excessive expectations, role conflicts, undermining of one's professional reputation, a feeling of inadequacy, etc.). Contrary to the common perception held two decades ago, we observe that this syndrome particularly affects the best employees; namely those who apply themselves the most, who aspire to meet their employer's expectations and achieve professional success. Aubert and Gaulejac contend that in their quest for excellence, these employees ascribe to the enterprise's ideals to the point of disregarding their needs and limitations and end up becoming estranged to themselves.

To motivate employees, enterprises suggest that they seek inspiration in the paths to success followed by exceptional role models such as Olympic champions. However, the general depiction of these prime models of excellence is flawed in several respects; to attain such heights these individuals must set aside entire aspects of their personal life, only a small minority ever reaches the podium, their career is short-lived, and reintegration into normal life is exceptionally challenging for quite a few of these elite athletes. In short, this model only considers the competitive aspect of work: rivalry, short-term success, neglect of anything that might impede optimal performance, and the merciless disqualification of anyone who fails to attain excellence. It implicitly discredits cooperation, time investment for the long haul, impediments to sustaining a high level of performance and any possible margin for error. Not only does this view disregard quality of life at work, it can even prove counterproductive in relatively short order. The current economic context puts competition first even as new issues that must be addressed arise:

retention of top employees, innovation, the need to stimulate synergy between various departments and hierarchical structures within enterprises, and setting parameters for sustainable development. All become preoccupations that cannot be addressed by the prevalent narrow approach of competitive performance for short-term gain.

In this context, to managers of enterprises and organizations I will propose a model for change that can promote adaptability, sustainable development, employee engagement and quality of life. This is the transposition of a dynamic experiential model for individual change I devised several years ago – the E.M.E.M. (Evolutionary Model of Experiential Movement) (Lynes, 1987-2014).

3 E.M.E.M.: a model for sustainable change

The E.M.E.M. is a model for change based on a dynamic and experiential approach. Relying on concepts developed in mind-body therapy and dance therapy, this model relates physical body movements and life attitudes. It is thus inspired by the physiology and diversity of human expressiveness. It strives to empower individuals to see how they fit into a predetermined, specialized operating method without being overwhelmed by it.

The model features two axes. The first horizontal axis represents tonus. This is a state that can clearly be felt within and can be measured by the psychogalvanic response or by blood pressure but is not easily observable from the outside. It extends from the release pole to that representing tension, passing through all the degrees of expression between these two extremes. In its positive form and dependent upon circumstances, release corresponds to the capacity to let go, to recharge one's batteries and wipe the slate clean. At other times and for certain individuals, the release state can also correspond to a lack of tonus, laxness and negligence. At the opposite end, in its positive form the tension pole corresponds to the capacity to make an effort, summon endurance and show determination. For certain individuals or in other circumstances, it can also adopt an adverse aspect which corresponds to an overestimate of one's strengths or an underestimate of needs.

RELEASE

TENSION

o-----T-----O-----N-----U-----S-----o

The second axis intersects the first vertically at the centre. This is amplitude. Much easier for an observer to perceive, this axis goes from contraction to extension while passing through all the degrees of expression between these two extremes. Physically, we can easily identify a contracted or restrained posture by the slumped shoulders, discrete body language, reserved expressivity, bowed back, bent legs, and eyes focused on the floor. In its positive manifestation it can correspond to the ability to bend to meet demands, to revitalize and to constructively recognize one's limitations. But in other circumstances or for certain individuals, it can express being weighed down, servility, lack of initiative, and trouble with recognizing one's self worth or taking one's rightful place.

At the opposite end of the amplitude axis is the extension pole. The individual found to varying degrees within this pole will have expressive body language, a bulging chest; with eyes fixed on the horizon and a forceful vocal tone, he or she will exude an impression of confidence. In its positive form, an individual characterized by this pole will be affirmative, seek to overcome obstacles, have confidence in his abilities and may even be an inspiring leader. But yet again, for certain individuals or in other circumstances, this posture may express an inflated view of one's importance, a preoccupation with always appearing to be in control even when the person feels or knows he is out of his depth, and a quest for the spectacular in defiance of reality's limitations.

CONTRACTION

EXTENSION

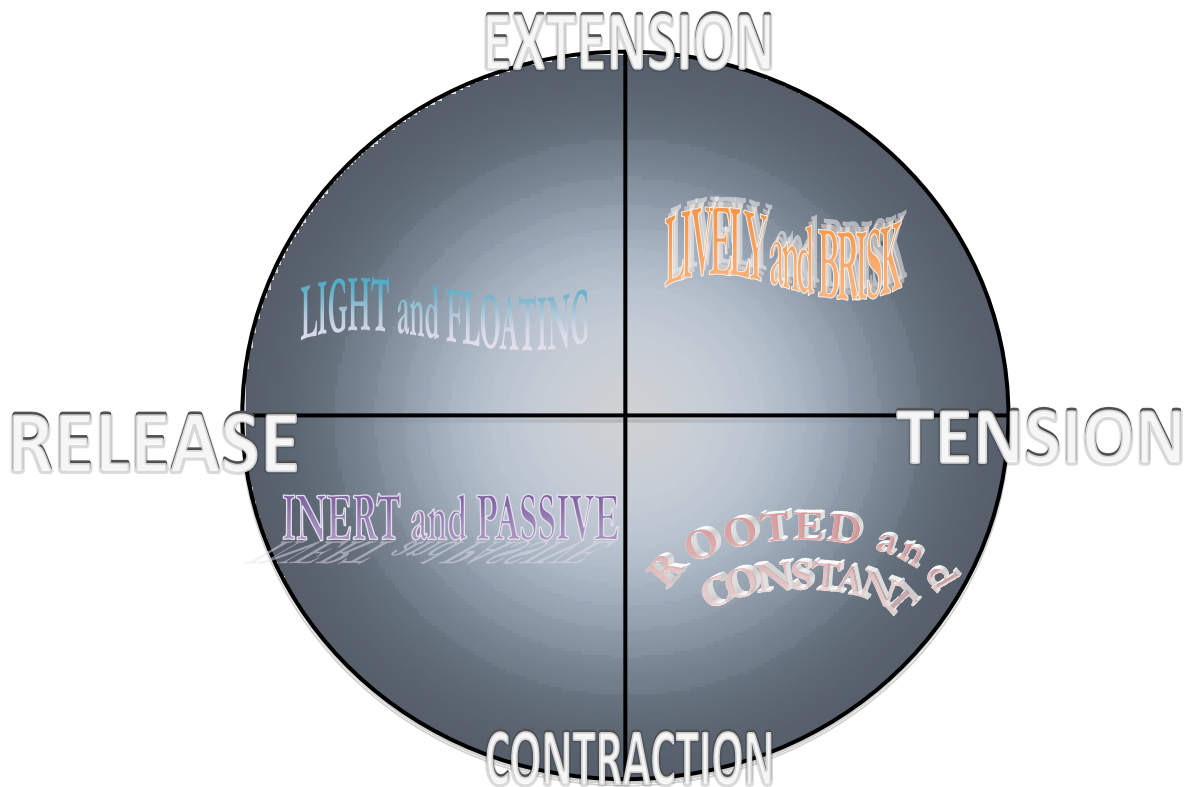
o-----A-----M-----P-----L-----I-----T-----U-----D-----E-----o

3.1 The four rhythms

In crossing, these two axes delineate four quarters which correspond to rhythmic expressions. Each of these is as important as any of the others. Some persons, due to their personality, education and experience, tend to recognize themselves more easily in one of these and less so in others.

E.M.E.M.: Evolutionary Model of Experiential Movement

Patrick Lynes 2014



To present them, we will proceed clockwise with the hands of the clock. Therefore, the rhythmic section that falls between noon and three, namely that falling between extension and contraction, will correspond to the lively and brisk rhythm.

Lively and brisk

Here gestural expression is quick, expansive, efficient and irregular. This is the rhythm assumed by someone running an obstacle course. It allows one to remain alert, ready to switch directions at any moment if the situation calls for it, and to exert the necessary energy to achieve goals. This rhythm stimulates the secretion of adrenaline which spurs action, as well as that of cortisone to alleviate pain. In its extreme expression, this electrifying rhythm mobilizes survival mechanisms; the individual will not retreat

from any effort, determined to dominate the situation and see things through to the end. This is the rhythm that allows for surpassing of limitations, achievement of exploits, and victory over one's adversary. Associated with conquest and efficiency, this is the rhythm most prized by enterprises presently. However, maintaining this rhythm systematically at a high intensity for prolonged stretches proves unsustainable. Subjected to permanent stress, the individual tends to disperse their energy, running on empty, and must summon even greater exertion to obtain the same results, while never appreciating successes which always seem to him to be insufficient, leaving him feeling overwhelmed and irritable. If the person is not sufficiently attentive to these symptoms and insists on continuing at this pace, he can even break down.

Rooted and constant

The next rhythmic quarter, located between three and six on the clock face between the poles tension and release, is that of rooted and constant. This is the rhythm of continuity, conducive to the execution of certain repetitive but necessary tasks. This is also the rhythm at which we can be present and aware of our actions. This rhythm is helpful for the fisherman untangling his nets, the massage therapist who unknots a muscular tension, or a person who must conduct a meticulous inspection. In enterprises there are persons who adopt this rhythm either as a natural tendency or as a function of the work to be done. Even if they are efficient, some of them object to looking bad and seeming to be dragging their feet in the eyes of those who prefer a more flamboyant rhythm. However, the concentration and precision required by certain tasks is ill suited to the adoption of a more expansive rhythm. It is essential to recognize the quality of work performed and the contribution of these employees, who although more discreet accomplish unavoidable tasks, if an enterprise wants to continue to rely upon their professional commitment. Being systematically constrained in an intense manner to such a rhythm also has its limits of effectiveness. The individual can become isolated in a monotonous routine, withdraw into the comfort zone of absolute control over too small a space, feel out of touch or a hostage to workplace objectives, suffer from a lack of recognition for efforts made and the enormity of the task accomplished, extending to an unwillingness to risk communicating to others the challenges faced and demands involved in the work he performs.

Inert and passive

The next quarter, between six and nine on the clock face, is that of inert and passive. At the opposite end of the spectrum from lively and brisk, and associated with doing nothing, this is the rhythm held in the most contempt. At given times, certain persons don't want to do anything whatsoever, but out of guilt still force themselves to take action. It must be noted that there is an implicit social imperative inciting us to always do more, resulting in a constant sense of withdrawal if we try to satisfy this need through recourse to external means. However, it is essential to catch one's breath to resume our path more effectively. This rhythm is that of internalization and reflection. It favors intimacy and depth. Some find themselves plunged into this rhythm during a depressive period. At such times, they would be best served to take stock, re-evaluate their situation and make better life choices that take their needs into account more suitably. These moments of inaction can thus help us avoid forging on in a way that no longer agrees with us. Some professionals who practice yoga and meditation affirm that these techniques help them strike a compensatory balance to the intensity of their professional lives. In the creative process, this rhythm corresponds to the fecund incubation period which fosters the hatching of new ideas and ways to bring them to fruition. Hours spent passively gazing at screens filled with images to which we pay scant attention are one way to satisfy this need to do nothing while having the opposite impression of being active. But then again, remaining systematically at this rhythm can prevent us from realizing our potential. Avoidance, seeking out protective isolation, and escaping into a dream world can become paralyzing. It is by engaging with the outside world, confronting adversity and prevailing over challenges that we learn to know ourselves and progress. If out of complacency or withdrawal we systematically seek refuge in passivity and avoidance of effort, the potential benefits of recourse to this rhythm fade and condemn the person who indulges in this state to a quagmire of powerlessness and incapacity.

Light and floating

Lastly, the rhythm found between nine and noon, between the poles release and tension, is that of light and floating. This is the rhythm felt by those swept up in a love affair, those celebrating a momentous occasion or even dancers who let themselves get spirited along to the tune of a waltz's melody. Sometimes simply hearing from a friend, receiving a compliment from a boss or a sign of affection from a loved one or feeling

useful to someone can stir this feeling of lightness in us, lifting the weight of the demands and responsibilities we usually bear. Tapping into this rhythm requires a capacity to let go and be receptive. We can neither decide when to experience such moments of joy or monopolize them. We can only lay the groundwork so conditions are fertile for their emergence. In poetic terms, we could say that taking a plunge into this rhythm is to experience life's generosity.

In its warrior mentality, the enterprise is wary of letting go. We are entitled to rejoice only when we have succeeded. In the economically challenging times we currently face, it could be useful to appreciate others for what they are as well in all their uniqueness and diversity and not just to underscore the achievement of a performance that current economic conditions often renders unattainable. Such generosity of spirit could help alleviate the morose atmosphere that permeates many workplaces and promote a spirit of cooperation and solidarity in these trying times.

Trying to sustain this heightened rhythm on a nonstop basis is as intolerable for oneself as it is for others. We know the sad stories of stars adored by the public and enjoying unbridled wealth who spiral to vertiginous depths of distress and despondency. The accessibility of distractions and facile access to drugs can give the impression of remaining in control for a while, but disenchantment rapidly weighs in. The dark side of existence or ideologies cannot be avoided, either for individuals or organizations. Accordingly, to take flight one must first start on solid footing. We cannot arrive at such moments of lightness of being without awareness of our imperfect reality. Trying to deny or avoid it only results in an even harder fall back to earth.

4 Conclusion; Favoring adaptability and sustainable change

This dynamic model for change has proven useful in practice to illustrate the limitations of resorting to a single operational mode. Just as a healthy diet needs access to various food sources, to arrive at a sustainable lifestyle the individual must not rely solely on a single rhythmic expression or systematically rely upon a single specialized operational mode.

Empirically, what emerges is the complementary aspect of rhythmic expressions. In fact, the more a person aspires to systematically and intensely prevail in a certain state, the more he risks being plunged as deeply into the opposite state. Thus, the person who always wants to be the best (the extreme of the extension pole) and dedicates every effort

to achieve this (the extreme of the tension pole), in denial of any impediments he encounters, can end up at the opposite extreme from his aspirations, crushed by the weight of his demands (the extreme of the contraction mode) and unable to act due to lack of energy (the extreme of release). Thus winded, he will have to gradually learn to recognize his needs and limits, so as to avoid falling yet again into a hyper-specialized lifestyle to the exclusion of all the other aspects of his humanity that allow him to pursue his life's path.

In my opinion, the former individual example can be transposed to enterprises which, out of exclusive concern for short-term gain aspire idealistically for all stakeholders within their organization to pursue the exemplary path of elite athletes. However, this unrealistic expectation exhausts employees, poisons workplace atmosphere, sets targeted objectives at unattainable levels, and incites some persons to sacrifice work quality in order to attain quantitative fixed standards or demoralizes those who, unable to conform to such laxness, are chastised for their "poor performance".

Such stress solely on quantifiable returns and the search for ways to always do more with less is unsustainable; it threatens individuals' health and commitment and impacts the operations and profitability of enterprises. I believe that we must urgently re-evaluate our operating methods and install the conditions most apt to ensure quality of life at work. We may also collectively call into question the tyrannical imperative of the constant pursuit of profit that shareholders impose on enterprises, compelling them to adopt measures that deplete and endanger their employees.

Sustainable development models are economy-centric, ecology-centric, or socio-centric (Thureau-Dangin, 2012). These perspectives are however closely linked and we are unable to intervene on one aspect to the detriment of the others without creating an imbalance and invalidating the proposed solution. Concurrently, since we must find solutions that adequately address all three components, we must recognize that this equilibrium is not static and is in constant flux as events influence us. The dynamic model for change proposed urges us to constantly readjust to accommodate these realities. Rather than seeking means to do more of what we are already doing too much of, we must learn to progress while taking into account the real time needed to assimilate the transformations that emerge and the priorities they impose along with the strengths and limitations to our capacities for change. Our world is threatened by a sclerotic or engrained subjugation to established models which deepen inequalities and accelerate the

predation of resources. But it is also possible for us, as ever, to cooperate to create a perfectible world in which our common humanity will reclaim its rightful place.

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Urban Communities and meta-communities

Domenico Maria Caprioli

Università degli Studi di Napoli Federico II
Napoli, Italy

Structured Abstract

Purpose Urban communities and meta-communities

The scientific debate has recognized that the sustainability cannot exist without a radical change of behaviours, and the community is the most suited place for this course. On this basis, a model of city as a cluster of villages (this definition has been recently formulated by Vandana Shiva) has been proposed, but it pays no attention to the recent innovations, most of all the ICT, which can give a deeper sense to the the concepts of network, cooperation and community. The focus is not the invention of urban communities, but returning a communitary dimension to the cities, to which it has been detracted by the modernity: the local structures have always played a central role, offering complex services, hosting relationships networks, economic activities, voluntary mutual aid societies and assuming so strong features to define the identity of their inhabitants. The crux is in lending new contents to this traditional heritage, connecting the communities and generating a virtuous circle of people, products, exchanges, relationships, aid and resources, starting with the energy ones: according to Rifkin, the energy production from renovable sources has left the "petroleum logic" of the great plants, migrating to a self-sufficiency and community logic. The proposed model regards the city as a strong network of communities, in which economic, human, cultural and energetic assets are produced and shared, with a new concept of self-sufficiency, an interconnected self-sufficiency. The virtual projection of assets, people and informations which constitutes the network is, de facto, a meta-community, a place and its projection at the same time. In brief, the features and the benefits of the urban communities can be so epitomized:

- More rational organisation: the technologies, mixed with a smaller scale, allow an optimal management.
- Targeted investments: the community manages the funding resources according to the needs, it has more assets than the individual and can benefit from more advanced technologies.
- Networked energy production: the community can choose the best solution to produce energy, common plants or individual networked plants, and it can use the network as accumulator.
- Exchanges, mutual aid, more relationships: the city is the network among the citizens and the places, paraphrasing Weber and Geertz, it secretes the relationships and it's secreted by the relationships. One of the main functions of the community is the importance acquired by the mutual exchange and aid and by the cooperation.
- Social control: in the huge and undefined metropolitan context, the good and bad actions are dissolved in a mare magnum; in a community, on the contrary,

everyone can check the outcomes of his own and other people's practices. The neighborhood watch, modern version of the multiparental control, falls under the same category.

Design/methodology/approach The proposed approach matches the instruments of several disciplines, a peculiar tract of the ecology as science. In particular, anthropology, history and the latest acquisitions of the sustainable city planning build a combination of traditional thoughts and new solutions, as well as of quantitative and qualitative evaluations. The methodology is prompted by the thick description approach, proposed by Clifford Geertz, which is composed not only of facts but also of commentary, interpretation and interpretations of those comments and interpretations. The thick description leads to a re-definition of sub-urban identities, the substratum on which we can rebuild sub-urban communities, filling them up with cultural meanings, economic contents, praxis and relationships. The combination of the communities and the potentialities of the network generates that implemented projection of community which we call meta-community.

Originality/value – This methodology puts in evidence the complexity of the problem, using more disciplines to approach it, and the importance of the social and anthropological aspects of the sustainability; it also underlines how a part of solution be already located in the cities and in their past, constituting a fundamental long term asset.

Practical implications – This survey aims to indicate a model of urban organisation which could be easily realised in european cities; it will be the object of a european JPI Urban programme in the next year.

1 Urban Communities and meta-communities

Interpretative anthropology, especially as explained by Clifford Geertz, taught us that a cultural phenomenon may be and should be interpreted as a text, whose relevant features are not only the forms in which it has revealed itself and the categories through which it has been perceived and interpreted, but also the description of the cultural issue made by internal and external observers and, of course, the vertical and horizontal relationships between these elements¹. Therefore, the analysis becomes a narrative operation which is in a dialectic relationship with the great meta-narrative systems - or even in opposition to them - that marked the period identified as modernism by some disciplines, often in a mutual morphogenetic connection with that phase called post modernism: according to Lyotard, the fading of significance of meta-narrations constitutes the distinctive element of post-modern. The ambiguity of this category discourages its use, yet it is a fact that the recent years – studded by powerful social,

1 CLIFFORD GEERTZ, *The Interpretation of cultures*, Basic Books, New York, 1973.

cultural, technologic and environmental phenomena – have experienced a linguistic explosion and a semantic wear and tear so powerful that they could not help leaving a trace on settlements, beginning with the cities. In 1979 Lyotard also recognized an atomization of language and its dispersion in “clouds of narrative elements” which, actually, produced a corresponding spatial atomization, the coming apart in the relationship between place and signification, in which the place was made up of the city category: Lyotard, Foucault, Fish and other scholars interpreted this phenomenon as a fragmentation which generated “interpretive communities” as defined by Fish, or a “platelet reticular network” as defined by Lyotard². Therefore, they claimed a process which would replace the modernist concept of a rational city based on large scale urban plans with a type of city seen as a composition of nuclei and, moreover, as a palimpsest, since the diachronic element concerning “space which encloses and contains time” had entered the debate over urban planning and the nature of cities. It can be noticed that this image of reticular communities – or community networks – which are mutually and perpetually changing - closely reminds us of the “liquid” category proposed by Bauman as a hermeneutical key to modernity which loses most of its innovative allure in the contest: not liquid but “soft” was London – as an ideal type of city – as described by Raban in the early Seventies: a set of stages on which the individual showed himself in a series of interpretations, whose lifeblood was made up of “signs, styles and quick, highly functional communication systems”. “The city” – Raban summarized – “our great modern form, is malleable and referable to an amazing sensual variety of lives, dreams and interpretations”³.

The weakening of “tough rhetoric” which had covered the form of the city with an improbable neo-enlightenment simplification, revealed the complexity of an organism subject to modifications induced by tensions – from an etymologic point of view – among a number of cultural production centres which are organised, according to Cosgrove, into dominant, residual, emergent and excluded cultures⁴: the great geographer underlines that even residual cultures play an active part in the morphogenesis of a city. On the basis of these results, in the late Eighties Leon Krier proposed a development model for England, in which a great urban expansion was to come, with cities made up of complete finished

2 JEAN-FRANÇOIS LYOTARD, *La condition postmoderne*, Minuit, Paris, 1979.

3 JONATHAN RABAN, *Soft City*, Harvill Press, 1974.

4 DENIS COSGROVE, *Cultural Landscapes in T.Unwin, Europe: a modern geography*, Longman, London, 1997, 65-81.

urban communities: this would have been, according to Krier, the only remedy for widespread symbolic poverty caused by functional zoning⁵. More than a proposal, Krier makes an analysis which is particularly valid for those European cities that, since the Middle Ages, have agglutinated in polycentric, substantially independent structures. These dynamics, which are studied in different cities in the North of Italy and in Europe have been brilliantly underlined by Jean-Claude Maire Vigueur's evocative picture of Rome during the Middle Ages, a context whose peculiarity confirms the general validity of the model⁶. Subject to different types of conditioning, the Romans gathered around heterogeneous focuses, constituting substantially autonomous communities that enjoyed a great availability of space to rebuild, in a limited spatial context, the functional complexity which was necessary to fulfill every need. The historian proved that this process of aggregation and identity reconstruction allowed the Roman population to oppose their will, often successfully, to the will of the big baronial families which ruled the cities. From the Middle Ages, suburban communities played a vital role on the development of cities, becoming resource management systems, mutual assistance societies, systems of aggregation and political pressure, and military structures. The city as a cluster of communities, as Vandana Shiva recently defined it, is not a product of post-modern fragmentation, but the habitus the European urban populations have adopted to give a shape to their own "being in the world"; the structures and dynamics produced by this habitus then and now are still evident in several European cities, and even more so in many South American metropolises, where the demographic expansion and the consequent extension of cities were not strictly regulated, but were carried out through spontaneous phenomena of bottom-up urbanization. On these themes, a scientific tradition, justified by the renewed interest in the topic of community - which had been overlooked for some decades after its renewed popularity in the Sixties and Seventies - begins to consolidate, this time in connection with environmental issues as well. It is believed that, in fact, the number of measures to face environmental issues are insufficient and that it is necessary to radically intervene on people's behaviour, beginning with the forms they can take. This evolution is perspicuous if we compare the different "State of the World" reports by the Worldwatch Institute, in which we can find a progressive rise

5 LEON KRIER, *Tradition-Modernity-Modernism: some necessary explanations*, in *Architectural Design Profile*, 65, 1987.

6 JEAN-CLAUDE MAIRE VIGUER, *L'autre Rome. Une histoire des Romains à l'époque des communes (XII-XIV siècle)*, Editions Tallandier, Paris, 2010.

of issues concerning communities, new ways of living and lifestyles. The latest report questions the idea of sustainability and its achievement, and gives space largely to matters concerning the traditional diet of native populations and in particular to their sacredness; an essay by Collins, Genet and Christian calls for “a new narration in support of sustainability”; resilience and community are shown as the reference values to react against environmental crisis and natural, economic, health-related and social disasters; an interesting essay by Pat Murphy and Faith Morgan, finally, urges the world to learn from Cuba, which has to face a forced decline to which it reacted taking measures of social and value organization that meet those “survival architecture” fascinations proposed by Yona Friedman as a reference for future development.

The relevance of the community emerged strongly from the recent discussion on the environmental crisis and from the number of solutions given by different disciplines. If we do not fall into the temptation of consolatory quantitative solutions, it will be clear that the environmental crisis concerns our being there and that it comes from the same spring that fed the Greek tragedy, that is to say, from that violation of the limit called *hybris* by the ancients: in fact there is no other way to recompose the variety of phenomena through which the crisis appears. Philosophy has proposed different solutions and the one that has mostly taken into consideration is the rationalistic ethic based on Hans Jonas’s principle of responsibility, whose formulation, nevertheless, appears to be unsatisfactory and inadequate for several reasons: leaving out the eminently philosophical arguments⁷, the main flaw in Jonas’s theory consists in its weakness as a bond, because it constitutes a moral imperative – not a categorical one – whose coercive effect gets weaker and weaker according to the scale to which it is applied, that is to say, humanity.

In such a wide context, the echo of individual actions fades and then disappears, watering down the positive and negative ones inside a general perceptive indetermination; the reference to future generations, moreover, averts the time of praxis and puts the cogency of the problem back in its right perspective. Actually, Jonas’s principle of responsibility constitutes the philosophical counterpoint of the idea of sustainable development, as it is formulated by Norwegian minister Bruntland, to such an extent that the two definitions seem to be superimposable. We cannot discuss herein the contradictions and ambiguities of these principles, it will be sufficient to underline how they take away effectiveness and urgency from praxis, even from the individual one: the

7 NICOLA RUSSO, *Filosofia ed ecologia*, Guida, Napoli, 2000, pp. 374-392.

optimal scale for these interventions is made up of that *hic et nunc* of relationships called “Circumstance” by Ortega y Gasset which can be undoubtedly recognized as the Community⁸.

On a smaller scale, actions acquire an immediately perceptible relevance and their consequences immediately reflect on individuals; negative actions, moreover, are stigmatized and weakened by social control, which is poor, if not impossible, in larger contexts. After decades of studies on eusocial insects and a long time tendency towards a “familist” thesis, evolutionist biologist Edward Wilson acknowledged that the community is the result of powerful Darwinian forces and constitutes the optimal soil to achieve the best living conditions for mankind⁹. That complex balance between selfish and altruistic behaviour which has guaranteed the survival of our species and formed our culture appear to be, in fact, unfeasible outside a collective context but at the same time, restrained enough to protect the relevance of individual behaviour.

Citing another recent study, it is not by chance that, when declaring the reasons of his interest in traditional societies, geographer and anthropologist Jared Diamond first introduces a criterion of scale, proposing the obvious remark that in a more restricted context, the relationships between men and their surroundings – the Circumstance, indeed – are more perspicuous. According to Yona Friedman, the time of community is not the past at all, but the future, when the bent for flexibility and adaptability guaranteed by the soundness of personal relationships ensures that cities acquire more and more the appearance of agglomerates of constantly connected groups, arranged on non-permanent, flexible models¹⁰. The ruralist nuance we give to the idea of community is a modern distortion, easily belied by the obvious consideration that a communitarian spirit can be detected in the Greek *poleis*, therefore in eminently urban contexts: if we try to separate the definition from the semantic conditionings of the contingency, we can define the community as a network of meanings and signs which correlate a human group, that recognizes itself in that network, and its Circumstance; this network is produced by the morphogenetic relationship between its knots to such an extent that we can say that it secerns and is secerned at the same time. The community exists everywhere this

8 DOMENICO MARIA CAPRIOLI, *Uomo, Circostante e progetto architettonico. Outillage concettuale per una nuova alleanza, Riflessioni, Napoli, 2011.*

9 EDWARD O. WILSON, *The Social Conquest of the Earth, Liveright Publishing Corporation, New York, 2012, pp. 45-56; 133-157.*

10 *cf.* YONA FRIEDMAN, *L'architecture de Survie, L'Eclat, Paris, 1978.*

connection takes place, even in a urban quarter. Arrigo Colombo asserts that “if the community model as a universal model [...] may seem incongruous nowadays and most of all, in a future perspective, there is a diversified, well-constructed community model [...] a reduction and composition of communities which range from the family to the school community and the university [...] to the political community mostly and essentially as self-government and local assembly. The picture of a brotherly society seems to be drawn in this construction of communities”¹¹.

The quarters – or other similar divisions of the urban territory – are characterized by recognitive features, iconems, signs and traditions and most of the time they possess a strong consolidated and more or less ancient identity. Especially in the European cities, moreover, they are easily identifiable from a urbanistic point of view, since they are often aggregated around particularly relevant focuses. This constitutes an essential precondition for their rearrangement into urban communities, a process that in many cases has already begun or, more correctly, has endured preserving the vitality of the social and economic fabric¹².

The transition of territorial divisions into urban communities is, therefore, easily feasible and has several significant benefits, which can be summarized as follows.

Scale reduction: a smaller structure can be managed and controlled more easily, the interventions can be planned more clearly and better suit the users’ needs; the statistical surveys become more relevant as they represent the citizens’ behavior and give accurate information on the criticity of the management systems. Reducing the observation scale to that of a quarter-village, therefore, we would be able to accurately monitor the flows by recording, for example, the inbound and outbound resources. It is valuable information especially because it allows to modify a urban metabolism that must restore reusage and closed cycles, increasing resource exploitation and not the quantity of resources we use. Monitoring the fluxes allows us to enrich that network of exchange of people, information, goods and resources: the better it is structured, the better it works.

Bottom-up processes: in a more restricted context, less resources are needed, planning is easier and benefits are immediate and perceived straight away. Therefore, although a traditional management from above would obtain benefits from dividing the urban fabric into spontaneous villages, they constitute the ideal place to put into practice

11 ARRIGO COLOMBO, *L'Utopia. Rifondazione di un'idea e di una storia*, Dedalo, Bari, 1997, p. 385.

12 LEONARDO BENEVOLO, *La città nella storia d'Europa*, Laterza, Bari, 1993.

bottom-up processes.

Social control: in a wide indistinct context social control is not required and cannot work, neighborhood relationships are weak, an individual interest limited to very restricted surroundings prevails; when the context is smaller and other people's harmful behaviour affects the individual more evidently, there is a greater interest in disciplining one's and other people's behaviour and the opinion of the community becomes a powerful weapon to stop dangerous behaviour. Social control also involves the virtuous action of neighbourhood watch, which means extending the surveillance usually carried out on somebody's property and relatives on neighbours as well; it derives from the traditional neighbourhood relationships, although it dates back to recent years in American and English quarters – where relationships between people have been damaged by modern lifestyles – in order to build relationships between neighbours. They are benefits whose effects are extremely relevant: data collected by the police have shown the effectiveness of neighbours mutual control and many recent studies, American studies in particular, show that living in a community may make people live longer, especially because depending on other people's support reduces stress and the anxieties generated by modernity.

Sustainable mobility: public transport is quite emphasized, partly because of the territorial expansion of big European metropolises and in particular, in newly industrialized countries. Compact cities are a partial answer that reduces the occupied surface, but the size of cities with a high housing density and millions of inhabitants is still unmanageable. Urban villages, instead, give a very interesting complementary solution, since they contain a series of facilities and activities which are often situated in other parts of the city and can be reached only by moving many times.

Density and functional complexity: giving back the quarters their functional complexity by transforming them into villages means to allow people to reduce their movement and use bicycle and pedestrian mobility. The more quarters convert into urban villages, the more relevant the effects: in a great cooperating context, in a urban village organized as a community which tends to self-sufficiency, citizens will be able to reach all the facilities they need near their house, as well as most of the goods and some of them are made locally. Moreover, in an advanced system even the workplace may be closer: in Europe and the US, big factories yield the ground to tertiary sector, small factories or handicraft, which are all activities that can be carried out in a urban context. Urban

communities full of facilities, goods and services are also a solution to the problem of emptying city centres, which has reached disturbing levels in many Italian cities and transformed, for example, places of deep complex anthropization into open-air playgrounds.

Self-sufficiency: a complete urban village is supposed to have at least a partial self-sufficiency and to be a place where most of goods and services for local use are produced, beginning with agricultural products. Many people have shown an increasing interest in urban agriculture recently: Bill Mc Kibben, author of *Deep Economy*, estimated that big American metropolises may be able to produce at least 50% of their own food needs by carrying out urban agriculture. Self-production, Mc Kibben added, if combined with the communitarian demands of cooperation and sharing, may have many other consequences: urban farms involve the effort of several families and allow to obtain better results with less individual effort; consuming the fruits of a teamwork – Mc Kibben underlines the drastic decrease (50%) of family lunches in the United States –allows people to build solid personal relationships and also optimize the use of resources.

The challenge in the near future, he concludes, will be to get small towns out of metropolises. Owen too considers urban agriculture as a big resource and notices its increase in many metropolises of the world: American cities, with their huge sprawls, show us a vivid picture of the space that can be used for farming and other productive activities. Yona Friedman, who refers to FAO studies as well, tried to give some figures: 40 square metres are sufficient for one's subsistence, while 100 square metres meet the total calorie needs of an adult; working 20% less and spending more time farming and doing housework would guarantee a saving which may reach 80%. This data are contained in *Alternatives Énergétiques*, whose meaningful subtitle is "*Compendium for a local self-sufficiency*", an essay that gives self-production a quantitative dimension; in *The Architecture of survival*, Friedman writes about urban villages and agriculture: the cities, the Hungarian architect underlines, are full of unused spaces which may be used for new functions. This idea combines with one of the leitmotiv of his original thought, that is mobile architecture: in Friedman's vision, the cities are light, versatile and cooperative, their inhabitants enjoy the collectivization of part of the spaces. The plots of land that can be obtained from unused spaces may not be sufficient singularly, but may produce a food surplus if connected and farmed jointly.

Agriculture is only one of the activities which can characterize the rebirth of urban

villages: craftsmanship, especially the one concerning repairing, small scale retailing, especially the local one, but also professional services. Encouraging local consuming and service fruition means to give the population large quantities of benefits. Cooperation also allows to develop advanced services without any economic burden, which work by mutual assistance, like baby sitting, kindergartens, afterschool programs and other educational experiments; there may be also comanaged activities like laundry services, a solution which may lead to a more efficient use of energy and water and a lighter individual economic burden. Many of these projects have already been feased in North European quarters, beginning with Eco Vikki in Helsinki, and are commonly carried out in many South American metropolises. The urban village, therefore, has got a number of advantages and an undeniable improvement of living conditions: it creates a network of relationships and solidarity which represents a sort of protection for its inhabitants, preserving them from many daily problems and external disturbances (a local self-producing economy is definitely immune to financial storms) and facilitates all management and control processes and also services. It is worthwhile to repeat that all these principles can be put into practice in different ways and at different paces and, above all, that a cooperative supportive economy may coexist with the traditional economic relationships: the aim of cooperation, on the other hand, is to put the free time of a community to good use by optimizing it.

A community is the result of composition and recomposition (concerning this, the fascinating discussion on utopia from Servier to Mumford is particularly interesting, see bibliographical notes), so communication has always played an essential role in it. For this reason, Mattelart focused his work *Histoire de l'utopie planétaire* on communication, suggesting interesting forerunners of modern technologies, such as the optical telegraph: in 1795 Alexandre- Théophile Vandermonde proposed to use the optical telegtaph to create a modern form of direct democracy. He was a teacher of Political Economics and claimed that this kind of technology would solve the age-old problem – as old as Plato's works at least – of community dimensions, since – as Rousseau had warned – there cannot be any democracy beyond the range of voice. A widespread network of that device, similar to the one installed earlier between Paris and Lille, would have allowed to connect directly and constantly the whole country, making collective shared decisions, a topic which is clearly similar to the contemporary discussion on Internet as instrument of participatory democracy. The scholar's proposal triggered a lively discussion but, as it

happens in every dystopia, in the end the solution was found by the army, who took upon themselves the use of the telegraph line for war purposes only. Apart from the many unsolved problems of the project, Vandermonde's proposal shows that guiding thread that connects utopic thought with the communitarian one and suits the need for integration and recomposition. ICT technologies add to ancient community dynamics, which date back to its foundation, not only a new more powerful tool nor just innovative functions, which will be analyzed later, but also different logics and even new space production systems. The datas which are transferred through new technologies, in fact, do not have only a different medium, but a peculiar, almost ontological statute, since they have all together the freedom to generate space, although immaterial. The network of relationships and exchanges between communicative subjects through ICTs, in fact, defines a metaspace and inside of it communities project themselves into metacommunities, which are generated and enriched by the contents people exchange through the net.

The contemporary historic form would not exist without the importance communication networks have gained lately, moreover, while they were contributing to the semantic demolition of the idea of place, they were producing another place, a metaplace, that is the virtual one. If a community is, by definition, a network of signs, the contemporary community cannot help but project this network to the outside, producing a metacommunity, that is the virtual counterpart of the physical one, and this metacommunity cannot help but connecting with the other ones, in a flux of signs, meanings and contents. It is important to underline that, although the vocabulary may induce to think so, this image cannot be superimposed on McLuhan's global village. McLuhan is, probably, one of the last great utopists of means, but his utopia is on a worldwide scale and cannot exist without the model indicated by Brzezinski as "global model of modernity"¹³, that is that series of issues and needs that used to be part of the American way of life exported worldwide during the Sixties and the Seventies. It is not by chance that the themes McLuhan and Brzezinski proposed are found in Al Gore's speech for the GII (Global Information Infrastructure) presentation at a meeting about telecommunications in Buenos Aires in 1994: the American vice president supports a new Athens which could be possible thanks to simultaneous real time communications, an age

¹³ ARMAND MATTELART, *Histoire de l'utopie planétaire: De la cité prophétique à la société globale, La Découverte, Paris, 1999, p. 352.*

of global harmony¹⁴. When Mattelart admits the failure of utopia he actually refers to worldwide utopia, that is the wish to recompose the human Babel in a global village which has not only the form of relationships, but also the cultural substance. This wish collides with the considerations made about the scale and, more generically, with the lack of place, of the Circumstance in which the relationships and connections that cannot be obtained elsewhere are created. It is the Circumstance that makes a global society unfeasible and draws, instead, a reticular image of interconnected groups. On a urban scale, this model expresses its potentialities to the full, reifying that continuous adaptive tension between model and praxis that is chosen by Bertelley, for instance, as a fundamental dynamic of any community, beginning with Plato's Republic. On the same line, the model of a city as a cluster of villages has a different importance: going beyond the suggestive image of a cluster, in fact, the big cities would configure as networks of communities in which a virtual network superimpose on a physical network of relationships, fluxes and exchanges. The virtual network is not only an instrument for flux control and optimization, but also a projection of the community network itself, a meta community. Such a model would allow the restitution of complex functions and services to urban subunits, by restoring quarter communities which have characterized the traditional European settlements, for the benefit of life quality and eco compatibility, with more interpersonal relationships, less movements, less transfer of materials and people: if the quarter offers advanced services, job opportunities and places for self-production, the problem of transport will drastically decrease and lose importance, as demonstrated by the experiments made in some German and North European cities. The services and facilities that need a larger scale, a urban one, would benefit from the computer control structures guaranteed by the net and already fully recognized, since the smart city model is the hub of the EU investment plan for the next six years; the same fluxes of resources may be controlled by management softwares, this would help optimize the use of inbound resources, but also self-production: a virtuous cycle of production and exchange of goods and services between communities would begin and this circuit would be more effective and immediate thanks to ITC. In addition, the reduced scale of the urban community would give back statistical surveys their own value: in fact, data would not be indefinite as for a metropolis, but would concern the citizens who live in that very community, that is, that particular human group. The most fascinating aspect of this scenario is the new

14 MATTELART, *op.cit.* p. 401.

and more radical meaning of the idea of morphogenesis in this context. It has been said that the single knots of a community network are in a mutual morphogenetic relationship, since each one of them influences the form of others and, at the same time, it is influenced by them: the use of telematics networks through computer applications, even self-produced ones, give us a new idea of morphogenesis of networks, in which the ideas of flexibility and adaptability - that according to Yona Friedman will inspire physical architecture in the near future and are already visible, in a spontaneous form, in South American metropolises – are fully put into practice¹⁵. Place of exchange, relationships, communication and hypercommunication, a metacommunity is not only a structure of management and control, but also a real community, because it creates a network of signs with users and the meta place it occupies. In an essay published in 2012 edition of *State of the World*, Diana Lind listed some of the innovations in intelligent cities management: they are proposals which have been developed mostly through a bottom-up process, often carried out by citizens, but the most important aspect is their relationship with their surroundings¹⁶. These examples, in fact, are not universal solutions to general problems, but come from an internal discussion in a group whose commitment concerns its territory, as a reaction to specific problems of the territory itself; but as they are carried out in a modular way, they can be easily adapted to other contexts, transferred through the network. It represents a new element that overtakes the *think globally, act locally* strategy; in this case, thought and action are indissolubly linked to place and are then enriched, modified and spread globally. A maybe utopic future is coming, in which behaviour and the way people use cities and parts of the urban space will be produced by citizen communities operating in a particular place; these products will derive from the relationship between human groups and Circumstance and will have a double nature: a material and an immaterial one, connected but independent. As Lind said, citing an article by Carlo Ratti and Anthony Townsend, 'we discovered that it is sociality and not efficiency the real killer of the city. Cities will be probably saved by people and not by technology, by serendipity and not by programming'¹⁷. The pair community-metacommunity relieves the tension between localism, that is a peculiar characteristic of the communitarian approach, and irenic planetarism, generally typical of utopic thought,

15 YONA FRIEDMAN, *Utopies réalisables*, L'Eclat, Paris, 1974.

16 DIANA LIND, *Information and communications Technologies creating livable, equitable, sustainable cities*, in *State of the World 2012*, Worldwatch Institute, 2012.

17 *Ibidem*.

generating a system made of a proficuous relationship between the webknots: each knot is autonomous but in a morphogenetic relationship with the other knots. Actually it is a recomposition, that is what mankind has always looked for in utopias.

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Crowd Participation in web 2.0. Understanding Roles, tasks and Incentive Mechanisms in Travel Communities

Stefano Consiglio, Gianluigi Mangia, Mariavittoria Cicellin*, Maria Laura Toraldo, Adriana Scuotto
Department of Economics, Management, Institutions
University of Naples Federico II
C.U. Monte Sant'Angelo – Via Cinthia (NA)

Caterina Galdiero
Department of Economics
Second University of Naples
Corso Gran Priorato di Malta, Capua (CE)

** Corresponding author*

Structured Abstract

Purpose - This study presents preliminary evidence of an ongoing research project (Orchestra - ORganization of Cultural HERitage for Smart Tourism and Real-time Accessibility) on smart city platforms. Our analysis refers to smart city platforms meant to develop a set of organizational solutions to foster the sustainable compatible exploitation of cultural and touristic resources in the city of Naples. The main goal is to outline a framework able to explore participation patterns. We explain intrinsic and extrinsic motivations employed for the engagement and the retention of participants on web 2.0.

Methodology – Our empirical research follows a qualitative approach and consists of two phases. In the first one, we adopted an internet based research method, investigating four travel communities that employ incentive mechanisms to encourage the user-generated content: Tripadvisor, Travellution, AirBnB, Voglio Vivere Così. In the second phase we conducted semi-structured interviews to the administrators of these travel communities. We expanded our study in order to investigate the administrators' perceptions and the meanings attributed to motives and incentives. In particular we aim to understand which types of incentives are better employed in these communities to engage and retain users.

Originality/value – The crowdsourcing topic gained in popularity over the last decade, as more and more users have begun to flock to social communities. Our contribution is twofold. First, through an analysis of the recent literature on the crowd topic, we provide reflections on intrinsic and extrinsic motives. Second, through the case studies we shed light on a partly jagged and new topic related to the use of incentive mechanisms in order to recruit and motivate crowd. In particular, we try to explain some preliminary insights and emerging issue needed to create a model that could be applied in the ORCHESTRA platform.

Practical implications - By taking into account the incentive mechanisms and the sense of fun perceived by its users, we have reflected on the implications for the web 2.0 by looking at the mass of creative subjects that take part in crowdsourcing activities. Our argument is that the ‘architecture of participation’ surrounding the web is inextricably linked with the perception of enjoyable experiences deriving from networking activity through the mobilization of millions of voluntary actors. The inclination towards interaction would appear to be the level for motivating many web initiatives. Several communities began huge business all over the world thanks to user-generated contents.

Keywords – incentive mechanisms, participation, crowdsourcing, social communities, user-generated content.

Paper type – Academic Research Paper

1 Introduction

This study presents preliminary evidence of an ongoing research on smart city platforms. Our analysis referring to smart city platforms takes place within a research project (Orchestra - ORganization of Cultural HEritage for Smart Tourism and Real-time Accessibility) meant to develop a set of organizational solutions to foster the smart, sustainable and ecologically compatible.

The main goal of our research is to outline a framework able to explore the participation patterns. We explain motives and intrinsic and extrinsic incentives employed for the engagement, the retention and the motivation of the “crowd”, that voluntarily participate on web 2.0. In particular, the crowd is represented by the users that with different roles and tasks produce and offer contents on online social communities (user-generated content). The bottom-up participation issue and the role of the crowd in web contents production will be the focus of this paper. In particular we try to explain which tasks the crowd performs on online communities and which are the main motives intrinsically and/or extrinsically based, that lead users to participate. Our assumption is that on these motives communities administrators should invest to incentivize the users’ participation.

In light of these aims and assumptions case studies of four travel communities will be presented. We choose these travel communities because their administrators employ many incentive mechanisms to encourage the crowd participation and the user-generated content (UGC). We analyze the case studies in terms of three research questions:

- Which roles and tasks do users perform in online communities?
- Which types of contents do users generate?

- How do users perform tasks and generate contents on online communities? which are the motives and the incentives?

The paper is structured as follows. It begins with a contextualization of the crowd issue in social and managerial studies. Then we analyse roles, tasks and contributions of the crowd reflecting on the fact that many online communities, wiki -pages sites, open source projects, and social networks are based on the idea that users are key to success and that they sustain creativity, innovation and solutions. The focus then moves to a systematic review of the literature on main motives and intrinsic and extrinsic incentive mechanisms that lead the crowd's participation. Finally the case studies are described and analysed on the basis of the research questions; and the conclusions and main limitations of this study are presented.

2 Contextualizing the crowd in managerial studies

Between the late '800 and the early '900 Le Bon and Tarde (1895; 1901) introduce the concept of crowd in social studies, as an improvised aggregated of individuals, giving a purely negative meaning. In fact, the authors state that the crowd (several individuals together without a specific order) could be a threat for the civil society.

Over the years, the sociological and organizational literature has produced different meanings of the crowd concept, in some cases reducing that negative connotation before given. In particular several studies have focused on the establishment dynamics of the crowd, dimensions and the relational characteristics, therefore individuals beginning crowd acquire a new social identity (e.g. Park 1975; Diener, 1979). In this sense the thought on the crowd concept is strictly related to to the studies on the work group; then individuals as a group perform better than a single individual and it is something more than the mere sum of individuals. Over the years the crowd starts to participate not only in political and institutions events and going further the mere ideological purpose. Brabham and Page (2006; 2007) argue about the contribution the crowd coul make in terms of diversity and meanings in problem solving. The crowd participates with a process of association of ideas that rise through mutual interaction, cooperation and, critical feelings (Park, 1975, trad. italiana 1996). The crowd actively participate with different roles and tasks coming into different domains of the society and with relationship mechanisms that in the last decade strongly changed. In 2007 one of the Time cover entitles "*You*" referring to the new actors of the web 2.0: that are all the

individuals that participate on social networks, forums, blogs, virtual platforms, producing new contents and offer new meanings to the communication ways. Web platforms, blogs, online communities and other types of virtual interfaces are often defined as 'places' in which the active participation of users is clearly manifest. This new phenomenon leads to a new business model of the web based on open participations and shared relations. The roles the crowd plays in social communities and web platforms (of different sort) become the lever of competitiveness and generating new knowledge that spreads quickly and economic value.

The technological innovation and the web 2.0 become the domain for the high potential of people, for their skills, ability, ideas, through a network of not formalized social relations (Furlani and Lutman, 2012). Besana (2012) states that to be able to rapidly and immediately getting in touch seems to be the most important element.

The crowd that participates on the web 2.0 shares information, contents and data that in turn generate other new ideas, but also new and additional needs and demands to be answered. Therefore online social communities are frequently depicted as venues for users' active participation in various forms of co-production, where ideas develop and enrich thanks to new interactive experiences and the contributions of others. Moreover these ideas could "get out" of the web turn into start up, associations, etc. (Gassman, 2006).

It is clear that this massive change has an impact on the structures of several organizations, modifying their image. To face this change organizations have to re-shape their business approaching to the virtual communities world. The ability of the organizations connected to virtual reality is to engage a mass of individuals (not employees) who provide their entire subjectivity and their contributions for a new product or service in a voluntary way, just because "they like to do it" (Kodama, 2005).

In this sense, it is the whole distinction between production and consumption that is questioned; it is in the wake of the changing relationship between consumers and producers that we can find the foundations for the phenomenon of crowdsourcing, and more generally for the implementation of productive forms based on social cooperation (e.g. Howe, 2006). About this, literature is increasingly focusing on this topic, highlighting the role of the crowd participating on virtual and social communities, as a real business model creating value (Hagel and Armstrong, 1997; Lechner and Hummel, 2002; Sun et al., 2012).

As observed by Jeppesen & Lakhani (2010), even if problems can be solved through a variety of alternatives, some of these problems have no solutions if just internal resources available inside the company are used. Web 2.0 and social networks become repositories of solutions, knowledge, informations. Webb and Tohen (2010) use the concept of "Proudly Found Elsewhere" to better competitiveness and innovation.

According to some scholars (e.g. Arvidsson, 2007), the diffusion of online platforms involves a process of democratization of the economy, and this is represented by the key role of users. Following this perspective, blogs, virtual communities and other virtual interactions seem to move toward a more democratic approach of the entire society, with users' sovereignty as the key principle. A newly empowered user – whose structuring trait revolves around creative expression, cooperative activity, and a playful attitude – has arisen as the participating subject of the numerous living web platforms (Tapscott and Williams, 2006) and virtual worlds where the quality and the value of the social relations are crucial for the innovation. This seems to follow a logic based on participants as 'operant resources', where they are framed as active contributors in relational exchanges and co-production (Vargo and Lusch, 2004). Tapscott and Williams (2006) this 'participative paradigm' deriving from online collaboration. The authors account for a 'new world' of 'ever-connected people' which are the mass creativity of many 'web initiatives'. The idea of collaboration to achieve common goals is the cardinal principle. Also Van Dijck et al. (2009) critically discuss the participatory culture. They dismantle the 'rhetoric of connectivity' as a means for companies to extract value from 'networked active co-creators' (p. 863). Following this perspective, clicking, blogging and uploading videos are, among others, activities carried out by an 'army of amateurs who dedicate their time and energy to developing and sustaining a vast array of products and services'.

From this angle, the web 2.0 includes as its primary raw material users' contributions. The promise for them is receiving recognition and, potentially, to seek their sense of self-worth by marketing themselves to other virtual actors (Bauman, 2007).

3 Roles, tasks and contributions in social communities

The bottom-up process of the active crowd that participates through the web to create value also involves businesses massively, especially those that deal with innovation in a broad sense. This, together with the overbearing development of social networks are profoundly changing the way of production (Shiffman et al., 2008).

Garrigos et al. (2012) emphasize that without the participation of users on online platforms, without their contents, it would not be possible to understand what is happening outside the organizational contexts influencing the economic trend. Fuchs et al. (2010:46) state that “the user is an integral part in the production process of content, tastes, emotions, goods, contacts, relevance, reputation, feedback, storage and server capacity, connectivity, and intelligence”.

The practice of crowdsourcing – in which companies outsource a function or task to an undefined network of people — is nowadays becoming mainstream (Howe, 2008; Geiger et al., 2011).

In the social communities, crowdsourcing activity largely covers the process of creating and generating new ideas and solutions, unlike the case of the open source community where even the commercialization processes are being outsourced to the crowd (Pisano and Verganti, 2008; West and Bogers, 2010).

But then what does the crowd do, which main activities does it carry out and what are the roles that participating users hold?

In this regard, there are different types of roles within the crowdsourcing, and different types of tasks delegated (Howe, 2006). In the most recent studies and practices there are various success stories (Brabham, 2010), among others “My Starbucks Idea” which asks and rewards customers for innovative ideas for the design that could renovate the coffeehouse chain’s services; Amazon’s Mechanical Turk which acts as intermediary connecting outsourcers with the largely underutilized global workforce, letting workers accomplish different kinds of tasks. Moreover, as JetBlue Sony and Chrysler did, organizations can commit to young users user generated content (UGC) production dedicated to their social media (e.g. Facebook) (Brabham, 2008; Rieder and Voß, 2010).

A study of Von Hippel (2005) shows the advantages of the social media applications to the B-2-C communications, especially for marketing purposes. In particular, the scholar argues that a company can receive multiple benefits from innovations developed by the so-called user innovators, who are beyond the market average users, and that the proliferation of social media platforms, branded applications and widgets describe it as a booming increasing trend. In addition, other studies have shown that the crowd, as compared to professional employees of companies, is able to submit to the online platforms the best ideas in terms of quality and innovation, thanks to a process of

motivation and incentive, which will be discussed in the next section (e.g. Acar and Van den Ende, 2011).

In this context and in accordance with the paradigm of Open Innovation (Chesbrough, 2003), therefore, firms choose to cooperate with other firms, but also have the ability to connect with voluntary individuals who contribute to the innovation process (West and Lakhani 2008; Jeppesen and Lakhani 2010).). Just to give an example, at Procter&Gamble, for example, new products stemming from external ideas with the "Connect and Develop innovation model" increased from 15% in 2000 to 35% in 2006 and 45% in 2010.

In this domain, companies and practitioners commonly believe that crowd participation will solve their problems quickly and efficiently, or in a cheaper manner, but effective crowdsourcing solutions require activities that both fulfill the outsourcer's production needs and — by utilizing various motivation mechanisms — account for individual contributors' needs.

The crowdsourcing process needs a proper definition of the problem by the organization, to make it readily understandable, so to let the crowd quickly proceed to develop the solution.

Many tasks delegated to the crowd concern the production of contents that users may provide other users to help them: tips, immediate solutions to unresolved issues, reviews, experiences, activating discussions and debates, and by uploading any type of information, photos, videos, etc.. These tasks are typical of the wide plethora of online platforms in the field of travel and tourism (as Tripadvisor, Booking.com; Couchsurfing, BNB, Travellution, Gogobot, etc.), culture and publishing software (as Amazon) (Buhalis et al., 2011; Sigala, 2009). In this direction, the link between virtual communities and culture and tourism is proving to be a valuable resource, as shown in precisely the creation and the increasing number of online platforms used by tourism and cultural enterprises show in order to produce and share useful information and knowledge. In fact sharing and commission of tasks to the crowd for the production of information and knowledge is critical for those organizations that operate in highly complex and dynamic sectors, and subject to changing fashions, trends and user needs. Therefore, the participation of users facilitates the ability of these organizations to follow how the demand can evolve, potential users and customers (in terms of gender, age, preferences, requirements), types of needs they have, what they do not like (Kleemann et

al., 2008). As Micelli (2000) claims, through a system of "distributed intelligence", online communities are considered the new center of gravity around which new forms and dynamics of social innovation and competition can be built and rethought.

The growing interest in the creation of communities of practice (e.g. Wenger, 1998) allows the sharing of values and meanings that, together with the construction of a feeling of mutual trust, support and reputation, foster a strong sense of belonging to the community. Users of these platforms share goals, interests, needs, activities, and actively co-creating collective products, not only forge very strong bonds. Moreover through the reciprocity of information, they have access to shared resources (through clear and defined rules of behaviour and social filters) that without this form of participation would be limited (Whittaker et al., 1997; Spadaro, 2007).

For this reason, often travellers and tourists themselves spontaneously give rise to virtual communities in order to organize their trips and to share online their own travel experiences, providing important information to other potential travellers and tourists interested in the same goals. These new travel communities are very important also for the organizations operating in the tourism and culture sector to change their internet marketing strategies.

This aspect focuses on the fact that the participation and involvement of the crowd do not only affect the production processes of large companies and multinationals, as we talked about before. Indeed, more and more often in recent years, the phenomenon of crowdsourcing is strongly invading in the social sector and in particular the sector of culture. Focusing on the feeling of belonging of citizens, local stakeholders, tourism and cultural operators and their willingness to contribute to improve the quality of the region in which they live and work, many local virtual communities are springing up. Therefore processes of active participation, aimed mainly at creating plans for improvement, enhancement, development of the cultural and environmental heritage are arising.

In light of these assumptions several scholars (Chung et al., 2008; Acar and Van den Ende, 2011; Bakici et al., 2011; Bloodgood, 2013) highlight the ability of online communities' administrators to retain the users' participation and to motivate them in order to produce high quality contents for online communities as a very interesting research field. In other words we try to understand how to manage the crowd engagement on the online communities and which types of incentive mechanisms can motivate the crowd to participate.

The different incentive mechanisms for the engagement and the rewards that online communities put in place to retain its users are primarily used to understand how to increase their commitment, but also to control people's behaviour and their role within the community and to understand how to react to misbehaviour (Frey and Jegen, 2001; Almirall and Wareham, 2011) .

Literature on crowd incentives in online communities ranges on different fields and with several levels of analysis. The spread of these studies is mainly due to the development of virtual online communities in different areas and for multiple purposes. Thus, analyzing the incentives that spur users to contribute are critical to designing crowdsourcing applications (e.g. Shah, 2006), in order also to understand the potential related benefits and impacts on the governance of the companies themselves (O'Mahony and Ferraro, 2007; Almirall and Wareham, 2011; Acar and Van den Ende, 2011).

At a first glance there is the traditional stream of literature which link motivation and engagement to rewards and financial incentives and other aspects such as, non monetary prizes, recognition and status; thus, based on a purely extrinsic motivation. Others focus on the importance of incentives in terms of intrinsic motivation, as, belonging, identification and reputation, curiosity, play and fun (e.g. Ryan and Deci, 2000a, 200b; von Hippel and von Krogh, 2003; Kazai and Milic-Frayling, 2009; Acar and Van den ende, 2011). In the following next paragraph, we will explore the role of motivation to retain crowd on online communities. We will look at all those motives and mechanisms to incentive people's participation on on-line communities.

4 Motivation and retention of the crowd: a review of intrinsic and extrinsic incentive mechanisms

Recent studies on crowdsourcing highlight the importance of crowd motivation and incentives in participation processes on online communities, providing interesting suggestions. However, the theme still appears to be partly jagged since it is quite new and still few studies shed light on this aspect in depth (Estellés-Arolas et al., 2012). Incentives and rewards are crucial for the functioning of these virtual communities, especially since users do not receive a salary or a fixed remuneration for the services and the activities they offer.

A great part of scholars focus on this debate distinguishing two groups of motives that influence the crowd that based on intrinsic and extrinsic incentive mechanisms (Hars and Ou, 2002; Bitzer et al. 2007; Lakhani and Wolf, 2005).

As it is known, intrinsic motivation, refers do something for its inherent satisfactions rather than for some separable consequence, something you enjoy and that feeds you in a way that is not connected to external feedback (e.g. fun, pleasure, self-determination, curiosity, reputation¹, altruism, community identification, interest, involvement, feeling of challenge). In this sense, people do something, and in this particular case participate on the online communities because they want to, and feel a great personal enjoyment, without any material or monetary return. On the other hand, extrinsic motivation is based on a push that leads to a separable outcome. In the specific case, people participate on online communities because they know they can receive monetary and non-monetary rewards (money, prizes, recognition, evaluation, peer rewards, consideration, status). In light of these assumptions, an increasing numbers of scholars are focusing on the behaviours within the online social communities to understand how and to what extent intrinsic and/or extrinsic incentives can motivate users' participation (Bakici et al., 2011).

In this context, Nov et al. (2011) elaborate an interesting analysis. They distinguish between two different types of intentions that address crowd participation at different times: the intention to increase participation and the intention to maintain participation. Specific motives influence these intentions: group motives; norm-oriented motives; identification motives, intrinsic motives; reputational motives, social interaction motives.

There are also several empirical investigations that analyse the characteristics of the contents produced on online communities and the motives that address these tasks. The great part of these studies found that the main motives have a basically intrinsic nature (Hertel et al., 2003; Lakhani and Wolf; 2005). For instance, Lakhani and Wolf (2001, 2005) believe that the intrinsic motivation, based on a sense of pleasure and personal satisfaction, is one of the strongest incentive in online contents production.

Some literature argues that people like to actively participate because they feel fun and identify themselves (von Hippel and von Krogh, 2003; Torvalds and Diamond,

1 In the matter of the reputation, the literature thought is not uniform. According to some scholars (e.g. von Hippel and von Krogh, 2003; Mason and Watts, 2009) reputation is an extrinsic incentive, whereas according to other scholars e.g. Bakici et al. 2011; Bagozzi and Dholakia, 2002; Hargadon and Bechky, 2006; Lakhani and Wolf, 2005) within the specific context of online communities and web 2.0, reputation is considered an intrinsic motive. Finally according to others (e.g. Nov et al., 2011; Frey and Jegen, 2002; Benabou and Tirole, 2006) reputation is analysed as a different motive not included nor among the intrinsic, neither among the extrinsic incentives.

2001), but also some non-monetary incentives can positively influence the increase of their identification with these communities and their reputation (see, for example, the stars users earn providing the best answer to Yahoo Answer! questions; or the whole evaluation system of reviews and best profiles to award users on Tripadvisor) (Jeppesen and Frederiksen, 2006; Lerner and Tirole, 2002; Bagozzi and Dholakia, 2002; Hargadon and Bechky, 2006; Lakhani and Wolf, 2005).

In particular Kollock (1999) claims that there are five main motives that lead the crowd to participate on online communities: reputation; mutual expectations (providing information engages a feedback mechanism that facilitates the return of this information, as helping by other members or specifically, by the person who has been previously helped); the feeling of being useful for the community; commitment and the need for affiliation and belonging. Moreover Wasko and Faraj (2000) add that learning, fun, interaction with other community members, material returns (e.g. receiving useful information, personal gains), sharing interest with others members are equally important incentives to support the crowd's participation. But the intrinsic incentives seem to weigh much more than purely extrinsic ones (Ryan and Deci, 2000a).

In this sense, Bakici et al. (2011) run a study on the German community Atizo, an open innovation platform where creative people meet and submit their projects to be developed. The analysis and the interviews, including that with the CEO Christian Hirsig, show fun and personal satisfaction as important incentives to support the members' participation on the community. According to the CEO the motivation to perform an enjoyable task, the interest and the pleasure to do it are very strong incentives that involve skills, talent and intelligence of people, as compared to mere extrinsic incentives.

Extrinsic incentives, such as money, are at their best when the tasks to be performed are uninteresting, unrewarding, repetitive or in sluggish contexts, so very far from the characteristics of the web 2.0 context. In particular the challenge, the game and the voting mechanisms, characterizing the competition in creative projects, strengthen positive effects as cooperation and cheerfulness between members. This generate great awareness in the participants improving each other's ideas for their own projects. In addition, it is clear that this situation enhance the engagement of new members and new projects coming into the community. In this study the authors (Bakici et al. 2011) found that the extrinsic rewards used within the community receive very low scores, showing that they are not decisive for the members' participation.

In the same way also Lakhani et al. (2007) analyse what motivates people to produce contents on online communities of various types. The authors argue that in these specific contexts, motivation closely link to the ability to submit a winning answer to a problem or providing not ready available information to other users without any monetary incentive.

Despite these considerations, in the plethora of these studies, some still emphasize the main role of monetary and non monetary extrinsic incentives for maintaining a high motivation of the crowd to participate. According to these studies, individuals perform required tasks mainly because they know they will get money (if contents produced are judged as significantly valuable), and/or the highest recognition status within the virtual community and among other members (e.g. Antikainen and Väättäjä; 2010).

Also the literature on prosocial behaviour focuses on incentive mechanisms used in the online communities, distinguishing three types of incentives: extrinsic, intrinsic and reputational (Frey and Jegen, 2002; Benabou and Tirole, 2006; Mason and Watts, 2009). According to these scholars, people are intrinsically motivated to participate when they perform a task and reach a goal that has a high value for them. Extrinsic motivation is at the core of the rational choice theory and triggers when people are stimulated by material rewards and positive and negative reinforcements. Finally, reputational incentives, such as praises, advertising and shame motivate because of social norms and social interaction processes. These studies are very interesting because they introduce the time issue. Therefore, the crowd undoubtedly is moved by material incentives, especially in the short term, but in order to maintain a quality of participation in the long run, people need to receive what is called the "social addiction", generated by the combination of intrinsic and reputational incentives (Brabham, 2010; Liu et al., 2011).

As part of extrinsic incentive mechanisms, an aspect to highlight refers to the relationship between the characteristics of the contents produced and the size of material and monetary rewards (e.g. Terwiesch and Xu, 2008; Acar and Van den Ende, 2011). In fact the value generated within the crowdsourcing communities through the rewards is one of the few aspects that should be controlled. Given the potential impact of extrinsic rewards on motivation, a part of the literature analyse the relationship between rewards, motivation and contributions to reap the benefits of the functioning of these online communities.

In this context, if on one hand, there is a significant body of literature on incentives, on the other there are still few studies that focus on the effects produced by rewards and

incentives on performance and on individual behaviours. For example, Weiling and Ping (2010) and Acar and Van den Ende (2011) analyse how the production of contents and the motivation of the users are influenced by personality traits. Moreover they investigate how the type of personality together with the use of specific incentives can affect users' behaviour and performance. Acar and Van den Ende (2011) try to understand if and how intrinsic and extrinsic incentive mechanisms can impact on motivation and performance, measured in terms of quality, quantity, originality, innovation and usefulness of contents produced. The most important aspects that emerge is that intrinsic incentives have a high positive effect on the dimensions of quantity, innovation and originality of contents, less on the usefulness. Otherwise extrinsic incentives positively affect the time response, but not the overall quality. Regarding the effects of extrinsic incentives, the analysis model provides lower scores compared to the impact generated by intrinsic ones.

Another interesting study is that carried out by Rogstadius et al. (2011) recruiting participants for a challenge, on Amazon Mechanical Turk platform. The study partly confirms and reports the results of a similar previous study of Mason and Watts (2009). Rogstadius et al. (2011), grouping users by extrinsic and intrinsic incentives, illustrate that monetary incentives increase quantity, not necessarily the quality of the users' contents, due to the "anchoring" effect. Users who only get paid for the tasks they perform fail to perceive the significance of what they are doing, just converging on money and not to what they really can improve. Therefore, they are not motivated to do better than those who do not receive monetary incentives. In their analysis users, who get monetary rewards, provide faster feedback and solutions, but the contents are not qualitatively superior in terms of adequacy and care than users. In light of these results, authors state that the "under-contribution" is a problem for many online communities. Those who are not paid, but receive intrinsic incentives (such as the participation to new and challenging activities), although they are not as fast and timely as users receiving extrinsic ones, provide higher quality output. However, they conclude by supporting the use of both intrinsic motives and extrinsic incentive mechanisms, which would in the long run respond to both dimensions considered crucial: quality and speed of response.

Following we provide a table that summarizes the main literature regarding incentives.

Table 1 – Intrinsic and extrinsic incentive mechanisms. A summary of the main literature

	Incentive mechanisms and motives	Results
P. Kollock, 1999	Focus on five mechanisms: reputation; mutual expectations; feeling useful in the community; commitment; affiliation and membership.	Providing information led to feedback mechanisms that facilitate the information flow.
M.M. Wasko e S. Faraj, 2000	These authors add four mechanisms to the Kollock's study: learning, fun, interaction with other members of the community, material returns.	Sharing mutual interests with other members is a crucial motive to support for the crowd's participation
R.M. Ryan e E.L. Deci, 2000	Focus intrinsic motivation with the following incentive mechanisms: increase of identification, affiliation and reputation, curiosity.	The intrinsic mechanisms affect more motivation than the extrinsic ones.
K.R. Lakhan e R. Wolf, 2001; 2005	Taxonomy illustration of the two groups of mechanisms.	The intrinsic motives, based on the feeling of pleasure and personal satisfaction are the strongest ones and affect the whole motivation, increasing reputation and identification of members.
von Hippel e von Krogh, 2003	Taxonomy illustration of the two groups of mechanisms.	People like to actively participate because have fun and they identify with the community.
K.R. Lakhani, L.B. Jeppesen, P.A. Lohse, J.A. Panetta, 2007	Analysis of motives that led people to produce subjects on different kind of online community.	Motivation closely relates to the ability to submit a winning solution to a problem or to provide required not available information. The online communities analyzed members do not get any monetary reward.
M.J. Antikainen, H.K. Väättäjä, 2010	Focus on extrinsic incentive mechanisms and their effects.	The role of rewards are important to maintain high motivation and the crowd's participation in the long term.
W. Mason, D.J. Watts, 2009	Focus on extrinsic incentive mechanisms, in particular reputation on web 2.0	Incentives related to reputation: praises, advertising, shame motivate because of social norms and processes of interaction.
K. Weidung, Z. Ping, 2010	Analysis of extrinsic and intrinsic motivation, that can be influenced by personal traits and the incentives that affect organizational behaviors.	Personal traits affect content's production. Community manager should care of the members' personality and behavior in order to establish the more appropriate incentive mechanisms to motivate.
I. Borst, J. Van den Ende, 2010	Focus on extrinsic incentive mechanisms; in particular on the role of monetary rewards and the impact on members' motivation.	Authors study the effects related to the presence and absence of rewards within the community, but they do not measure them and do not analyze the impact of rewards on members' performance.
O.A. Acar J. Van den Ende, 2011	Authors analyze the main features of contents uploaded on the community and the relevance of rewards size. They try to understand if and how incentives influence members motivation and performances in terms of quality, usefulness, quantity, originality and innovation of contents produced.	Intrinsic mechanisms have a high positive effect on the quantity, innovation and originality of contents, less on the usefulness. Otherwise extrinsic incentives positively affect the time response, but not the overall quality.
T. Bakici, E. Almirall, J. Wareham, 2011	Authors analyze motives that led the crowd to participate and illustrate the most commonly used incentive mechanisms.	Authors highlight how crucial is the sense of fun among participants. Extrinsic mechanisms, such as money, are at their best when participants are asked to perform repetitive tasks in sluggish context. In particular another important point is the challenge incentive that strengthens cooperation and cheerfulness between members. Authors moreover state that extrinsic incentives are not critical mechanisms.
J. Rogstadius et al., 2011	Focus on intrinsic and extrinsic mechanisms and related effects on members' performances.	Monetary rewards increase the quantity, but not automatically the quality of contents offered by the users, because of the anchoring effects.
Nov et al. 2011	Analysis of motives that address crowd participation: group motives; norm-oriented motives; identification motives, intrinsic motives; reputational motives, social interaction motives.	Authors recognize a crucial distinction between two intentions motives, that can occur in different time periods: the intention to increase the participation and the intention to maintain the participation.

Source: our elaboration

In conclusion, literature on crowdsourcing and, in particular, studies that analyse motivation and crowd incentive mechanisms represent a new frame with a landscape that is still quite various fragmented. Therefore, it is necessary that organizational and sociological scholars deepens and focus on this topic, because without active and motivated users online crowdsourcing communities can not exist. In particular, as several studies claim, it is appropriate to dwell more on the jointly use of intrinsic and extrinsic incentives in order to maintain high and long-lasting crowd participation and to allow for ample contents production.

The next section focus on the empirical analysis we conducted on four main travel communities. In particular we will understand how the administrators of these communities use the incentive mechanisms in order to influence the users' participation and the contents production.

5 Motives and incentives for participation. Comparing four case studies in travel communities

5.1 Methodology

Our empirical research follows a qualitative approach and consists of two phases carried out between October 2013 and February 2014.

In the first phase, we adopted an internet based research method (Eysenbach and Till, 2001), investigating the online communities. Data are produced through an active involvement of the researcher, participating in communications on the following Italian and international travel communities: Tripadvisor, Travellution, AirBnB, Voglio Vivere Così (the tourism community of Tuscany Region, Italy). In this way, contents uploaded by users, such as discussion boards on websites or chat rooms, internet postings are tracked down and analysed. We observed many different types of incentive mechanisms (such as game and contests, uploading photos and videos for voting the best traveller profile, etc.) used in these communities in order to create a fun environment for users and to enable them to better participate to the production of inputs.

In the second phase we conducted semi-structured interviews to the administrators of the travel communities analysed in the first stage . We expanded our study in order to investigate the administrators' perceptions and the meanings attributed to motives and incentives. In particular we aim to understand which types of incentives are better employed in these communities to engage and retain users and to stimulate UGC. The analysis therefore combines the interpretations and perceptions of top management with the personal experience of the researchers in participation process on these communities.

The interviews took place by phone, were conducted in Italian, lasted about 50 minutes, and were recorded and fully transcribed. They were guided by a wide-ranging questionnaire including questions about basically specific roles played by the users and crucial for the community; specific tasks "outsourced" to the users, the demography of the crowd participating; the main important extrinsic and intrinsic incentives employed and their impact on the users' behaviour.

5.2 Results

Tripadvisor

TripAdvisor is one of the most popular travel communities and used back in the panorama of 2.0 travel to help travellers plan the perfect vacation with reliable advice, posted by real travellers and a wide range of information search options, with direct links to booking tools. The PhoCusWright study, conducted in December 2013 reveals the main trends of the most widely used website for reviews:

- More than 57 mln users worldwide.
- Over 80 content pieces per minute.
- More than 260 mln visitors per month.
- Over 150 mln reviews and comments.

Tripadvisor has had a growth of 140% between 2012 and 2013, and today the Italian section constitutes 26.6% of the online travel market.

Tasks and roles

Information published on TripAdvisor are generated by its users that voluntary publish reviews, comments and ratings of destinations, accommodation facilities (Hotel, B&B, Resorts), and the various tourist attractions in the cities and places of destination. The platform allows users to add multimedia contents (photos, videos), maps from previous trips or participate in discussion forums on specific goals. In order to produce contents, users must be registered on the platform and create a personal profile containing basic details.

The choice of the types of holidays and trips is therefore greatly influenced by post published data and feedback from users. In addition, they can also provide more information about a particular destination with the creation of the 'Traveller articles' (WikiPages created and edited by users describing the experiences and destinations visited). An important task delegated to the crowd is also the peer review of hotels and restaurants, commercial structures. This last aspect is particularly important, because it shows how the judgement of the crowd can determine the success and the promotion of a structure, and to create a positive word of mouth.

The platform has thus grown thanks to the user-generated contents produced by the crowd that is considered in a dual role: as the creator of inputs for the operation of the

community, and as a target for facilities that wish to sell their services to the users of the platform. Users can be divided into 3 categories:

- Reviews Readers
- Reviewers
- Managers of pages (operators that promote their structures and facilities both through free profiles and through the activation of fee-based profiles in TripAdvisor for Business).

The reviews system actually has considerable importance for the purposes of our analysis, because it is linked to a certain extent to the ability of the crowd to create an evaluation system that then has a real impact on the images of the facilities. This has important developments especially in the case of the structures through which a high rating from users can receive the so-called 'Certificate of Excellence', which is the certificate awarded to accommodations and restaurants more appreciated by users on the basis of a rating average of a score of 4 out of 5 based on TripAdvisor reviews drafted by users and the total volume of reviews received in the last 12 months. Moreover the crowd has another tool: the 'Traveller' Choice Awards, the annual ranking of the users made that aims to identify exactly the best facilities and the best destinations.

In the control systems of all of this content there are mechanisms for review and replication-mediated mechanisms filtered by a content team. The automatic ones are controlled by computer filters, such as typing criteria able to identify the veracity of contributions. For the mediated ones, in support of the platform a content team is involved with monitoring activities, leaving the online conversation or speaking, even by removing, in case of divergence from the policy that explains the rules precisely of completion of the review and usability site. The work of the content team is very important in the content management system that out of 1900 employees around 300 staff are involved in this activity. In addition, the promotion and reputation management platform are handled by a country manager.

Incentives mechanisms

In order to enhance the users' participation there are directed strategies. The only strategy that was implemented at the beginning, the birth of the platform in 2000, was a big advertising investment that has helped to create the critical mass that then has ensured the expansion of the community for content enrichment, also for indirect leverage.

In the phase of engagement of users, therefore, two were the key factors:

- The massive advertising investment;

- The right time, because the birth of Tripadvisor has filled the need to overcome the information asymmetry enhancing the exchange of content-based trust mechanisms.

In the maintenance phase, the incentives that encourage users to participate are linked with intrinsic motivation, such as a sense of belonging and collaboration with the community. One of the main intrinsic incentives is receiving recognition from other members of the community; actually, 75% of users writes reviews because they want to share their travel experience with other travellers.

Another type of incentive is the play & fun tool, in other words the ability of the operator of the platform to create a fun environment for users to enable them to participate to the production of inputs and have more fun. An example is given by the function Travel IQ, an active game on the platform by the World Travel Challenge Game where the player must identify the city and the sights on a world map.

The extrinsic incentives are, however, mostly automatic:

- For the managers of the page, the higher the reputation, the higher will be the price on the market. Actually, the relevance of the operator's response far exceeds the reliability of review: 84% of users claims the reply of the operator makes the information much more reliable and enables the consolidation of online reputation;
- For the reviewers, the incentive is also recognition of the mechanisms by management advisor through, for example, the distinction of users in different rankings according to the number of reviews published and therefore the ambition to the Expert Level.

Today the platform is much less interested in the online community growth or encourage the interaction between users and is much more focused on the evolution of business. Specifically Tripadvisor has recently adopted two strategies that leverage extrinsic motivations for participation of accommodation and insist on the Tripadvisor for Business section:

- Pay per Click: on the pages for operators, OTAs (Online Travel Agency) have a paid banner and earn with the click of the users;
- Trip connect: operators can pay an annual fee for having business profiles and compete to get reservations because this mechanism allows landlords to generate new business by addressing travellers willing to book directly on the booking page of their website. Tripconnect thus increases the visibility of the facilities and the opportunity of direct bookings.

The real reason for these strategies is to optimize the user experience that organizes the trip through the travel community. The travel user searches are never smooth or regular trend because the user considers various options going from one platform to another, and this makes it complex for the loyalty. For this Tripadvisor is trying to centralize the users' attention to start and complete their search on a single platform, with all the features needed for the planning of a journey.

Travellution

Travellution puts in touch people willing to travel to the same place, in the same period and in general, with goals, interests and travel-related style before departure with the goal of bringing together people with whom they can organize whole or part of trips. The project was realized in 2008 from an idea by Giacomo Bastianellis sometime before that had in mind to create a content aggregator that would give access to all the necessary steps in organizing a trip. In 2011 was launched the beta version of the platform that was much more oriented to be a social community pushing on the connection among travellers. Thanks to the financial support of investors, technology upgrades were implemented that ensured users good planning trips services.

Today, the platform has 14,000 registered users and 50% of them are active users because they have proceeded with the creation of their trip.

Tasks and roles

The concept of this community is clearly in line with the trend of the moment, or the idea of encouraging new encounters and experiences through travel and, at the same time encourage users to value the traditions that make every trip a unique experience. For this reason, the slogan of the community is: "*Travellution, the social network that turns strangers into fellow travellers*". Using the tourism strategy of conversational marketing you create a relationship between consumer and business useful to promote destinations using assessments and reviews of the users themselves.

The user-generated content therefore represents the main instrument for the operation of the platform that is heavily dependent on its users and what they provide. The registered user can take part in travel plans already existing or can start create his own journey becoming Tripmate. The organizer of the trip creates a proposal and invite other users through a mechanism of collaborative planning; also the operators of the platform, according to the chosen destination, create suggestions for users. When people meet and

with same needs and purpose of travel, the platform asks them to become Tripmate so that the journey can become a social network with a bulletin board, events and other social tools. The main activities of the platform, therefore, are mainly three:

1. *Useful Content*: According to the chosen destination, the user can find all the content they need (information, photos, tips, travellers to the same destination);
2. *Trip Design* the system for planning a trip with a schedule, organizing day-to-day stages and destinations, lets you see if in those days and stages there are identified potential Tripmates with whom you can get in touch, exchange information and share content;
3. *Like-Minded Travelers* This service allows you to simply get in touch with potential fellow travellers, who have the same interests and tastes, even if you do not have a precise idea of travel plans.

In terms of privacy conditions, Travellution has restrictions because the contents of the trips are only visible to registered users and subscribers to travel themselves, but proposals can be shared on major social networks in order to be able to appeal to a wider audience and create interest in individuals who then become registered users and Tripmate themselves. The travel groups also provide even greater reliability and trust, because the reviews posted are definitely more travel contextualized and truthful and therefore the risk of fake content is reduced. The team has a community manager who is engaged in the promotion and retention of users on social networks.

A final aspect to be mentioned is that of the companies section, a service offered to tour operators that on 'Travellution Advertising Platform' can get advertised to the users and promote their offers and travel plans. Specifically, Travellution offers the possibility to create business partners for the organization of travel, through a free registration for six months and a profile that will be advertised on the home page of the platform. Then, if the business partner is satisfied, it can buy space on the website to have a greater market visibility. From this point of view, Travellution also acts as an intermediary and tourism is clear that users have a dual role: the first is necessary to the survival of the platform for user generated content; the second is useful, for potential buyers of travel services of partner companies that pay advertising to Travellution.

Incentives mechanisms

The platform does not have a structured incentive system. The administrators control users' participation through monitoring the travel cycle. Moreover management controls

users' feedback through monitoring that is based on internal surveys. In light of this, they plan to launch themed routes (eg, adventure, fantasy, etc...) that might attract business relying on the interest of users.

The platform is therefore based mainly on intrinsic incentives related to the willingness to share the experience of planning the trip and the trip itself with other users. The intent of the managers of the platform, however, is pushing a lot more on extrinsic levers because they feel that the service can become more professional. Therefore they are also assuming the use of a monetary reward for creating a profile of Expert Travel is contacted and paid to support the user during the journey. Another extrinsic mechanism is activated through contests to reward the best trip; this affects appearance, but also the quality and reliability of the trip.

Finally, to recruit new members, management proceeds on two fronts:

- Partnering with other services, such as the Erasmus network technology which offer the service for planning Erasmus trips in exchange for visibility and user recruitment;
- Agreements with travel agencies, which offer the service because technology makes organizing travel certainly more fun and attractive.

Airbnb

Airbnb is a community in which people can publish, discover and book unique accommodations around the world, called hosts. It puts people in touch at affordable prices in 35,000 cities and 192 countries, with different possibilities of accommodation. A sort of low cost participatory tourism based on sharing, collaboration and exchange. If you are travelling this way it does not only save you money, but the financial motivation is not the only or the main mechanisms that pushes to travel using these new forms of tourism. The basis of this model is actually a sort of recovery of values of a generation that looks to travel as an experience, as an encounter of cultures, not only as an opportunity to relax and have fun.

The platform now has 50,000 active hosts in Italy and 12,000 travellers every day staying with the Airbnb booking system. The main host cities in Italy are Rome, Milan, Venice, Florence, Bologna, and Turin and in 2013 there was a large increase of hosts in Sardinia. Just the case of Sardinia is an example of the need that Airbnb meets, because thanks to the enormous work done to enable hosts Sardinia is able to satisfy much of

foreign tourist demand. The platform is growing exponentially and in 2012 saw an increase of 650%.

Tasks and roles

Participation is through the community that is very referenced. In the community there is no anonymity: profiles are verified as related to social networks and through email and phone numbers, so there is always a verified and traceable identity. The community activities take place:

- Online, with the reservation system for other users;
- Offline in real host-guest relationship;
- Online for later review.

The airbnb administrators greatly focusing their activities on the hosts, who are followed since registration, even with the use of a professional photo shoot free to enrich their online profiles.

The Airbnb employees are mostly hosts who were hired by the management for their passion and professionalism, among these are also the community manager.

Offline activities originally had as a main objective the creation of events to get hosts to meet up. For about two years after the Italian launch, actually, the platform has only worked on this activity; today it is run by the hosts themselves, from a community that aggregates them in every city, self-organize and plan events together to promote their business.

Incentives mechanisms

Nowadays, the platform has never made any promotion with marketing actions (the first to do so were Airbnb USA this year) but have grown increasingly through word of mouth and important press coverage that is enriched with content of the stories of users.

Motives of hosts to participate are mainly extrinsic -based. First of all there is a full monetary reward, since it has no running costs of the profile; also Airbnb's gain, indeed, happens via the guest, who pays 10% more than the base rate of the host, so the cost is included in the total room rate. And then the review system increases the social value of online reputation host and increases the economic benefit.

Other elements of incentive for the host are:

- The usability of the site;

- The confidence that is generated either by the reputation of the reviews this is by giving a guarantee in the policy that the host is covered for serious damage with a guarantee of up to € 700,000;
- The customer support (24/7 in 16 languages).

Voglio Vivere Così

Voglio Vivere Così (VVC) is a project of the “Sistema Toscana” Foundation for the tourism and cultural promotion. With this project, born in 2008 and recently ended, the Tuscany Regional Authority wanted to develop a model that can reposition and renew their tourist offer, integrating a systemic view of the area and involving a new model of tourists who are fond of personalized travel, eager to share their experiences and major user of the tools provided by web 2.0 and new digital technologies.

In this regard, MirkoLalli, who was head of marketing and communication of the Fondazione Sistema Toscana for this project, said: *"What the Region of Tuscany did is an example of the use of massive and integrated web 2.0 tools applied to promote the area and an increase in tourism. A valuable experience that shows that even in this area you can push yourself to talk about ROI. "*

Today, according to the latest report conducted in December 2013 it includes:

- 7 profiles on Facebook with 557,000 fans
- 8 profiles with 30,000 followers on Twitter
- 2,100 Instagram users
- 17,000 users on Foursquare
- A Youtube channel
- 5 Flickr accounts
- One Pinterest account

Tasks and roles

The starting idea has been converted into a large operational plan, articulated in different directions necessary to achieve its goals: technology and multimedia, accessibility, synergy between public and private actors, communication and monitoring. A campaign to collect data, information and calendars of events and initiatives of all local touristic organizations (Aziende di promozione turistica, APT) companies and consortia was initially launched to promote tourism, special offers and packages for tour operators and

they proceeded to approve all the websites of the tourism and cultural heritage operators, directing all of them to a single portal, visited by all the tourists and visitors.

The next step has been the creation of a brand, to become the Tuscan territory a brand, a symbol known and loved worldwide, aiming at a sort of "All Region Land Mark", which has its basis in the network with a slogan which has become: "From a Landmark to a Lovemark. The activity related to the project continues today at www.allthingstuscany.com in that it contains several services, such as blogs AroundTuscany 4 (general), Tuscanyicious (food), TuscanyArts (art), Diaries Toscani (travel stories); the relational service tool Talk to Tuscany, the BookinToscana App for mobile reservation.

Thanks to the web, the 2.0 tourist acquires information and buys tickets for museums, shows, events, travel packages, looking for accommodation and location suitable to his/her needs, in particular in the comments and reviews, with the same interests and priorities. They post photos and videos, review and share their experience, but also call for advice on hotels and restaurants, and come into contact with tourists from all over the world. Every traveller is an opinion leader of his own social network that influence their content with the choices of other users and their relationship with and between users takes place mainly through social networks.

Incentives mechanisms

The activities of the Sistema Toscana Foundation towards users is strongly focused on the engagement, to offer a good service, to communications and sharing information, rather than the user-generated contents.

The project mainly relies on intrinsic motivations concerning the interests and the emotional sphere: what arouses the activity of users in sharing and participation is the recognition of elite, in a quality destination like Tuscany. Identifying with the stereotype of a goal that is lifestyle, the user replaces this with a component of belonging and recognition from the cultural point of view. The belonging intrinsic mechanism enables then to feel part of the community and the sharing photos of users makes them the ambassador of the destination. Users that sees their shared photo with the hashtag #visittuscany do not feel violated in the privacy and indeed perceive an added value. In this way, users become producers of content and this happens especially on Instagram profiles where there is a strong content care.

Another intrinsic incentive on which they have worked is the sense of belonging on the site www.tuscanyfaces.com launched in 2013 on the occasion of the Tuscany Fayre. The project shows the human, man-made aspect of Tuscany in art, in nature and food. Collecting photos and disclaimers at the same time allowing the registration online through a form, have created a gallery of profiles that are both residents of Tuscany, or from Tuscany living elsewhere in the world, or foreign and now living in Tuscany. This dynamic on one side has revealed all the sense of belonging to the region and the other is part of the proactive promotion of Tuscany itself.

Administrators hardly have employed extrinsic incentives. Sometimes the administrators have launched contests with prizes of symbolic recognition, such as the publication of the photo in the cover of FB, but in general they believe that the intrinsic incentives are much more important than extrinsic factors that work in the short term but then did not follow up with significant results.

Today, starting from very large user base and the successful brand “Tuscany”, Sistema Toscana Foundation is planning a development that goes in one direction of spatial proximity marketing through the creation of a loyalty card. The intention is to transform all users collected over the years into a database of contacts to be able to offer them discounts and promotions. The card has no cost, so the entry will always be incentivized by intrinsic motivations such as membership and identification, paly and funs, but in exchange for users, once community members, receive customized information and personalized newsletters. All aimed at creating a meeting point between users and operators in order to increase tourism promotion activities that already has to its advantage a wealth of users and content.

6 Conclusive remarks

A great stream of studies on crowdsourcing highlighted the importance of crowd motivation and incentive in the participation processes of online communities, providing interesting suggestions. This topic gained in popularity over the last decade, as more and more users have begun to flock to social communities and content-based sharing collaboration. But still few studies focus in depth on the application of intrinsic and extrinsic incentives mechanisms in these new contexts.

Our contribution is twofold. First, through a careful analysis of the recent literature on the crowd topic nowadays at stake, we provide reflections on intrinsic and extrinsic

incentives. In particular this analysis lead us to explore the extent to which these incentives are able to engage and motivate users in community building processes. Second, through the case studies we shed light on a partly jagged and new topic related to the use of incentive mechanisms in order to recruit and motivate crowd. In particular, we try to explain some preliminary insights and emerging issue needed to create a model of motives and incentive mechanisms that could be applied in the ORCHESTRA platform for the city of Naples.

Findings from the case studies focus on intrinsic mechanisms that stimulate users to participate on the social communities. All the platforms analyzed, in line with the literature, make a great use of intrinsic mechanisms. They have a primary role than extrinsic motives. First of all, the users are stimulated by the mutual reciprocity that motivate to produce a content, in terms of help and/or information in the expectation of receiving other useful information. Another important incentive refers to the the reputation in the community that users get by the sharing content and marker systems. Users will be motivated if they feel useful and trustworthy for the administrators. These aspects strongly influence the feeling of belonging and identification with the community. Another motive to participate is the social interaction and the opportunity “to make yourself heard”. The more are the contacts, the most users are encouraged to participate and to produce contents, so it’s crucial enhance the connection between users and create common interests between them. In this sense, social communities follow the way that the online participation and the contents production are the results of the work of each user; therefore the term “user-generated content”.

According to the administrators that we have interviewed the intrinsic mechanisms must be included in almost all the crowdsourcing tasks in order to motivate participation and to keep up the loyalty of users. Working on intrinsic mechanisms it is therefore in the interest of the platforms, and in general of all communities of crowdsourcing. In this sense intrinsic mechanisms can be defined as "non-profit framing", and they are difficult to identify and implement but are able to increase the motivation of the crowd.

The inclination towards interaction would appear to be the level for motivating many travel and tourism web initiatives. Several communities began huge business all over the world thanks to UGCs. In fact over the years it has become clear that users handle the review tool for the destinations they visit or for commercial products and services, and for supporting or criticizing the hospitality of some structures.

In light of these results we can draw two considerations. The first is that platforms administrators must constantly strive to create dynamic environments in order to positively influence intrinsic motives to participate, maybe through a mechanism of progression: new users may start to provide input on more simple and elementary tasks, then thanks to the seniority, they can focus on the development of more sophisticated contents to support the communities functioning.

A second suggestion refers to the fact that it might be useful to make a distinction between different time situations of participation: the engagement of the crowd and the retention and the involvement increasing, differentiating the specific incentive mechanisms.

Extrinsic rewards appear to be mere component in the platforms analysed and not precisely the most important one. We can observe how intrinsic mechanisms affect the construct the participation in a more pronounced way than extrinsic incentives and in particular monetary rewards. Nevertheless it could be useful to combine rewards, motivation and performance to determine if and how users' contributions are influenced by the extent and type of reward.

By taking into account the motives and the incentive mechanisms and the sense of fun perceived by its users, we have reflected on the implications for the web 2.0 by looking at the mass of creative subjects that finally take part in crowdsourcing activities. Our argument, simply put, is that the 'architecture of participation' (O'Reilly, 2005) surrounding the web is inextricably linked with the perception of enjoyable experiences deriving from networking activity through the mobilization of millions of voluntary actors.

In conclusion, following we provide a table that summarizes the results of our case studies, in terms of tasks outsourced to users, roles played and incentives employed in the communities analysed.

Table II – Summary of results

		TRIPADVISOR	TRAVELLUTION	AIRBNB	VOGLIO VIVERE COSTI
DELEGATED TASKS					
CROWD USERS	MONITORING	✓		✓	
	PEER REVIEW	✓	✓	✓	✓
	INFORMATION REFERENCING	✓	✓		✓
	CONTENT SHARING	✓	✓	✓	✓
STRUCTURE USERS	PROMOTION	✓	✓	✓	✓
	INTERACTION		✓	✓	
	CONTENT SHARING			✓	
	INFORMATION REFERENCING				✓
	BOOKING	✓		✓	✓
INCENTIVE MECHANISMS					
CROWD USERS	PEER REWARDS	✓	✓	✓	✓
	PLAY&FUN	✓	✓		
	PERSONAL KNOWLEDGE	✓	✓		✓
	MONETARY REWARDS			✓	
	NON MONETARY PRIZES		✓		✓
	RELATIONSHIP		✓	✓	✓
	REPUTATION	✓	✓	✓	✓
	IDENTIFICATION				✓
	RECOGNITION	✓	✓		✓
STRUCTURE USERS	ADVERTISING	✓	✓	✓	✓
	PEER REWARDS			✓	✓
	PLAY&FUN	✓		✓	
	PERSONAL KNOWLEDGE	✓	✓	✓	
	MONETARY REWARDS			✓	
	NON MONETARY PRIZES				
	RELATIONSHIP	✓	✓	✓	
	REPUTATION	✓	✓	✓	
	IDENTIFICATION				
RECOGNITION	✓	✓	✓	✓	

Source: our elaboration

Finally, our study had two main limitations. In the first place, in the empirical analysis we concentrated only on the perceptions and meaning of the administrators about motives and incentives use. Future studies should focus on the users' perceptions in order to study their motivation and behavior, understanding the impact of specific incentives mechanisms. We also intend to broaden the empirical research, involving other social communities.

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Different organizational models and roles in smart city systems.

Paolo Canonico, Stefano Consiglio

Department of Economics, Management, Institutions
University of Naples Federico II
C.U. Monte Sant' Angelo – Via Cinthia (NA)

Mario Pezzillo Iacono

Department of Economics
Second University of Naples
Corso Gran Priorato di Malta, Capua (CE)

Lorenzo Mercurio, Alessia Berni *

Department of Economics and management
University of Naples "Parthenope"
Palazzo Pacanowski
Via Generale Parisi, 13 (NA)

* *Corresponding author*

Structured Abstract

Purpose – In this paper we will investigate different organizational models and roles delivered by actors in smart city systems. A smart city strategy aims at using technology to increase the quality of life in urban space, both improving the environmental quality and delivering better services to the citizens. Our case study analysis referring to smart city platforms takes place within a research project (*Orchestra - ORganization of Cultural HEritage for Smart Tourism and Real-time Accessibility*) meant to develop a set of technological and organizational solutions to foster the smart, sustainable and ecologically compatible exploitation of cultural heritage and touristic resources in the city of Napoli.

Design/methodology/approach – Our research was based on a qualitative investigation. In particular we analyze a set of international cases analyzed during a research project funded by the Italian Ministry for University and Research. The selected cases are representatives of different governance structures, technologies adopted and phases of maturity in the development of integrated smart city applications. The collection of empirical data was carried out using a heterogeneous plurality of instruments. The methods include: document analysis, semi-structured interviews and participant observations. Fieldwork was carried out between September 2012 and early July 2013.

Originality/value – This research presents a preliminary view of a smart city developments. Analyzing different cases from Europe, USA and Asia we recognize common features and different characteristics in cities' smart planning and development.

The paper presents a first attempt to study different stages of maturity in the development of a smart city system.

Practical implications – First, from the analyses carried out, it would seem that models for development of integrated systems for smart city tourism-mobility are still under developed. Moreover, in many cases, "archipelago" logic of specialization seems to prevail, with the proliferation of separate and distinct applications for application domains rather than aiming towards integration. The development of inter-organisational relationships with service and technology providers by local public transport companies has proved much easier, as there is a strong *incumbent* operator with consolidated experience as a catalyst for innovation.

Keywords – smart cities, ICT, inter organizational relationships, integration

Paper type – Academic Research Paper

1 Introduction

In recent years many cities around the world are experimenting innovative ways of using digital technologies to enable competitiveness and sustainability. More generally, a smart city strategy aims at using technology to increase the quality of life in urban space, both improving the environmental quality and delivering better services to the citizens (Nam T., Pardo T., 2011). Smart cities are more and more considered as an interesting topic for organizational studies, since they bring about powerful implications in terms of issues such as coordination, incentives, design, behavior. In fact, smart city platforms typically require cooperation of a plurality of organizational actors to manage effectively collective interdependences through innovative ICT devices. They are developed on an evolving technological and economic scenario which provides at the same time an opportunity in terms of new entrepreneurial initiatives, but also constraints in terms of the availability of financial and knowledge resources needed to fully grasp their potentialities.

Our work referring to smart city systems takes place within a research project (*Orchestra - ORganization of Cultural HEritage for Smart Tourism and Real-time Accessibility*) meant to develop a set of technological and organizational solutions to foster the smart, sustainable and ecologically compatible exploitation of cultural heritage and touristic resources in the city of Napoli.

2 Inter organizational relationships and stages of development

The publications in the field of smart cities describe a richer and more complex digital space. First of all, it is worth noting how the management and competitiveness of cities does not only depend on the availability of the physical infrastructure, the "physical capital", but also and increasingly so on the availability and quality of infrastructure dedicated to ICT communication and social participation. A city can be classified as a smart city if it manages intelligently the economic flows, transport, the environmental resources, social relationships, housing choices and the administration method. In other words, a city can be defined as smart when investments in the human and social capital as well as traditional and modern infrastructures fuel a sustainable economic development and a higher quality of life. It is important to point out that not only smart features should be linked to the presence of information and communication infrastructures but also and especially to the role played by human, social and relational capital (European Smart Cities, 2012, Shapiro, 2008 Caragliu, Del Bo, Nijkamp 2009).

According to Dameri (2013): "A smart city is a well-defined geographical area, in which high technologies such as ICT, logistic, energy production, and so on, cooperate to create benefits for citizens in terms of well-being, inclusion and participation, environmental quality, intelligent development; it is governed by a well-defined pool of subjects, able to state the rules and policy for the city government and development".

Following Komminos instead (2006, p.69), the debate on smart cities belongs to the wider discourse on innovation and knowledge management; in fact, smart cities may be referred to as "territories with high capacity for learning and innovation, which is built-in the creativity of their population, their institutions of knowledge creation, and their digital infrastructure for communication and knowledge management".

Sometimes, "smart" is used interchangeably with intelligent, wired and digital. A few authors have progressively criticized this approach claiming that "the disjuncture between image and reality [. . .] the real difference between a city actually being intelligent, and it simply lauding a smart label" (Hollands RG, 2008., p.5).

As already highlighted and specified in the literature on this topic, the areas of analysis and the development aims of smart cities are different: they include the economy, mobility, the environment, people, governance, life quality (Komminos, 2002; Giffinger et al., 2007; Shapiro, 2008). Apart from the purely hard aspects tied to technology there are softer ones. In fact, the main definitions of smart city are tied together with creativity,

learning ability, innovation, knowledge and human and social capital. The technologies for information and communication integrated in the community can allow an effective use of resources by creating the conditions for the territory thanks to the interaction between citizens, institutions and businesses, so it becomes attractive from a socio-economic point of view (Berthon et al.2012)

From an economics point of view, it is important to note that the available resources should be networked so to improve economic efficiency and enable a development that is social, cultural and urban. In a broader sense, the term infrastructure includes the availability and provision of services for citizens and businesses. This is by making extensive use of information technologies, so highlighting the importance of connectivity as an important factor in development.

Similar processes take place in many cities around the world. They combine individual grass-root initiatives with investments that are the result of top-down planning. The two development processes foster the creation of a digital urban space and its integration with the pre-existing social and physical infrastructure.

In this context, integration is the driving force for development of smart cities, combining the strengths of ICT with the city community and the tools of the institutions. The applications are designed to directly complement the activities of the community, improving processes and workflows. However, we can then also observe an indirect integration of knowledge spilling over, which promotes learning and the dissemination of know-how within the city. The urban environment becomes a platform for the learning of digital skills and the creation of education systems for people living in the city.

Online transactions are reducing the need for the physical mobility of the inhabitants. Physical mobility is replaced by online transactions in the citizen's dealings with the public administration, with banks and the suppliers of recreational activities. A city that is more useful to visitors is the result of a greater information about the city and its features, monuments, and the recreational and cultural activities available online. This is particularly important for a city with great tourist potential where the employment rate in the service sector depends in large part on incoming flows. These changes however come largely from "grass root" initiatives created by small companies and individual developers. In some cases, these initiatives are then linked to aggregation systems of intermediate information at district level or that of a university campus, or other urban systems such as railway stations, ports, airports and shopping centres.

Furthermore, the development of the network economy creates new cooperation models in the production, distribution and consumption of services. On the one hand, service companies and other service providers can create different types of alliances or consortia through electronic networks with the aim of disseminating knowledge, sharing risks and reformulating value chains. On the other hand, virtual communities convey consumption patterns and user expectations, so creating opportunities to share experiences (Bessant and Tidd 2007; Furubotn and Richter 2005). Finally, with the potential liberalisation of many public utility companies (at least in some countries) a greater competitive and innovative pressure is created in terms of reconfiguring services.

Additionally, our perception of value creation has changed in the sense that service providers are not conceived to be the only parties able to create value for users. Rather, users now have a vital role in the process of value creation. In the current debate on services, an additional contextual element is featured in the design of the service system. In the new service economy, value is created not only by the service providers and customers but also as part of a broader service system of intermediaries and other stakeholders. These ideas help to redefine the organisational models for division of labour and the relationship mechanisms between public and private actors (Paton and McLaughlin 2008). The process of urban economic development that may potentially arise from a smart city perspective is not simply a model for reinforcing existing structures to achieve economies of scale and scope (range of action). The greatest benefits can actually be achieved through innovative organisation of the relations between the parties involved.

In terms of ICT, smart cities are mostly related to the applications of ICT both as infrastructure (platform) and ICT usage. Digital network infrastructures are used as a means to improve economic and political efficiency and at the same time to enable social, cultural and urban development. Such infrastructure includes mobile and landline phones, satellite TVs, and mostly the physical layer of the Internet (inter- and intra-city digital networks). The digital infrastructure with the services built upon these networks, such as electronic commerce and e-governance, are one of the main economic driving forces in cities and urban regions, producing numerous social and spatial effects.

In terms of domains of application, in the following table we put forward a tentative taxonomy of potential fields in which it is possible to deploy smart city applications, and

the levels of maturity in the development of integrated smart city applications, seen as different levels of integration of the applications, ranging from a purely informative role (diffusion of information) to a fully fledged integrated platform in which applications are mutually embedded to deliver a high level of service to citizens.

Tab. 1. A model of the phases of maturity in the development of integrated smart city applications

Field of application	Level 1 (Informative)	Level 2 (Final transaction)	Level 3 (High integration)
Orientation/location	Map	Maximizing itinerary	Comparative use of location application to decide different uses on the platform
Tourist resources	Information service about point of interest	Tickets for attractions	Enlarged fruition and augmented reality through smart city services
Public transport	Timetable and availability of transports and parking	Tickets of TPL	Planning itinerary and purchasing of integrated tickets
Public administration services	Information about potential services	Informative transactions and records on demand	Integrated access to PA information in relation to platform services
Buying goods and services	Showcase	Purchase, payment system	Integration of merchant of different types
Customer loyalty	Business proposal	Booking, discounts	Integrated access to a wide range of services
Financial services	Information related to financial service	Purchase related to specific financial services	Electronic money to buy services of the platform

3 Data Analysis

Our research was based on a qualitative investigation. As the case study approach refers to an in-depth study or investigation of a contemporary phenomenon within the real-life context, we set up six descriptive case studies, using theoretical replication logic [7]. In particular in this paper we selected six case studies, within a set of 15 international cases analyzed during a research project funded by the Italian Ministry for University and Research. We present the main evidences related to the cities of Songdo, Nice, New York, Amsterdam, Dublin and Barcelona. The selected cases are representatives of different governance structures, technologies adopted and phases of maturity in the development of integrated smart city applications.

The collection of empirical data was carried out using a heterogeneous plurality of instruments. The methods include: document analysis, semi-structured interviews and participant observations. Fieldwork was carried out between September 2012 and early July 2013. The interviews were guided by a questionnaire of wide-ranging, including questions about: the governance model, the fare structure and the fare evasion, the

transportation demand trend, the key element of the technological side, the problem of revenue distribution (clearing), the response of some managers to the application of electronic ticketing, and the socio-technical interplays within the network.

3.1 Songdo

The concept of Ubiquitous Computing Environment leads new paradigm change in urban space creation (Carvalho, L., 2011; Jang M., Suh S.T, 2010). In Korea, new concept of Ubiquitous-City (U-City) draws a lot of attentions now. It is trying to fuse high-tech infrastructure and ubiquitous information service into the urban area. It is also thought to bring innovations of urban functions, delivering information anytime, anywhere to anybody, via interconnected information systems and ubiquitous ICT solutions over the city. New Songdo is the first U-City case, where ICT are applied during urban development rather just being applied in the city, suggesting that future urban planning will possibly set ICT as an axe of precedence. In particular, Songdo International Business District is a U-City underway from scratch on 1,500 acres of reclaimed land along Incheon's waterfront, 65 km southwest of Seoul, and connected to Incheon International Airport by a 12,3 km highway bridge (Shin D.H , 2009; Shwayri S.T. 2013).

The city is planned as a hub for international business, high-education, new high tech industries, and also container port facilities: schools, hospitals, apartments, office buildings and cultural amenities are to be built in the district. Much of Songdo has still to be built, but even as it is under continuing construction, there are signs that point to its becoming an important business and residential hub. When completed in 2015, it is estimated that this \$25 billion project will be home to 65,000 people and that 300.000 will work there. It is being developed as a sustainable city with more than 40% of its area reserved for green space, including the park, 26 km of bicycling lanes, numerous charging stations for electric vehicles and a waste collection system that eliminates the need for trash trucks. The green infrastructure of the new city is to be enhanced by the provision of extra services that combine ICT as well as digital networks to ideally create harmony among the environment, society, and technology. Computers have been built into the houses, streets and offices as part of a wide area network. It can be described as a merge of information systems and social systems, where virtually every device and service is linked to an information network through wireless networking and RFID tags and sensors.

For example, crime prevention CCTV (security camera system) and CPTED operating CCTV have been installed, an Intelligence Traffic System that gives services to traffic controllers in Songdo from Incheon Traffic Information Center's Network, lower operation costs and there is also a traffic light system that uses the sensors on vehicle detectors. Moreover, Citizens will use U-mobile services to get traffic, weather and new updates through their smart-phones. The school zone safety services in particular will have a speed warning system and smart curb system in place for drivers, which use facial emoticons to send warning messages. The most eye-catching item from all these efforts has to be the U-disaster services. On top of the 68-floor Northeast Trade Tower a thermal imaging camera has been placed, in order to gather temperature, humidity, wind direction, and wind speed information all across Songdo. If there is a big fire or any pollutants being released, or significant changes to standard conditions, the system is able to sense this and alert the appropriate emergency vehicles like police cars, ambulances, fire trucks, etc.

In terms of organizational actors, relevant social groups around the development of u-city can be categorized into three groups: 1. initiators: Ministry of Information and Communication (MIC) and Ministry of Construction and Transportation (MCT); 2. industry providers of electronics conglomerates system (development companies, telecom equipment manufacturers and service providers, such as LG, KT, and Samsung) 3. host municipal authority. Along with MIC, MCT is a major initiator in u-city projects with the main responsibility of implementing the infrastructure. They have been key players in pushing ahead its nationwide u-city, coordinating the actions of both public (local) and private stakeholders.

3.2 *Nice*

Cityzi project (the integrated platform for mobile devices in use in Nice) started in 2005 in Japan with a research carried out by the third French largest mobile operator, Bouygues Telecom. At that time, in Japan, an "electronic portfolio" was already used for small payments, to buy train tickets and flights, travel titles. While the Japanese solution with proprietary technology was deemed unfit for European customers, Bouygues Telecom was convinced that the phone in the future could have been a payment instrument.

In France Bouygues Telecom had developed an interest in technology NFC in public transport (NFC cards were already in use in 35 cities) and payments (some French banks

were interested in using NFC for small amount transactions). It was clear to Bouygues Telecom that, being only the third largest telecom operator, it would not have been able to begin such a demanding initiative alone. In addition, Bouygues Telecom had understood that banks and public transport operators prefer technical solutions that can be used by all operators and on all handsets. As a result, Bouygues Telecom shared all the information in its possession with Orange, the leader in the field of mobile telephony, to convince them of the importance of undertaking the NFC initiative, but, more importantly, to emphasize the fact that, in order to be successful, would have had to work together. In addition, the president of Bouygues Telecom - having previously worked for banking groups and for Visa, was considered as the right person to convince these players that it was preferable to collaborate rather than seek each proprietary solution. Also public transport operators, manufacturers and retailers joined this collaboration that in April 2008 would have given life to AFSCM (French association for the diffusion of technology NFC). When the French mobile operators began to collaborate to develop an understanding on NFC there were no technical specifications for NFC mobile services. The first step was the creation of these specifications. Between 2006 and 2008, tests were being carried out in the cities of Paris, Caen, Grenoble and Strasbourg. In addition to testing the technology, these pilot tests served to verify the assumptions about consumer behavior. Initially, young people were seen as the target segment for services NFC mobile since they are good users of public transport, spend most of their income, rather than save, and are accustomed to electronic payments. However, during the pilot tests it became clear that the focus was too limited. Bouygues Telecom decided to extend the range of age to include older people: the objective was the segment of the population that potentially buy phones equipped with technology NFC. The collaboration within AFSCM developed in a positive way. However, some problems took place between Visa and AEPM (European Association for mobile payments), due to the potential overlap of interests between Visa and banking institutions. Only after several months of negotiations, the French banks and the telephone operators managed to convince Visa Europe of the value of the solution during implementation. After the pilot phase, the members of the AFSCM have realized that it was important to organize a final test before the launch; it was necessary to involve real customers that could have used phones to make shopping, offering them the download of real services to use.

Cityzi nowadays represents the main scheme of integrated services of mobility platform on ICT in Europe, through the use of technology NFC. Users can exploit their smart phones to access to a variety of services, including payments by credit cards, tickets of the urban network of TPL, discounts and coupons for shops, museum services, and information services on the city. The costs of the system are supported through installments paid by those who deliver a service. In particular, the actors which deliver services are charged a monthly fee. End users do not bear any charge. Veolia transdev manages the entire network of local public transport. Therefore, the revenues from public transport are transferred to the transport operator diminished of the fees needed to conclude the transaction on the smart phone platform. The system operates in a similar way as regards to the payments made toward other types of retail outlets.

3.3 New York

There is an integration system in New York that mainly concerns transport and also partly relates to tourism. It is a centralised and relatively traditional system, run by a focal organisation (a transport authority) which also makes the technological service-related decisions and develops partnerships with financial or tourism entities (in the latter case, mainly through a series of discounts and agreements).

The institutional player that governs the public transport system is the Metropolitan Transportation Authority (MTA), that operates the subway, buses and trains to Long Island and to the north (it is the biggest local transport network in North America with 16 railways lines , 24 subway lines and 338 bus lines, providing these services for a population of 15.1 million people). The MTA is governed by a board of 17 members: five members, as well as the Chairman and Chief Executive Officer, are directly appointed by the Governor of New York. All members of the Board are confirmed by the U.S. Senate.

Since 1994, the MTA has introduced a payment system called the *MetroCard*, which allows passengers to use magnetic cards which "contain" the exact value of the amount paid to the seller or electronic machine. Each Metro Card is assigned a specific serial number and transactions are recorded in the Automated Fare Collection Database: in this way the typical features of a Transaction Processing System are associated with those of a Management Information System (which acquires and processes the data collected, aggregating and compressing it and submitting it in systematic reports). In 2006, the MTA signed a deal with MasterCard to test a new payment system (*Paypass*), an

alternative to the MetroCard, with RFID technology that allows direct payment by credit card. The contactless MasterCard card has an embedded chip and antenna. Placing the card near the specific reader allows a wireless exchange of payment details without there being any need to swipe the card or insert it into a terminal. Information regarding the account is transferred from the reader and processed through the MasterCard Acceptance circuit. Starting in 2010, this solution has been extended to smart phones via an application that uses Visa pay Wave. With both methods, in order to buy a ticket for a ride you just have use the "*Slyde to pay*" method, or place your iPhone or credit card near the device, a kind of contactless reader, capable of detecting devices in relation to "non-contact" payments. The processing of the purchase is then handled in the same way as any other Visa or MasterCard transaction. The purpose is to speed-up the movement of people to the line and thus minimise payment waiting time. Despite the widespread positive response from users, the test is still being carried out for only 28 stops along the Lexington Avenue line.

The MTA has also created several smart phone applications that are freely downloadable on the App Store platform, which allow you to always have a subway map at hand and calculate the time required to move from one station to another with relative indications (iTrans NYC and NYC subway). In addition, in 2012 the MTA completed its "MTA subway time" application that allows you to check the times of all incoming and outgoing subway trains and delays.

The MTA is developing an integration system, that from 2015 that will allow users to use the MetroCard as well as the bike sharing system (Citibike), which has already been available in cities since 2012 with more than 10,000 bikes. The MTA is also developing the *Pay By Phone* system that allows citizens to pay for their parking via NFC technology. After registering your vehicle and your credit card on the service's website, you can pay for parking services by touching the relevant parking meter. This system is being developed in collaboration with the supplier of *PayByPhone* mobile payments, a *Pay By Phone* company providing a service similar to other cities in the world, such as Miami, San Francisco, Vancouver and London.

Finally, from the point of view of integration with the tourism system, it should be noted that with the purchase of a weekly or monthly MetroCard you are entitled to a discount for the New York Pass, New York City and the New York Explorer Pass. It is a magnetic card that allows discounts of up to 50% to visit the most important sights of the

city of NY (the most complete one allows visits to 80 attractions). In particular, New York Pass is a "smart card" which allows you to visit more than 80 New York attractions without having to buy a ticket. The smart card records when and where you used the pass for the first time and displays the expiry date.

3.4 Barcelona

In Barcelona the integration system concerns all transports. In late 90's, the organisation of the public transport system in the area of Barcelona required the creation of a metropolitan public transport coordinating agency, the ATM, by local government. Barcelona ATM is the governing body for integrated fare collection covering the metro system, railways, tram systems, buses, and other forms of public transport within Barcelona and the 250 towns in the surrounding area. The agency provides the system for approximately 74 transport operators in the Barcelona metropolitan region, which covers 3,240 square kilometres and serves more than five million residents. More than 70% of the journeys made by customers are with integrated tickets. In its function as regional mobility authority for the metropolitan region of Barcelona, the ATM is responsible for the following main functions: i) the drafting, processing and evaluation of the mobility steering plan; ii) issuing reports with regard to the urban mobility plans, the services plans and the evaluation studies of the mobility generated; and fostering the sustainable mobility culture among the public.

The Integrated Fare System was implemented in 2001. It is a zonal fare system (concentric crowns divided each into sectors): the fare zone is the area resulting from the intersection of crowns and sectors. In total 6 crowns and 33 sectors. Zone 1 includes the city of Barcelona and 17 other municipalities. Revenue from integrated tickets collected by ATM and paid monthly to all operators as established in the contracts. Private operators are paid according to concession contracts Renfe is paid by ATM as a result of the increase in passengers following fare integration (limited in time).

ATM is now deploying a full NFC-contactless solution for ticketing, based on open standards and ISO-CEN compliant, which is intended to be a significant step towards the deployment of contactless services across the rest of Catalonia, as well as interoperability with transport systems in other regions. ATM is also building on the momentum of Barcelona City Council's TAP@GO project, which is enabling NFC-payments and municipal services within the city.

In other words, the ticketing system the AMT is backing is based on data stored in a portable device that can be used as a bank card as well as a phone. This would mean moving beyond the ticket with a magnetic strip to employ the new contactless technology; the “the bus or train ticket” would thereby become a "transport application", which can be used in a range of bank cards and telephones.

At the moment, the only integration with the tourism system is the “Barcelona card”, developed by the Tourism de Barcelona Consortium. It is valid for unlimited journeys two, three, four or five days in the zone 1, and for free admittance in 25 touristic attractions. Furthermore the card includes many discounts in several museums, shops, restaurants.

3.5 Amsterdam

The OV-chipkaart is a contactless smart card system for all public transport in the Netherlands valid since 2011. The OV-chipkaart was first introduced to the Rotterdam Metro in April 2005. Since 2005 have been sold 6.800.000 cards on 16.500.000 people, 412 cards every 1000 people. The OV-chipkaart is a collaborative initiative of many actors. Five large public dutch transport operators: the main rail operator NS, the bus operator Connexxion and the municipal transport operators of the three largest cities (GVB, HTM, and RET). These five actors established the joint venture Trans Link System to develop and implement the card. The OV-chipkaart uses the MIFARE technology and three versions of the card are available: the disposable card, the anonymous card, and the personal one. The latter two types are valid for between five and six years, and can store credit. The disposable card, used mainly by tourist or by people who don't use often public transport, is thrown away after use. It can only be used for simple travel products and cannot be topped up with credit since it does not feature an electronic feature. The anonymous card, reusable and used by people who travel more frequently, has an electronic purse feature and the balance of the card is topped up at vending machines or at manned kiosks. The card is transferable and can not be used to hold season tickets longer than a few days in duration. Anonymous cards are obtainable from vending machines, kiosks and a special website for a fee but can be used immediately, unlike a personal OV-chipkaart. The personal OV-chipkaart used by residents, is similar to the anonymous version though it is possible to store season tickets and other travel products of a period longer than a single month. Other advantages of the

personal card are that it can be blocked if it is lost or stolen, and it can be set to automatically "top up" when the electronic purse credit drops below a certain level.

3.6 Dublin

The introduction of an integrated transport system in the Greater Dublin Area was part of a wider project. Transport 21 was an Irish infrastructure plan, announced in November 2005. Its aims to greatly expand Ireland's transport network encouraging use of public transport providing an integrated pricing system through the use of a smart card. A cost estimate of €34 billion was attached to the plan at the time. The plan includes continuing investment in Ireland's road network, along with investment in public transport in the form of buses and rail. In 2008 the Railway Procurement Agency, the State Agency of the Department of Transport charged with the development of light railway and metro infrastructure is appointed for the development of an integrated smart card system. The RPA has been a crucial role in implementing key rail elements of the Irish government initiative, Transport 21. It will be responsible for the planning, coordination and procurement through conventional means, and through Public Private Partnership. On 12 December 2011 was introduced the leap card, a form of integrated ticketing. The card can be used on DART, Dublin bus, Iarnród Éireann and Luas; minimum top up for the card is currently €5. The Leap card is the result of many years work by the Railway Procurement Agency to get an integrated ticketing-scheme for the public transport in Dublin city. Initially it only offers a pre-paid electronic wallet system to buy single trip journeys on Luas, DART / Commuter and Dublin Bus but there are plans to also offer week, month and year subscriptions on the card. It is also planned to extend the capabilities of the card. Introducing transfer rebates, monthly and yearly passes Even though the Leap card is usable on the bus, tram and local railway lines, it can only be used for single journeys within one of the systems. Any form of subscription/multi-day offerings are not (yet) possible with the Leap card: Even though tickets bought with the Leap card are cheaper than single journeys bought with cash money, using the Leap card for frequent travellers is more expensive than using the different weekly or monthly cards. There are plans however to extend the functionalities of the card, like the ability to "upload" a week, month or year-card to a Leap card.

The Leap card uses a chip inside the card then can be read from and written to without direct contact: a so-called proximity card or RFID cards. As far as concern the actors

involved in the integrated system. Several companies offer public transport in the larger Dublin area. Apart from several private companies transport is offered by Veolia Transport which operates with two tram-lines (Luas); Dublin Bus, the state owned bus service operating lines in the greater Dublin transport area, Iarnród Éireann, the national railway company (DART). In addition, Hewlett Packard Ireland/Payzone , IBM.

4 Discussion and conclusion

By presenting the cases, it is possible to make some preliminary comments about the different lines of development of the smart cities applications linked to the various spheres of citizens' lives, and more specifically, to local mobility and tourism.

In some of the world's major cities, the spread of integrated tariff schemes and mechanisms for using local public transport and having access to the city's major attractions has not yet been accompanied by a widespread use of smart city applications that employ ICT for shared and integrated access to a wide range of resources and services. However, in some cities, this potential is becoming clear, and players and services have been converging on a single platform for some time now. Finally, in other cities, the situation is at an intermediate stage and some attempts at moving toward integration of the services offered have been successful.

Table 2 summarizes the empirical findings that emerged and highlights the level of complexity and progress for each of the situations surveyed, with respect to the following aspects:

- number of services covered by the smart city application evaluated (the range of the application's portfolio of services);
- number of connections to the reference environment (the network of relationships with local stakeholders);
- number of players involved (those who have played or play a role in the application under examination);
- specificity of the inter-organisational coordination mechanisms (the establishment of site-specific, administrative and trade agreements or relationships, or agreements that can be effortlessly replicated elsewhere);
- specificity of the integrated system business model (the design of a mechanism for economic and financial equilibrium of the platform, and that relies on more or less innovative logic);

- presence of technologically relevant aspects (understood as the presence of cutting-edge technologies).

Tab. 2. The level of complexity and progress for each of the situations surveyed

Case study	Integration	Task Environment links	Number of actors	Collaborative Partnership	Governance model	Intelligent Technologies
New York	medium	medium	high	medium	low	medium
Barcelona	medium	high	high	medium	low	medium
Dublin	medium	low	medium	low	low	low
Amsterdam	medium	low	medium	medium	low	low
Nice	high	high	high	medium	high	high
Songdo	high	high	high	medium	medium	high

Figure 2, furthermore, also displays the positioning of the cases under examination in comparison to the other two key dimensions: the range of services offered by the *card* or the platform and the level of integration between the services themselves.

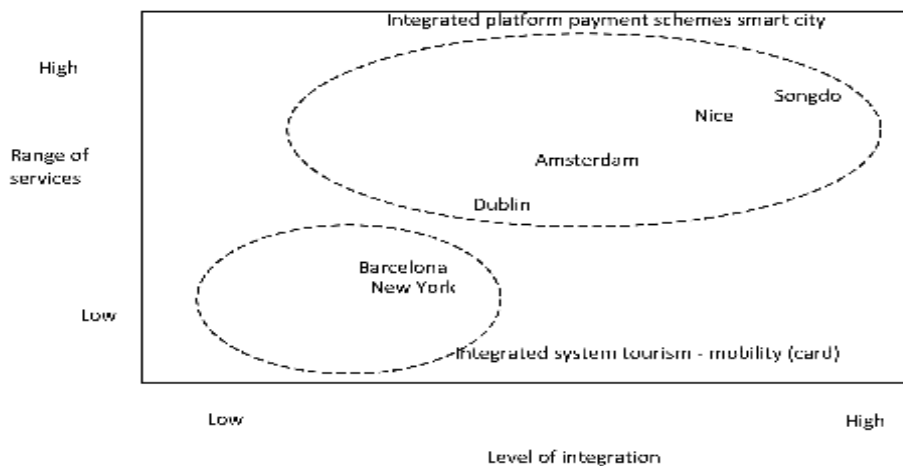


Figure 2. The positioning of the cases in comparison to the range of services and the level of integration between the services themselves.

Ultimately the level of integration (Canonicò et al., 2011), the functional and technological towards which the most advanced experiences are moving, in an attempt to

offer citizens a variety of jointly designed services equipped with commercial synergies and aimed at homogenous groups of users).

Therefore, a model of the phases of maturity in the development of integrated smart city applications could be defined as follows.

- An initial phase of basic use of the features offered by smart phone technology to facilitate a purely informative access to application domains, such as localization, access to tourism and mobility resources, public administration services, and business and financial services.
- An intermediate phase of transactions that stand alone in their respective application domains without sharing databases and information resources.
- An advanced phase represented by those integrated platforms for joint delivery of synergically designed services connected to a multitude of application fields.

The following table illustrates the levels just described, highlighting their respective potentials.

Tab. 3. The positioning of the cases in comparison to the phases of maturity

Field of application	Level 1 (Informative)	Level 2 (Final transaction)	Level 3 (High integration)
Orientation/location	Dublin, Amsterdam	New York, Barcelona	Nice, Songdo
Tourist resources	Dublin, Amsterdam, Barcelona	New York	Nice, Songdo
Public transport	-	New York, Dublin, Amsterdam, Barcelona	Nice, Songdo
Public administration services	-	-	Nice, Songdo
Buying goods and services	Dublin, Amsterdam	New York, Barcelona	Nice, Songdo
Customer loyalty	-	New York, Dublin, Amsterdam, Barcelona	Nice, Songdo
Financial services	Dublin, Amsterdam	Barcelona, New York -	Nice, Songdo

We can therefore provide a summary of useful observations for interpreting the future development paths of smart city platforms.

First, from the analyses carried out, it would seem that models for development of integrated systems for smart city tourism-mobility, while representing the frontier toward which to strive, are still under developed. In other words, the applications available in many cities are still at an embryonic stage and are not integrated schemes that are actually in use when compared to the city's mechanisms of use. Moreover, in many cases, "archipelago" logic of specialization seems to prevail, with the proliferation of separate and distinct applications for application domains rather than aiming towards integration.

In more detail, in Europe there is a prevalence of anarchistic models while in Asia, a more centralized set-up prevails (for example, Hong Kong or Songdo).

In many of the cases analyzed, we find a hurdle to spreading integrated schemes that interface with payment systems, probably due to the delay in collaboration between telephone services providers and global financial traders, still lagging behind in terms of the potential of smart city applications. The exception is France (and in particular, Nice) where the telcos have been a driving force in terms of launching platforms integrated with payment systems.

With regard to the spread of technologies, NFC, an integrated smart phone technology, is definitely the one most widely used for payments, despite discounting Apple's choice not to install NFC tags in their iPhone.

The development of inter organizational relationships (Canonico et al., 2012) with service and technology providers by local public transport companies has proved much easier, as there is a strong *incumbent* operator with consolidated experience as a catalyst for innovation.

The existing smart city applications also seem to show a very limited connection with the logic of *user generated content*. For this purpose, one of the central aspects should consist in the assumption that people should be able to participate actively in the design of the services and content that they are accessing. In fact, the delay in the synergy between *user generated content* and integrated mobility-tourism applications can essentially be explained by the limited availability of sensory, ICT and modelling infrastructures that can gather real-time input from citizens and adapt to those requests. This last point is perhaps the most challenging because it calls for flexible services, but it is the key to setting in motion the "*resource on demand*" mechanism to provide the service at the exact place in time and with the required intensity. In the early stages of application development, design tended to be self-referencing, generating a number of various initiatives with technical solutions and economic feasibility of an alternative rather than synergic nature.

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Spatial Spillovers of Foreign Direct Investment Inflows: the Empirical Evidence from China

Xinzhong Li

Institute of Quantitative & Technical Economics (IQTE),
Chinese Academy of Social Sciences (CASS),
No. 5 Jianguomennei Avenue, Beijing 100732, P.R. China.

Seung Rok Park

Enterprise Economic Institute,
Korea Economic y Research Institute (KERI),
No. 28-1 Yoido-Dong, Yongdungpo-KuB, Seoul 150-756, Korea.

* *Corresponding author:*

Structured Abstract

Purpose – This paper tries to develop an analyzable framework of the effects of spatial knowledge spillovers on economic growth of China. Firstly, this paper investigates spatial pattern of FDI inflows in China according to the spatial neighboring effects of knowledge flow; Secondly, this paper analyses the spatial dependence process of interaction between knowledge spillovers of FDI inflows and innovative activities in China, so as to look for insights on the mechanics of knowledge interdependences across regions;; Finally, it is expected to get the practical implications about a spatial policy of driving local area success growth .

Design/methodology/approach – In accordance with the theory and method of spatial interdependence, heterogeneity, variation of knowledge spillovers involved with spatial econometrics, the paper uses Chinese provincial data to investigate the empirical evidences of the effects of knowledge flow and spatial spillovers on innovative activities of China. On the platform of GeoDa and EViews software system, the spatial econometrics models of spatial pattern and spillovers effects of FDI inflows are built so as to examine the spatial variation of knowledge flows in Chinese provinces.

Originality/value –This paper points out the ideas of spatial interdependence, heterogeneity, variability of knowledge spillovers, so as to indicate spatial association process between FDI inflows and innovative activities in China. This paper constructs the methodology of Negative binomial and Poisson probability distribution model in FDI inflows and innovative activities, and applies the methods of spatial econometrics in analyzing the mechanics of dissemination and agglomeration of innovative activities in China as well as characteristics of knowledge spillovers with distance decay effect.

Practical implications – it is expected that the studies make policymakers get a good understanding of spatial association process between FDI inflows and innovative

activities in China. In addition, this paper suggests that spatial dimension of effects of knowledge spillovers generating by FDI inflows in China on innovative activities can not be ignored. The derived suggestions and policy implications of spatial agglomeration and dissemination of innovative activities are very helpful for policymakers.

Keywords – Spatial Spillovers, Foreign Direct Investment, Innovative Activities, China.

Paper type – Academic Research Paper.

1 Introduction

Knowledge spillovers are one of the main sources and engines of sustainable innovation and economic growth (Fujita and Thisse, 2002) , and foreign direct investment (FDI) inflows are the main channels to promote knowledge spillovers and growth of productivity (Xinzhong Li and Tongsan Wang,2009)¹. In turn, FDI firms with advance technology or managerial know-how knowledge, which bring the externalities of knowledge, may enhance competitive power of local firms in China. Especially, the early encouraging FDI inflows policy has been helpful for coastal regions since China launched the “open-door” policy in 1978, which makes FDI inflows located mainly in coastal developed economic regions so as to gain agglomeration economies. As a result, FDI inflows play important role in the strong growth regions in the coastal regions, and the located regions of FDI inflows are also the most intensive regions of innovation activities in China. This shows that FDI-related technological spillovers are the sources of sustainable innovation and productivity growth in coastal areas of China.

However, most of present literatures about interaction between FDI inflows and innovation activities have gone along with the traditionally theoretical framework of knowledge production function (KPF) without considering the spatial dimension since Jaffe (1989) described the local externalities in the process of creation and diffusion of knowledge by using KPF which focus on the intra-sector dimension. Although some recent studies take into account spatial and sector dimension of knowledge spillovers of FDI inflows, the magnitude or scope and spatial variation of knowledge spillovers are not examined. The rare literature fully investigates variation of knowledge spillovers with geographical distance and spatial proximity.

¹ Li, Xinzhong, Wang, Tongsan, 2009, “*The Technological Spillovers Effects of FDI inflows in China*”, research report, Institute of Quantitative & Technical Economics (IQTE), Chinese Academy of Social Sciences (CASS).

Just as Paul Krugman (1991) shows in a theory of new economic geography, the most striking features of the geography of economic activity are notable concentration of production in space. Especially, innovation activities have even more remarkably characteristics of spatial cluster in the geography. However, Krugman (1991) argued that empirical measurement of knowledge spillovers would prove to be impossible because “knowledge flows are invisible, they leave no paper trail by which they may be measured and tracked”¹. That is, regarding knowledge spillovers, there are no reasons for a political boundary to stop the spilling and limit the spatial extent, such as city limit or province line, or national boundary. Thus, this has currently triggered a strand of new literature of understanding the spatial dimension of innovative activity.

Jovanovic and Nyarko (1995), and Glaeser (1999) argue that proximity makes worker with greater skills or knowledge helpfully acquire the skills and the exchange and diffusion of knowledge. Helsley(1990), Ota and Fujita (1993), Lucas (2001), Berliant, Peng, and Wang (2002), and Lucas and Rossi Hansberg (2002) show that cities evolve a transition from a mono center to a multi-center structure, and then to have a dispersion with spatial decay over distance, but, they don't take account of much detail of the knowledge spillovers and the spatial decay function. Helsley (1990) suggests that the knowledge spillovers are a byproduct of output, and in part of specific location. Thus, these papers can be considered as the first step towards a fully understanding knowledge spillovers and spatial cluster and decay of economic activity.

In fact, the knowledge spillovers generated by FDI inflows follow a complex diffusion process through geographic, social, institutional, and technological proximity (Jaffe and Trajtenberg, 2002). Thus, FDI inflows-related spillovers are highly likely to have a spatial dimension. That is, FDI inflows-related spillovers present the characteristics of spatial interdependence, spatial heterogeneity, and spatial variation in the spatial dimension (Xinzhong Li and Tongsan Wang, 2011)². For example, LeSage, Fisher and Scherngell (2007) attempt to incorporate spatial dimension in conjunction with KPF to demonstrate variation of spillovers with geographical distance; Blonigen and Davies et al.(2007) indicate spatial autoregressive relationships of FDI inflows based on the surrounding market potential and the spatially lagged dependent variable; Baltagi,

¹ Lucas (2001), and Lucas and Rossi-Hansberg (2002) construct a spatial structure on production externalities so as to capture the externalities of knowledge.

² Li, Xinzhong, Wang, Tongsan, 2011, “The Effects of FDI inflows on Chinese sustainable innovation”, research report, Institute of Quantitative & Technical Economics (IQTE), Chinese Academy of Social Sciences (CASS).

Egger and Pfaffermayr (2007) use spatial weight to investigate the determinants of FDI inflows; Coughlin and Segev (2000) examine the neighboring effects of FDI inflows based on database of Chinese provinces.

These studies show that ignoring spatial effects of FDI inflows likely causes the bias of model specification and unreliable estimation of externalities of FDI inflows. FDI inflows-related spillovers based on geographical proximity and spatial clustering can enhance productivity and competition of Chinese firms. Especially, location choice of FDI inflows and spatial clustering of innovation activities not only depend on characteristics of foreign or Chinese firms within regions, but also the factor characteristics of neighboring provinces or cities such as market size, relative factor endowments, and economic developing level and so on. Besides, spatial clustering and geographical proximity mean that knowledge flow increases the opportunities for face-to-face contacts among people working, and also implies that there exists the limited spatial process over geographical distance for knowledge spillovers.

Thus, in order to fully understand the role of spatial dimension of knowledge spillovers in enhancing the innovative capability across Chinese provinces, and explore mechanisms of interactions between FDI inflows and innovation activities, the paper tries to develop an analyzable framework of the dynamic spatial model of knowledge spillovers based on the methodology of spatial dependence, heterogeneity, variation of knowledge spillovers generated by FDI inflows in China according to database of Chinese provinces. Besides, the possible spatial effects such as geographical scope and spatial decay effects of knowledge spillovers as well as the limited spatial process of externalities generated by FDI inflows are examined. It is expected that the evidences can be found which FDI inflows enhance knowledge spillovers and technology diffusion.

The paper is organized as follows. Beside the section above reviews the emerging literature on the spatial effects of FDI inflows on innovation activity and spatial empirical evidences regarding FDI inflows, the subsequent section uses probability model to examine the characteristics of spatial distribution of FDI inflows and innovation activities. The third section discusses measures of spatial dependence and empirical findings and explores externalities in the process of spatial creation and dissemination of knowledge as well as the effects of proximity on knowledge spillovers. Sections four summarize some remarks and policy implications are concluded. Finally, the acknowledgments and references are given.

2 Spatial Distribution of FDI Inflows and Innovative Activities in China

In accordance with the observed spatial clustering characteristics of FDI inflows and innovative activities in coastal regions of China, the conventional linear model are not appropriate to model spatial distribution of FDI inflows and innovative activities. Therefore, Negative binomial (NB) and Poisson probability distribution models are more appropriate approaches to be superior to others for describing the characteristics of count data with cluster. Thereby, NB and Poisson model can be used to approximately simulate the spatial agglomeration of FDI inflows and innovative performance so as to understand the mechanisms of dissemination and agglomeration of innovative activities as well as the effects of technological and geographical proximities on FDI inflows and innovative activities.

2.1 Probability model of spatial distribution

In theory, when $\sigma^2(X) > E(X)$, NB distribution model may be simulated the variable X which has the characteristics of clusters; when $\sigma^2(X) = E(X)$, Poisson distribution model may be simulated the variable X which has the characteristics of clusters; when $\sigma^2(X) < E(X)$, Binomial distribution model may be simulated the variable X . In addition, NB distribution can be combined by a few Poisson distribution with the different expectations of the variable X , and the limiting distribution of NB distribution is regard as Poisson distribution.

In particular, zero-inflation probability may be present when there are frequently so low probabilities over some time period and in regions. That is, sometimes the conventional applications of NB and Poisson models don't properly address the possibility of zero-inflated counting processes. As a consequence, zero-inflated probability processes are considered as an extension of standard Poisson and negative binomial regression, such as the zero-inflated Poisson (ZIP) and zero-inflated negative binomial (ZINB) regression models have widely applied in practical frequency analysis (Shankar and Milton et al. 1997), which may generate the better results of frequency simulation.

Thus, in order to illustrate the spatial distribution characteristics of FDI inflows and innovative activities, statistical analysis is started with Poisson model in frequency analysis. When the observed data obeys $\sigma^2(X) = E(X)$, the Poisson mode is as follows:

$$P(x_{ij}) = \exp(-\lambda_{ij}) \lambda_{ij}^{x_{ij}} / x_{ij}! \quad (1) \quad E(x_{ij}) = \exp(\beta Z_{ij}) \quad (2)$$

Where $P(x_{ij})$ is the probability of spatial distribution of the variable x in region i and time period j ; x_{ij} is the grade; λ_{ij} is the expected value of the variable x_{ij} , that is, $E(x_{ij}) = \lambda_{ij}$; Z_{ij} describes the vector of grade characteristics affecting the frequency of FDI inflows and innovative; β is the vector of regression coefficients to be estimated by standard maximum likelihood methods;

However, when the observed data presents the characteristics of over-dispersion, that is, it is subject to $\sigma^2(X) > E(X)$, Poisson model may result in biased estimation of model. Thus, NB model is applied in simulation of spatial distribution. The modified equation is derived as follows:

$$\lambda_{ij} = \exp(\beta Z_{ij} + \varepsilon_{ij}) \quad (3) \quad \sigma^2(x_{ij}) = E(x_{ij}) + \alpha E(x_{ij})^2 \quad (4)$$

Where $\exp(\varepsilon_{ij})$ is a ε_{ij} error term that follows Gamma distribution, in order to allow variance ($\sigma^2(x_{ij})$) may be unequal to the mean $E(x_{ij})$, which is very different from requirement of the Poisson model; α is a adjustable parameter between Poisson and NB model. When parameter α approaches zero, Poisson model is selected, otherwise, NB model should be considered. Thus, NB model can be formed as follows:

$$P(x_{ij}) = \frac{\Gamma((1/\alpha) + x_{ij})}{\Gamma(1/\alpha) x_{ij}!} \left(\frac{1/\alpha}{(1/\alpha) + \lambda_{ij}} \right)^{1/\alpha} \left(\frac{\lambda_{ij}}{(1/\alpha) + \lambda_{ij}} \right)^{x_{ij}} \quad (5)$$

Where $P(x_{ij})$ can be estimated by moments and standard maximum likelihood methods, which can be simplified as such the forms as $P(x_{ij}) = (\hat{\kappa} + x_{ij} - 1) R(\hat{\kappa}, x_{ij}) P(x_{ij} - 1) / x_{ij}$, $R(\hat{\kappa}, x_{ij}) = E(x_{ij}) / (\hat{\kappa} + E(x_{ij}))$, $\hat{\kappa} = E(x_{ij}) / (\sigma^2(x_{ij}) - E(x_{ij}))$.

2.2 Test statistic of spatial distribution

The test of spatial distribution models are started with goodness-of-fit test of χ^2 distribution. That is, in accordance with the observed data of FDI inflows and innovative activities, the NB and Poisson model are tested respectively based on the data set of Chinese provinces and cities level. The formula for the test is as follows:

$$\chi^2 = \left(\sum_{i=1}^n x_{ij}^2 f_{ij} - \left(\sum_{i=1}^n x_{ij} f_{ij} \right)^2 / \sum_{i=1}^n f_{ij} \right) / \sum_{i=1}^n f_{ij} \quad (6)$$

Where f_{ij} is the observed frequency of variable x in region i and time period j . The test values of χ^2 distribution and test results of probability distribution model see table 2.2-1, table 2.2-2, and table 2.2-3. The test results of probability distribution model show that FDI inflows, which include number of manufacture firm, R&D firm, managing & marketing firm, and total sectors, as well as innovative activities, which include number of patent applications examined such as inventions, utility models, designs, are subject to the NB probability distribution, which is also consistent with the observation of FDI firms and innovative activities concentrated in coastal cities and provinces.

However, because probability of FDI firm distribution frequently presents so low value to approach zero in regions, ZIP or ZINB model may be developed in the observed count data of FDI firms and innovative activities, and assume that the events Y are independent. Because the NB model is favored for the observed data, rather than Poisson model, the ZINB models of the modified probabilities are only considered and are formed as follows:

$$\text{Prob}(Y_{ij} = 0) = p_0 + (1 - p_0) \left(\frac{1/\alpha}{(1/\alpha) + \lambda_{ij}} \right)^{1/\alpha} \quad (7)$$

$$\text{Prob}(Y_{ij} = c_i) = (1 - p_0) \frac{\Gamma((1/\alpha) + c_i)}{\Gamma(1/\alpha)c_i!} \left(\frac{1/\alpha}{(1/\alpha) + \lambda_{ij}} \right)^{1/\alpha} \left(\frac{\lambda_{ij}}{(1/\alpha) + \lambda_{ij}} \right)^{c_i} \quad (8)$$

Where $c_i = 1, 2, 3, \dots, n$ is the grade number of events such as FDI firms and patent applications examined; p_0 is subject to the formulas as follows:

$$E(y_{ij}) = (1 - p_0)\lambda_{ij} \quad (9) \quad \sigma^2(y_{ij}) = (1 - p_0)\lambda_{ij}(1 + (p_0 + \alpha)\lambda_{ij}) \quad (10)$$

$$\frac{\sigma^2(y_{ij})}{E(y_{ij})} = 1 + \left(\frac{p_0 + \alpha}{1 - p_0} \right) * E(y_{ij}) \quad (11)$$

Obviously, the variance is greater than the mean in ZINB model, which shows that observed data has the characteristics of clusters in ZINB model. But, because Poisson and ZIP or NB and ZINB counterparts are not nested, this test can't be conducted directly. Thus, the statistical test is critical for the selecting, ZIP, ZINB or not. According to the methodology for non-nested models developed by Vuong and Quang (1989), let random variable $Y = y_i$, and assume that the probability density functions of ZINB and

NB model are respectively the $f_1(y_i/x_i)$ and $f_2(y_i/x_i)$. As a result, the test statistic for non-nested ZINB and NB or ZIP and Poisson is as follows:

$$\eta_i = \ln\left(\frac{f_1(y_i/x_i)}{f_2(y_i/x_i)}\right) \quad (12) \quad \omega = \frac{\sqrt{n}\left(\sum_{i=1}^n \eta_i / n\right)}{\sqrt{\sum_{i=1}^n (\eta_i - \bar{\eta})^2 / n}} \quad (13)$$

Where, η_i is the logarithm of ration of NB to ZINB probability; $\bar{\eta}$ is the mean of η_i ; n is the sample size. Vuong's value obeys an asymptotical standard normally distribution, and if $|\omega|$ is less than 1.96, which is the 95% confidence level for the t-test. Thus, if the ω value is greater than 1.96, the observed data obeys the ZINB or ZIP model, while if the ω is less than 1.96, the observed data obey NB or Poisson model.

2.3 Empirical Results of Spatial Distribution

The statistical results based on Vuong's tests see table 1., table 2., and table 3.. Based on the provincial count data of such as manufacture firm, R&D firm, managing & marketing firm, and total sectors, as well as number of patent applications examined such as inventions, utility models, and designs, the results show that the ω values are less than 1.96. Thus, the observed count data obeys the NB probability distribution, rather than ZINB model, which are also consistent with the observation of FDI firms and innovative activities concentrated in coastal cities and provinces. But, based on the data of cities in China, only manufacture and managing & marketing firm obey NB model, and R&D firm and total sectors obey neither NB model nor ZINB model.

These results mean that there still exist the greater potentials for further introducing FDI inflows and sustainable innovation in China. Besides, the evidences of spatial agglomeration are helpful for further investigating the location determinants affecting innovative activities and different branches of FDI firms in global value chains. On the other hand, it is also suggested that, in accordance with the characteristics of spatial agglomeration of FDI firms in global value chains, maker of decision should preferentially support innovative activities in the advantageous location so as to boost agglomeration economies and spatial spillovers of FDI inflows.

Table 1. Probability model and test of spatial distribution of FDI firms in Chinese provinces.

Parameter	manufacture firm	R&D firm	managing & marketing	total sectors
$E(X)$	2.6356	1.1989	1.6453	2.2952
$\sigma^2(X)$	14.5324	3.7945	4.3191	12.2134
$\hat{\kappa}$ (moments)	0.5839	0.5537	1.0124	0.5312
$\hat{\kappa}$ (likelihood)	0.6755	0.9377	0.9440	0.6590
R	0.7960	0.5611	0.6354	0.7769
$\chi^2(\text{poisson})$	9.18E+12	1.14E+06	1040.4945	1.38E+14
$\chi^2(NB)$	28.2064	45.1926	5.7283	45.7072
Vuong value	-8.7480	-8.3222	-7.8351	-9.0488
	$\chi^2(\text{poisson}) >$	$\chi^2(\text{poisson}) >$	$\chi^2(\text{poisson}) >$	$\chi^2(\text{poisson}) >$
	$\chi^2(29,0.001) = 58.301$	$\chi^2(29,0.001) = 58.301$	$\chi^2(29,0.001) = 58.301$	$\chi^2(29,0.001) = 58.301$
	Rejecting hypothesis	Rejecting hypothesis	Rejecting hypothesis	Rejecting hypothesis
	$\chi^2(NB, 28) <$	$\chi^2(NB, 28) <$	$\chi^2(NB, 28) <$	$\chi^2(NB, 28) <$
Test	$\chi^2(0.1) = 37.9160$	$\chi^2(0.01) = 48.2782$	$\chi^2(0.1) = 37.9160$	$\chi^2(0.01) = 48.2782$
	Accepting hypothesis	Accepting hypothesis	Accepting hypothesis	Accepting hypothesis
	Obey NB distribution	Obey NB distribution	Obey NB distribution	Obey NB distribution
	$V_{ZINB} < \text{Vuong}(0.95)$	$V_{ZINB} < \text{Vuong}(0.95)$	$V_{ZINB} < \text{Vuong}(0.95)$	$V_{ZINB} < \text{Vuong}(0.95)$
	=1.96	=1.96	=1.96	=1.96
	Obey NB distribution	Obey NB distribution	Obey NB distribution	Obey NB distribution

Note: the data come from ministry of business and other China statistical yearbooks, and are required the number of multinational corporations above 10 million dollar of designated size by year total sales income.

Table 2. Probability model and test of spatial distribution of innovative output in Chinese provinces

Parameter	total patents	inventions	utility models	designs
$E(X)$	5.2960	5.4202	6.2886	4.0478
$\sigma^2(X)$	35.7037	36.8668	40.9518	27.2448
$\hat{\kappa}$ (moments)	0.9224	0.9343	1.1409	0.7063
$\hat{\kappa}$ (likelihood)	0.8011	0.8276	0.9313	0.7118
R	0.8686	0.8675	0.8710	0.8505
$\chi^2(\text{poisson})$	6.33E+08	1.59E+08	2.74E+07	9.62E+09
$\chi^2(NB)$	10202.0325	2015.2017	4113.3921	7604.8419
Vuong value	-6.9964	-6.8029	-6.0338	-7.9366

	$\chi^2(poisson) >$	$\chi^2(poisson) >$	$\chi^2(poisson) >$	$\chi^2(poisson) >$
	$\chi^2(29,0.001) = 58.301$	$\chi^2(29,0.001) = 58.301$	$\chi^2(29,0.001) = 58.301$	$\chi^2(29,0.001) = 58.301$
	Rejecting hypothesis	Rejecting hypothesis	Rejecting hypothesis	Rejecting hypothesis
	$\chi^2(NB,28) >$	$\chi^2(NB,28) >$	$\chi^2(NB,28) >$	$\chi^2(NB,28) >$
Test	$\chi^2(0.001) = 56.893$	$\chi^2(0.001) = 56.893$	$\chi^2(0.001) = 56.893$	$\chi^2(0.001) = 56.893$
	Rejecting hypothesis	Rejecting hypothesis	Rejecting hypothesis	Rejecting hypothesis
	$V_{ZINB} < Vuong(0.95)$	$V_{ZINB} < Vuong(0.95)$	$V_{ZINB} < Vuong(0.95)$	$V_{ZINB} < Vuong(0.95)$
	=1.96	=1.96	=1.96	=1.96
	Obey NB distribution	Obey NB distribution	Obey NB distribution	Obey NB distribution

Note: the data come from ministry of business and other China statistical yearbooks, and are required the number of multinational corporations above 10 million dollar of designated size by year total sales income.

Table 3. Probability model and test of spatial distribution of FDI firms in Chinese cities

Parameter	manufacture firm	R&D firm	managing & marketing	total sectors
$E(X)$	3.0142	1.2529	2.0933	2.6723
$\sigma^2(X)$	18.5676	4.4031	11.1475	16.8089
$\hat{\kappa}$ (moments)	0.5842	0.4983	0.4839	0.5052
$\hat{\kappa}$ (likelihood)	0.4897	0.7623	0.5356	0.4744
R	0.8603	0.6217	0.7963	0.8492
$\chi^2(poisson)$				
	5.79E+07	1.14E+06	6.00E+07	5.65E+08
$\chi^2(NB)$	36.5874	42.0954	21.6703	101.7649
Vuong Value	-7.1870	-6.4304	-7.1582	-7.4056
	$\chi^2(poisson) >$	$\chi^2(poisson) >$	$\chi^2(poisson) >$	$\chi^2(poisson) >$
	$\chi^2(18,0.001) = 42.312$	$\chi^2(18,0.001) = 42.312$	$\chi^2(18,0.001) = 42.312$	$\chi^2(18,0.001) = 42.312$
	Rejecting hypothesis	Rejecting hypothesis; Not obey Poisson	Rejecting hypothesis	Rejecting hypothesis Not obey Poisson
	$\chi^2(NB,17) <$	$\chi^2(NB,17) >$	$\chi^2(NB,17) <$	$\chi^2(NB,17) >$
Test	$\chi^2(0.001) = 40.790$	$\chi^2(0.001) = 40.790$	$\chi^2(0.1) = 24769$	$\chi^2(0.001) = 40.790$
	Accepting hypothesis	Accepting hypothesis	Accepting hypothesis	Accepting hypothesis
	Obey NB distribution	Obey NB distribution	Obey NB distribution	Obey NB distribution
	$V_{ZINB} < Vuong(0.95)$	Not obey NB distribution	$V_{ZINB} < Vuong(0.95)$	Not obey NB distribution
	=1.96,		=1.96,	
	Obey NB distribution		Obey NB distribution	

Note: the data come from ministry of business and other China statistical yearbooks, and are required the number of multinational corporations above 10 million dollar of designated size by year total sales income.

3 Measures of Spatial Dependence

Just as is described by Tobler's first law of geography, spatial dependence means that everything is related to everything else over space, but near things are more related than distant things. Thus, spatial dependence between FDI inflows and innovative activities implies the existence of spatial process. Spatial dependence can be positive or negative, and positive spatial dependence much more common than negative. Positive

spatial dependence occurs when similar values cluster one another over space. Negative spatial dependence occurs when dissimilar values occur near one another over space.

3.1 Statistic of Spatial Dependence

Measures of spatial dependence include global and local spatial dependence based on Moran's Index (Moran 1950). Global measures indicate the same pattern or process over the entire geographic area, which are expressed by an average for the entire area. Local measures indicate different patterns or processes over different parts of the region, which have a unique number for each location. Thus, the formulas for global and local spatial dependence are described respectively as follows:

$$Moran's\ I = \frac{N \sum_{i=1}^N \sum_{j=1}^N w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^N (x_i - \bar{x})^2 \sum_{i=1}^N \sum_{j=1}^N w_{ij}} \quad (18) \quad Z(I) = \frac{Moran's\ I - E(I)}{\sigma_I} \quad (19)$$

Where *Moran's I* is the calculated value for global spatial dependence; *N* is the number of observations such as points or polygons; w_{ij} is a weight indexing location *i* relative to the contiguous location *j*; x_i is the variable value at a particular location *i*; \bar{x} is the mean of the variable x_i ; $Z(I)$ is the standard deviation for standard normal distribution for test of statistical significance of spatial dependence; $E(I)$ is the expected value; σ_I is the standard deviation for as asymptotical normal distribution.

$$I_i = z_i \sum_{j=1}^N w_{ij} z_j \quad (20) \quad Z(I_i) = \frac{I_i - E(I_i)}{\sigma(I_i)} \quad (21)$$

Where I_i is the calculated value for local spatial dependence; z_i 、 z_j are respectively the standard values of the original variables x_i and x_j ; $E(I_i)$ is the expected value of I_i ; $\sigma(I_i)$ is the standard deviation of I_i ; $Z(I_i)$ is the standard deviation for standard normal distribution for test of statistical significance of spatial dependence.

3.2 Empirical Analysis of the Spatial Effects of FDI Inflows on Spatial Distribution of Innovative Activities in China

The derived results based on calculation of Moran index indicate the existence of strong positive spatial dependence process. That is, there are the strong patent application activities in coastal cities and provinces, which are consistent with empirical observation on FDI inflows and innovative activities clustering in coastal regions. Besides, because of existence of spatial dependence, innovative activities have also close associated with FDI inflows in contiguous regions, and the spatial effects have a highly statistical significance in the global Moran index. Thus, the spatial spillovers generated by FDI inflows have the significant influence on growth of number of patent applications examined such as inventions, utility models, designs in China.

Table 4., Table 5., Table 6., Table 7. show the significant effects of FDI inflow on spatial distribution of innovative activities in the spatial dimension. According to the evolution of innovative activities from 1999 to 2012, as a whole, the innovative activities have been spreading to middle-western regions from coastal regions, and intensity of the innovative activities have greatly increased over year although it is very different for spatial spillovers effects of FDI inflows on spatial distribution of the different type of innovative activities such as inventions, utility models, designs, and total patent applications.

For example, based on calculation of global Moran's I , global spatial dependence between FDI inflows and innovative activities such as inventions, utility models, designs, and total patent applications are respectively examined. The spatial effects of FDI inflows on designs have always held the higher values in comparison with inventions, total patent applications, and utility models, Statistical values of Moran's I on the designs have increased considerably from 0.2212 in 1999 to 0.4475 in 2007 and decreased from 0.4475 in 2007 to 0.2573 in 2012, which have the trend from agglomeration to diffusion over time with highly statistical significance. However, spatial effects of FDI inflows on inventions have always maintained the lower values in comparison with utility models, total patent applications and designs, even so, the values of Moran's I on inventions have still increased from 0.0771 in 1999 to 0.2680 in 2012, which have been the trend from agglomeration and have begun to be the statistical significance in 2003. Nevertheless, spatial effects of FDI inflows on utility models and total patent applications have always ranged between inventions and designs. In

particular, the values of Moran's I on utility models have increased from 0.0895 in 1999 to 0.3795 in 2012, which have been the strong trend of agglomeration over time and have begun to be the statistical significance in 2002. Similarly, the values of Moran's I on total patent applications have increased from 0.1409 in 1999 to 0.3520 in 2012, which also have been the strong trend of agglomeration over time and have begun to be the statistical significance in 2001.

Table 8., Table 9. respectively show the decay effects of global spatial dependence over time along with increasing orders of contiguity for total patent applications examined and FDI inflows in China. For example, with the increasing of the number of order of contiguity, in 1999, Moran index of total patent applications gradually decreases from 0.0852 at 4th-order to -0.0218 at 24th-order, and in 2012, Moran index of total patent applications gradually decreases from 0.2836 at 4th-order to -0.0233 at 24th-order. Similarly, in 1999, Moran index of FDI inflows gradually decreases from 0.0849 at 4th-order to -0.0302 at 24th-order, and in 2012, Moran index of FDI inflows gradually decreases from 0.2503 at 4th-order to -0.0212 at 24th-order. Thus, the derived results means that the spatial process of externalities generated by FDI inflows is limited and variable, that is, the scope and the extent of spatial spillovers effects generated by FDI inflows on innovative activities vary with distance, which indicates the characteristics with spatial interdependence, heterogeneity, variation of spatial effects.

Table 10. and Table 11. report the spatial variation of innovative activities and FDI inflows across Chinese provinces over year. In accordance with the evolution of innovative activities across regions from 1999 to 2012, innovative output presents the strongly increasing trend in China over the recent years. For example, the innovative output in Beijing was 6.144 patent applications examined by per ten thousand persons in 1999, and significantly reached nearly seven times higher which was 44.607 in 2012. Respectively, the average innovative output in Zhejiang gradually reached nearly twenty-five times higher from 1999 to 2012, nearly sixty times higher in Jiangsu, eleven times higher in Shanghai, and almost fourteen times in Tianjin and so on.

As a whole, the average innovative output across Chinese provinces was 0.926 patent applications examined per ten thousand persons in 1999, and gradually reached nearly thirteen times higher which was 12.232 in 2012. The Coefficient of variation and standard deviation which indicated the degree of spatial concentration and variation of innovative activities gradually decreased from 0.771 in 1999 to 0.816 in 2012, so as to

show the trend from agglomeration to diffusion. Thus, innovative activities in China present the strong characteristics of spatial variation through spatial concentration in eastern coastal regions at the beginning having spread to more regions in middle-western and northern-eastern regions later.

In contrast, the spatial variation of FDI inflows in China shows the strongly spatial disparity across provinces. Although FDI inflows in Chinese provinces have gradually increased over time, the shares of FDI inflows in middle-western regions have been still less than the shares in eastern and coastal regions. Thus, FDI inflows in China have maintained the significantly structure characteristics of spatial distribution, which have mainly concentrated in eastern and coastal regions. The Coefficient of variation which indicated the degree of spatial concentration and variation of innovative activities gradually decreased from 0.550 in 1999 to 0.681 in 2012, so as to show the trend from agglomeration and the spatial disparity of FDI inflows in China.

In conclusion, the spatial dependence described above indicates that the innovative activities are close associated with FDI inflows in contiguous regions, and there exists the pattern of decreasing dependence with increasing orders. Secondly, spatial effects present the characteristics of spatial interdependence, heterogeneity, variation with distance. Finally, FDI inflows in China have the strongest knowledge spillovers effects on the patent applications examined of designs, and have less knowledge spillovers effects on the patent applications examined of inventions in comparison with designs and utility models. Thereby, FDI inflows boost the exchange between Chinese and foreign enterprises so as to generate the demonstrating effects for Chinese enterprises.

Table 4. Global Spatial dependence and test of patent applications of inventions based on contiguity of FDI inflows in Chinese provinces

Year	Moran's <i>I</i>	E(I)	Mean	Sd	P-value
1999	0.0771	-0.0357	-0.0048	0.0967	0.4590
2000	0.1480	-0.0357	-0.0038	0.0992	0.1110
2001	0.1059	-0.0357	-0.0077	0.0973	0.2910
2002	0.1285	-0.0357	-0.0107	0.1026	0.2140
2003	0.1965	-0.0357	-0.0072	0.1029	0.0620
2004	0.2076	-0.0357	-0.0085	0.1042	0.0520
2005	0.2555	-0.0357	-0.0126	0.1057	0.0200
2006	0.2625	-0.0357	-0.0152	0.0963	0.0160
2007	0.2683	-0.0357	-0.0091	0.1086	0.0250
2008	0.2022	-0.0357	-0.0152	0.1091	0.0510
2009	0.2421	-0.0357	-0.0197	0.1061	0.0280
2010	0.2649	-0.0357	-0.0194	0.1106	0.0210
2011	0.2592	-0.0357	-0.0234	0.1137	0.0220
2012	0.2680	-0.0357	-0.0185	0.1093	0.0260

Note: Multivariate Moran's *I* of both patent applications of inventions and FDI inflows is measured by the Queen Contiguity Weight.

Table 5. Global Spatial dependence and test of patent applications of utility models based on contiguity of FDI inflows in Chinese provinces

Year	Moran's I	E(I)	Mean	Sd	P-value
1999	0.0895	-0.0357	-0.0078	0.0991	0.4060
2000	0.0761	-0.0357	-0.0036	0.1124	0.5270
2001	0.1356	-0.0357	-0.0143	0.1061	0.2020
2002	0.1864	-0.0357	-0.0077	0.1041	0.0750
2003	0.2611	-0.0357	-0.0160	0.1078	0.0210
2004	0.2842	-0.0357	-0.0210	0.1038	0.0090
2005	0.3193	-0.0357	-0.0123	0.1139	0.0090
2006	0.3441	-0.0357	-0.0183	0.1139	0.0060
2007	0.3741	-0.0357	-0.0174	0.1140	0.0060
2008	0.3511	-0.0357	-0.0183	0.1234	0.0090
2009	0.3717	-0.0357	-0.0255	0.1171	0.0010
2010	0.3892	-0.0357	-0.0233	0.1140	0.0010
2011	0.3847	-0.0357	-0.0289	0.1162	0.0030
2012	0.3795	-0.0357	-0.0169	0.1188	0.0070

Note: Multivariate Moran's I of both patent applications of utility models and FDI inflows is measured by the Queen Contiguity Weight.

Table 6. Global Spatial dependence and test of patent applications of designs based on contiguity of FDI inflows in Chinese provinces

Year	Moran's I	E(I)	Mean	Sd	P-value
1999	0.2212	-0.0357	-0.0224	0.1020	0.0340
2000	0.2428	-0.0357	-0.0226	0.0985	0.0160
2001	0.2771	-0.0357	-0.0256	0.1050	0.0200
2002	0.3731	-0.0357	-0.0143	0.1109	0.0090
2003	0.4644	-0.0357	-0.0164	0.1104	0.0040
2004	0.4045	-0.0357	-0.0265	0.1069	0.0010
2005	0.4361	-0.0357	-0.0259	0.1146	0.0010
2006	0.4313	-0.0357	-0.0298	0.1167	0.0030
2007	0.4475	-0.0357	-0.0237	0.1221	0.0060
2008	0.4130	-0.0357	-0.0279	0.1204	0.0020
2009	0.3856	-0.0357	-0.0353	0.1128	0.0030
2010	0.3773	-0.0357	-0.0319	0.1131	0.0080
2011	0.3137	-0.0357	-0.0328	0.1058	0.0070
2012	0.2573	-0.0357	-0.0281	0.0989	0.0110

Note: Multivariate Moran's I of both patent applications of designs and FDI inflows is measured by the Queen Contiguity Weight.

Table 7. Global Spatial dependence and test of total patent applications based on contiguity of FDI inflows in Chinese provinces

Year	Moran's I	E(I)	Mean	Sd	P-value
1999	0.1409	-0.0357	-0.0156	0.1040	0.1610
2000	0.1610	-0.0357	-0.0087	0.1090	0.1350
2001	0.1919	-0.0357	-0.0187	0.1031	0.0550
2002	0.2770	-0.0357	-0.0163	0.1039	0.0140
2003	0.3423	-0.0357	-0.0140	0.1092	0.0080
2004	0.3147	-0.0357	-0.0222	0.1086	0.0060
2005	0.3645	-0.0357	-0.0174	0.1108	0.0030
2006	0.3702	-0.0357	-0.0252	0.1086	0.0020
2007	0.3978	-0.0357	-0.0100	0.1153	0.0020
2008	0.3607	-0.0357	-0.0237	0.1204	0.0070
2009	0.3711	-0.0357	-0.0203	0.1110	0.0060
2010	0.3838	-0.0357	-0.0234	0.1265	0.0080
2011	0.3591	-0.0357	-0.0262	0.1181	0.0050
2012	0.3520	-0.0357	-0.0262	0.1175	0.0090

Note: Multivariate Moran's I of both total patent applications and FDI inflows is measured by the Queen Contiguity Weight.

Table 8. The decay effects of global spatial dependence and test of total patent applications in Chinese provinces

Year	1 th -order	6 th -order	8 th -order	10 th -order	12 th -order	16 th -order	20 th -order	24 th -order
1999	0.0852	0.0639	0.0598	0.0431	0.0351	0.0453	0.0095	-0.0218
2000	0.0449	0.0315	0.0364	0.0215	0.0326	0.0455	0.0094	-0.0222
2001	0.0384	0.0236	0.0286	0.0147	0.0317	0.0444	0.0072	-0.0218
2002	0.0533	0.0343	0.0437	0.0325	0.0397	0.0526	0.0128	-0.0199
2003	0.0687	0.0420	0.0528	0.0429	0.0486	0.0600	0.0170	-0.0182
2004	0.0942	0.0555	0.0700	0.0590	0.0528	0.0664	0.0196	-0.0179
2005	0.1064	0.0529	0.0737	0.0632	0.0517	0.0705	0.0195	-0.0197
2006	0.1348	0.0649	0.0873	0.0738	0.0563	0.0775	0.0220	-0.0193
2007	0.1732	0.0862	0.1078	0.0872	0.0618	0.0826	0.0230	-0.0192
2008	0.2111	0.1056	0.1262	0.0987	0.0668	0.0880	0.0234	-0.0203
2009	0.2312	0.1161	0.1285	0.0986	0.0726	0.0878	0.0226	-0.0198
2010	0.2796	0.1406	0.1516	0.1217	0.0855	0.0966	0.0255	-0.0195
2011	0.2627	0.1297	0.1487	0.1187	0.0836	0.0906	0.0234	-0.0206
2012	0.2836	0.1424	0.1440	0.1144	0.0776	0.0828	0.0168	-0.0233

Note: Moran's I of total patent applications is measured by the k-Nearest Neighbor Weight.

Table 9. The decay effects of global spatial dependence and test of FDI inflows in Chinese provinces

Year	4 th -order	6 th -order	8 th -order	10 th -order	12 th -order	16 th -order	20 th -order	24 th -order
1999	0.0849	0.0652	0.0528	0.0329	0.0365	0.0219	0.0077	-0.0302
2000	0.1041	0.0665	0.0497	0.0359	0.0441	0.0328	0.0215	-0.0276
2001	0.1327	0.0872	0.0739	0.0579	0.0546	0.0486	0.0209	-0.0249
2002	0.1884	0.1206	0.0992	0.0855	0.0690	0.0609	0.0240	-0.0243
2003	0.3480	0.2289	0.1822	0.1681	0.0996	0.1019	0.0365	-0.0210
2004	0.3520	0.2418	0.2202	0.2026	0.1174	0.1262	0.0516	-0.0148
2005	0.3210	0.2087	0.1690	0.1679	0.0970	0.1042	0.0393	-0.0212
2006	0.3031	0.2025	0.1693	0.1635	0.1013	0.1056	0.0379	-0.0355
2007	0.2970	0.2069	0.1791	0.1684	0.1107	0.1042	0.0404	-0.0184
2008	0.2449	0.1550	0.1246	0.1041	0.0874	0.0753	0.0295	-0.0215
2009	0.2418	0.1532	0.1230	0.1024	0.0877	0.0749	0.0293	-0.0216
2010	0.2432	0.1531	0.1232	0.1023	0.0876	0.0744	0.0282	-0.0215
2011	0.2463	0.1548	0.1236	0.1020	0.0886	0.0752	0.0283	-0.0214
2012	0.2503	0.1558	0.1236	0.1011	0.0901	0.0764	0.0282	-0.0212

Note: Moran's I of FDI inflows is measured by the k-Nearest Neighbor Weight.

Table 10. Spatial variation of innovative activities based total patent applications in Chinese provinces (units: patent applications per ten thousand persons)

Area	1999	2000	2005	2006	2007	2008	2009	2010	2011	2012
Beijing	6.144	7.485	14.676	16.796	18.902	24.567	27.009	29.204	38.618	44.607
Tianjin	2.102	2.786	11.176	12.371	14.120	15.502	15.978	19.990	28.405	29.020
Hebei	0.503	0.571	0.934	1.047	1.131	1.306	1.615	1.709	2.430	3.189
Shanxi	0.356	0.447	0.592	0.837	0.982	1.579	1.990	2.218	3.554	4.649
Inner Mongolia	0.411	0.479	0.610	0.812	0.830	0.909	1.010	1.178	1.548	1.901
Liaoning	1.454	1.687	3.713	3.993	4.541	4.842	5.944	7.821	8.465	9.376
Jilin	0.794	0.917	1.510	1.681	1.923	2.025	2.166	2.347	2.981	3.334
Heilongjiang	0.764	0.842	1.584	1.709	1.894	2.085	2.356	2.679	6.112	7.984
Shanghai	3.124	6.772	18.415	19.858	22.875	24.682	28.160	30.919	34.171	34.734

Jiangsu	0.983	1.104	4.657	7.055	11.518	16.491	22.321	29.974	44.106	59.679
zhejiang	1.827	2.206	8.824	10.639	13.372	17.253	20.563	22.169	32.412	45.531
Anhui	0.276	0.314	0.575	0.766	0.992	1.697	2.673	7.912	8.136	12.506
Fujian	1.020	1.213	2.676	2.909	3.140	3.622	4.790	5.956	8.690	11.412
Jiangxi	0.328	0.376	0.653	0.731	0.812	0.851	1.179	1.413	2.155	2.766
Shandong	0.967	1.104	3.118	4.113	5.001	6.398	7.060	8.433	11.373	13.280
Henan	0.368	0.413	0.957	1.228	1.594	2.025	2.065	2.674	3.630	4.619
Hubei	0.499	0.578	2.020	2.560	3.049	3.703	4.756	5.466	7.383	8.880
Hunan	0.521	0.639	1.385	1.616	1.768	2.197	2.490	3.406	4.475	5.379
Guangdong	2.311	2.444	7.855	9.768	10.605	10.501	12.406	14.645	18.684	21.665
Guangxi	0.340	0.393	0.511	0.590	0.730	0.806	0.881	1.110	1.745	2.907
Hainan	0.490	0.638	0.601	0.644	0.748	1.022	1.204	1.173	1.697	2.057
Chongqing	0.414	0.576	2.237	2.304	2.385	2.932	4.716	7.913	10.976	13.217
Sichuan	0.149	0.540	1.287	1.605	2.358	2.990	4.038	5.001	6.178	8.211
Guizhou	0.213	0.280	0.597	0.712	0.760	0.818	1.049	1.269	2.408	3.242
Yunnan	0.297	0.399	0.574	0.688	0.689	0.900	1.014	1.227	1.544	1.988
Xizhang	0.039	0.107	0.368	0.317	0.336	1.197	0.659	0.540	0.867	0.553
Shaanxi	0.466	0.577	1.120	1.531	2.292	3.200	4.178	6.144	8.611	11.619
Gansu	0.229	0.311	0.678	0.560	0.631	0.854	1.047	1.390	2.062	3.205
Qinghai	0.337	0.336	0.398	0.593	0.701	0.778	0.895	1.068	1.288	1.473
Ningxia	0.483	0.607	0.866	1.111	1.374	1.759	2.043	1.168	1.687	3.067
Xingjiang	0.494	0.565	0.921	1.100	1.084	1.132	1.330	1.629	2.144	3.155
Mean	0.926	1.216	3.100	3.621	4.295	5.181	6.116	7.411	9.953	12.232
SD	1.200	1.708	4.469	5.026	5.880	6.967	8.020	9.222	12.252	14.987
CV	0.771	0.712	0.694	0.720	0.730	0.744	0.763	0.804	0.812	0.816

Note: it is measured by China statistical yearbooks (1999-2013).

Table 11. Spatial variation of FDI Inflows in Chinese provinces (units: %)

Area	1999	2000	2005	2006	2007	2008	2009	2010	2011	2012
Beijing	4.946	4.174	4.404	4.082	4.248	4.346	4.436	4.593	4.666	4.756
Tianjin	4.417	2.891	4.157	4.017	4.018	4.148	4.066	4.224	3.987	3.786
Hebei	2.609	1.684	2.385	1.446	1.411	1.496	1.541	1.555	1.587	1.559
Shanxi	0.980	0.557	0.344	0.650	0.862	0.796	0.853	0.884	1.108	1.018
Inner Mongolia	0.162	0.262	1.481	0.867	0.831	0.980	0.998	0.896	0.886	0.822
Liaoning	2.659	5.069	4.483	5.534	5.273	5.516	5.484	5.688	5.764	5.909
Jilin	0.754	0.836	0.825	1.804	1.519	0.773	0.802	0.858	0.808	0.761
Heilongjiang	0.797	0.746	1.811	0.802	0.702	0.715	0.751	0.756	0.727	0.708
Shanghai	7.103	7.835	8.554	13.206	12.461	12.999	12.834	13.078	13.104	13.175
Jiangsu	15.219	15.931	16.463	18.992	18.521	18.390	18.492	19.579	19.894	19.901
zhejiang	3.087	3.998	9.640	7.361	7.062	6.997	6.824	7.061	7.012	6.935
Anhui	0.654	0.790	0.862	1.072	1.152	1.126	1.161	1.168	1.142	1.272
Fujian	10.076	8.509	3.257	5.142	4.979	4.958	4.887	4.810	4.754	4.641
Jiangxi	0.803	0.563	3.022	1.359	1.404	1.481	1.536	1.692	1.704	1.715
Shandong	5.656	7.367	11.201	5.183	4.669	4.473	4.660	4.798	4.979	5.035

Henan	1.306	1.398	1.536	1.364	1.244	1.296	1.442	1.459	1.471	1.476
Hubei	2.291	2.340	2.729	1.640	1.520	1.505	1.570	1.652	1.802	1.856
Hunan	1.637	1.682	2.587	1.247	1.179	1.177	1.164	1.249	1.214	1.222
Guangdong	29.191	27.970	15.440	18.406	17.002	16.476	16.392	16.232	15.713	15.241
Guangxi	1.590	1.301	0.473	1.054	1.062	1.142	1.132	1.078	1.040	0.992
Hainan	1.213	1.068	0.854	0.691	4.562	4.274	3.759	0.997	0.766	0.862
Chongqin	0.598	0.606	0.644	0.545	0.959	1.054	1.157	1.344	1.569	1.710
Sichuan	0.854	1.083	1.107	1.165	1.303	1.862	1.919	2.096	1.994	2.039
Guizhou	0.102	0.062	0.134	0.152	0.136	0.142	0.148	0.159	0.197	0.244
Yunnan	0.385	0.318	0.217	0.627	0.574	0.624	0.661	0.692	0.717	0.718
Xizhang	0.000	0.000	0.014	0.023	0.025	0.024	0.026	0.021	0.025	0.036
Shaanxi	0.606	0.715	0.784	0.873	0.799	0.605	0.674	0.695	0.691	0.991
Gansu	0.103	0.155	0.025	0.164	0.149	0.169	0.205	0.242	0.222	0.222
Qinghai	0.011	0.000	0.332	0.117	0.118	0.146	0.118	0.091	0.109	0.090
Ningxia	0.129	0.043	0.176	0.258	0.106	0.108	0.105	0.153	0.153	0.099
Xingjiang	0.060	0.047	0.059	0.152	0.150	0.202	0.199	0.201	0.195	0.212
Mean	3.226	3.226	3.226	3.226	3.226	3.226	3.226	3.226	3.226	3.226
SD	5.862	5.744	4.425	4.977	4.703	4.672	4.646	4.789	4.780	4.738
CV	0.550	0.562	0.729	0.648	0.686	0.690	0.694	0.674	0.675	0.681

Note: it is measured by China statistical yearbooks (1999-2013).

4 Conclusions

The paper provides an analysis framework of spatial effects generated by FDI inflows on innovative activities, and illustrates the characteristics of spatial interdependence, heterogeneity, variation of spatial effects across Chinese provinces. The empirical evidences indicates that spatial agglomeration and proximity are the important factors affecting innovative activities and FDI inflows in spatial dimension, and also demonstrates that there exists the strongly positive spatial dependence process in innovative activities and FDI inflows across Chinese provinces.

The empirical evidences show that innovative activities and FDI inflows obey the probability distribution of NB model with the characteristics of spatial agglomeration, which implies that there are the greater potentials for further introducing FDI inflows and sustainable innovation across Chinese provinces. Secondly, spatial effects have the pattern of decreasing dependence with increasing orders, that is, knowledge spillovers present a decay process with increasing distance, which means that there exist the range of interaction and the limited spatial process in the analysis of spatial effects.

Thirdly, the innovative output not only depends on determinants within regions, but also is associated with FDI inflows and innovative activities in contiguous regions,

which means that the extent of spatial clustering and contiguity plays the important role in regional innovative activities. The derived results show that the innovative output in China mainly relies on human capital, international trade, FDI inflows, agglomeration economies, as well as the spatial externalities generated by these variables.

Finally, FDI inflows in China produce the different spatial effects on all the types of innovative activities, which have the strongest knowledge spillovers effects on the patent applications examined of designs, and relatively have less knowledge effects on the patent applications examined of inventions. As a consequence, FDI inflows promote knowledge spillovers and diffusion, and also boost the knowledge exchange between Chinese and foreign enterprises so as to generate the imitating and demonstrating effects for Chinese enterprises.

In conclusion, these results demonstrate that spatial clustering and contiguity can't be ignored in the analysis of externalities of knowledge, and knowledge spillovers generated by FDI inflows are one of the main sources of sustainable innovation in China. In the aspect of policy implication, in order to enhance the absorbing capacity of Chinese enterprises and promote the knowledge spillovers brought by FDI inflows, it should be encouraged that policy of introducing FDI inflows not only considers quantity of FDI inflows, but also think much of quality such as FDI inflows with advance technology. Meantime, education and training as well as R&D expenditure should be widely supported so as to enhance the human capital stock in regional economic developing.

Furthermore, it should be recognized for government agency to encourage cooperation and exchange between FDI firms and universities or research organizations, and actively embed Chinese enterprises in global value chains of FDI firms so as to promote the spatial spillovers of FDI inflows on the innovative activities in China. Besides, it is helpful for decision-maker of policy to select the advantageous location to preferentially support innovative activities for increasing the extent of agglomeration economies and spatial spillovers of FDI inflows in China.

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Size Matters: a study of value creation and business model development for creative arts organisations in the UK

Lorraine Warren *

Department of Management
University of Southampton
Highfield, Southampton
SO171BJ, UK

Sarah Thelwall

MyCake
Prospect House
Copt Hewick, Ripon,
North Yorks, UK

** Corresponding author*

Structured Abstract

Purpose – Small creative arts organisations are important contributors to the economy, not just in their own right, but wider. Despite the significance of such organisations in what Hearn et al (2006, 7) refers to as ‘value creating ecologies’, such organisations often struggle to survive. The study examines the pattern of order activities for a range of arts organisations and relates the outcomes of the analysis to questions of organisational growth and sustainability. The paper discusses the notion of ‘deferred value’ in relation to value creation and capture, where economic value may only be realised some time after the original creative event

Design/methodology/approach – The paper presents data from approximately 100 creative organisations for 2010 and 2011, analysing for relationships between:

- Turnover
- Size
- Revenue streams (types)
- Tangible and intangible assets

Originality/value – The paper contributes to understanding of the growth patterns and aspirations of small/medium sized arts organisations. In examining in detail the concept of deferred, the study offers new insights to the value creation literature, suggesting business models and patterns of financial support that offer a legitimate balance between the two, in relation to organisational sustainability overall. The paper is the first to look at the issue of organisational size in relation to value streams, in order to move forward from ‘one size fits all’ conceptualisations that have dominated the literature thus far.

Practical implications – From a practical point of view, the paper offers guidance to organisations in terms of addressing the very real challenges of monetising a range of revenue streams without compromising artistic integrity.

Keywords – value creation, sustainability, creative arts organisation, deferred value

Paper type – Academic Research Paper

1 Introduction

Creative arts organisations are seen as important contributors to the economy, not just in their own right, but wider, (Hearn et al, 2006, 2007) as they:

- Are a major source of innovative ideas that contribute to the development of new products and services
- Offer services that may be inputs to the innovative activities of other enterprises and organizations within and outside the creative industries
- They are intensive users of technology and often demand and create adaptations and new developments of technology, providing stimulus to technology producers.
- Realize a wide range of value, not just technical, but also social, creative, artistic, cultural, societal and of course economic

This is important economically, as the UK is renowned for its creative industries in areas as diverse as music, animation, design, gaming and the visual and creative arts. It has been estimated that the creative industries account for 7.3% of the UK economy, parallel in size therefore to the much-vaunted financial services industry (DCMS, 2007). In 2013, it was estimated that illustrates that the Gross Value Added (GVA) contribution of the arts and culture industry to the UK amounted to £5.5 billion in 2008. This actually jumped in the recession year of 2009 by 5.7 per cent to nearly £5.8 billion. Therefore, as UK GDP fell by four per cent, the arts and culture industry appears to have fared strongly in the tough economic climate. GVA fell by 2.1 per cent in 2010, but this was followed by a robust rise in 2011, when a 4.6 per cent increase saw the arts and culture industry's GVA total over £5.9 billion. Good understanding of the challenges and opportunities presented by the sector is therefore important from a regional development point of view.

The livelihood of a growing proportion of UK citizens therefore depends upon the sector maintaining its growth trajectory, particularly in the South East. Together with

London and parts of the East of England and South West, the South East region forms a "mega region" of world-class significance in relation to the creative economy. The David Powell report (2002) suggests that the creative industries employ more than half a million people in the South East and contribute more than 40 billion to the regional economy. Creative and cultural industries represent around 30 per cent of its GDP, making it our region's fastest growing sector.

Despite the significance of such organisations in what Hearn et al refers to as 'value creating ecologies', such organisations often struggle to survive, let alone grow, particularly in the current climate of austerity in the UK (and the EU more widely). Typically, multiple revenue streams are employed which span value creation and value capture (Chesbrough et al, 2006, p2). Not surprisingly, the notions of value creation and value capture are contested and open to multiple interpretations (Lepak et al, 2007), and are subject to questions of artistic legitimacy. Thelwall (2011) for example, distinguishes between 'first order activities', where endeavour is intrinsically linked to acts of artistic creation, and 'second order activities', often focussed on reproduction and scalability, rather than creative expression. The study examines the pattern of first and second order activities for a range of arts organisations and relates the outcomes of the analysis to questions of organisational growth and sustainability. Specifically, the paper discusses the notion of 'deferred value' in relation to value creation and capture, where economic value may only be realised some time after the original creative event. The paper argues that typical venture capital (VC) horizons based on high tech are too short to recognise this timing gap, which is likely to compromise sustainability and growth overall. Nor do standard funding mechanisms, which tend to focus on specific organisations, recognise the more diffuse 'organised networks' (Lovink, 2012) or 'reputational ecosystems' (Lessig, 2008) that pertain in creative milieu.

2 Background

Studying the creative industries sector presents challenges:

- Firstly, the 'creative industries' are very diverse, spanning a range of interlocking industries, including arts, culture, heritage, media, gaming, performance and occasionally sports; a wide range of organisational sizes from micro upwards; a wide range of different business models exist, spanning

different modes of funding and trading, including the production of both (aesthetic) artefacts and also surrounding services; venue and non-venue based activities.

- Secondly, developments in digital technology have stimulated new impetus for rapid change over the last decade, presenting unlimited possibilities for new resonances between social practices and values and the techno-creative milieu. For example, disintermediation in the music industry has been made possible through the internet, which allows new experiences anywhere/anytime, resulting in new behaviours in respect of the production and consumption of artistic output. Of course, this has had a profound effect on the power base in the industry, as old business models have been swept aside – at times, before new revenue streams have been established.
- Thirdly, the creative industries have a distinctive character that challenges traditional models of research into business innovation and entrepreneurship. Specifically, the creative industries revolve around entrepreneurial, innovative and often unorthodox collaborations in an ecosystem whereby numerous large, small and micro-businesses come together for the duration of a single project, then disband and form new partnerships for the next project (see Figure 1 for the arts ecosystem). This diversity, fluidity, interconnectedness and potential range of novel new combinations for which there may be currently no precedent presents a challenge for researchers, educators and policymakers who want to not only know, but explain, and further, anticipate, what is going on, so that appropriate development and support mechanisms might be put in place. This latter point is vital for sustainability and growth, particularly for small organisations, many of whom are currently struggling to realise not just social and cultural value, but economic return too.

The Art Eco-System Model

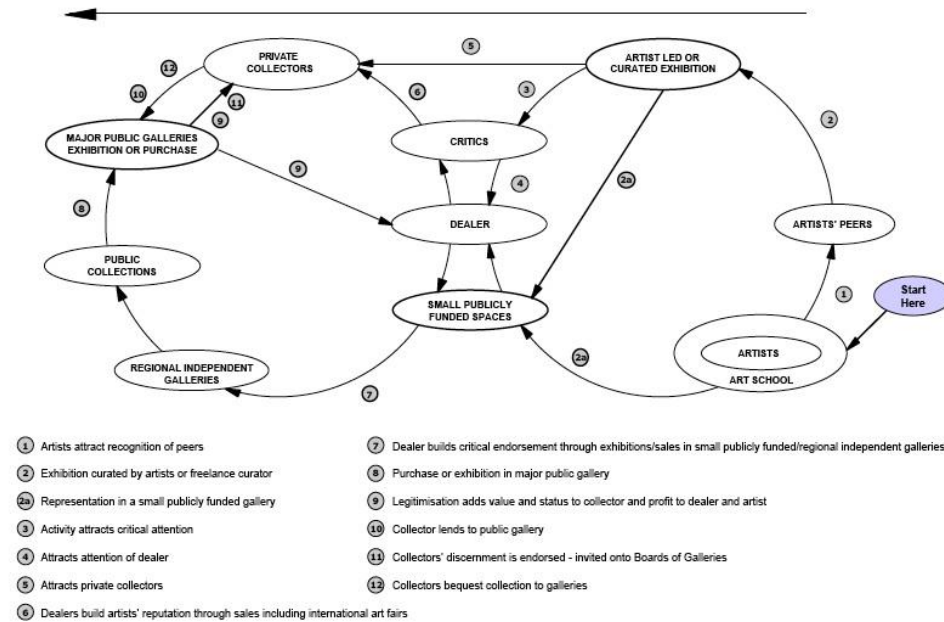


Figure 1 Arts ecosystem (Thelwall, 2011)

Fuller et al (2011) note, that to remain fit over time in the dynamic, fluid landscape of the creative industries, it is essential that creative groups constantly organise for novelty in anticipation of new collaborations, new networks and new patterns of consumer behaviour. This need is heightened by the desirable heterogeneity of actors engaged in the creative landscape, since innovation tends to spring from the fertile boundaries of previously dissociated areas of activity. Sustaining creative diversity through broad-based satisficing (Simon 1957) rather than quick-win optimisation approaches is likely to more effectively enhance the dynamics of such communities. To achieve sustainability through the creation of novelty, Fuller and Warren (2004-2008) refer to the interplay between entrepreneurial 'processes of emergence' such as experimenting (to yield new structures and practices), identity work (reputation management), organising (reflection on everyday practice), and sensitivity to conditions (anticipation of threats, knowledge and the propensity to survive). Yet to achieve sustainability without compromising artistic integrity, organisations must manage their knowledge assets, and accordingly, their business model strategies, in respect to financial realities.

Thelwall (2011) notes the difference between first and second order activities for arts organisations; first order activities are those which form the creative core of the

organisation – an exhibition for example. Typically, such activities are grant funded, as they are not expected to generate a financial return, but do deliver a cultural & social return. As they are usually intrinsically connected to the expert labour force in the organisation, they tend not to be scalable. Second order activities are those such as merchandise, that generate assets from the first order activities, and seeks to develop them into products & services that have a commercial value. As second order activities are much more disconnected from the expert labour force, they tend to be more scalable. Of course it has always been difficult to accrue funds for first order activities, and the issue today of course is that the pot of money is getting smaller all the time, with cutbacks in UK Arts Council funding leading to some groups disbanding. Organisations therefore have to manage the balance between first and second order activities very carefully in order to survive while not detracting from the creative flow.

Organisations must also balance carefully the income streams from tangible and intangible assets (Thelwall, 2011). Tangible assets include buildings, archives, collections; intangible assets individual and organisational expertise and experience, reputation, brand and goodwill, intellectual property, research skills, audience and customer base, educational reputation and resources, methods and processes, network, partnerships and people. The development of a portfolio of tangible assets generally requires substantial investment in a publicly accessible building, collection or archive. Holding tangible assets also implies significant ongoing maintenance costs, which may seem disproportionate with respect to total turnover. The challenge for small organisations is to make the best use of assets without allowing this to consume all the energy of the team, thus allowing the focus to remain on the development and delivery of projects.

The dynamics of the financial aspects of the arts ecosystem are depicted in Figure 2:

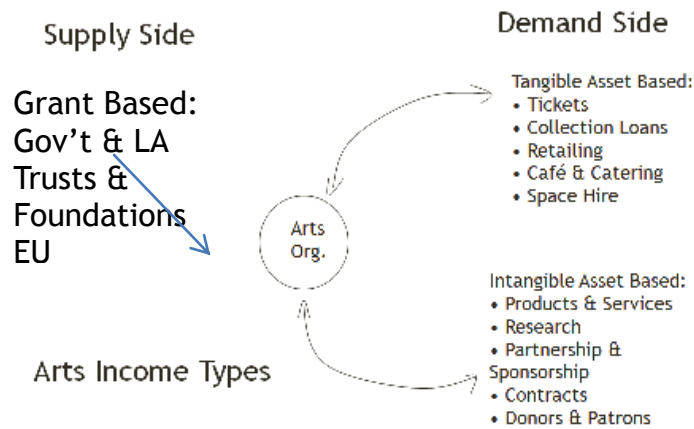


Figure 2 Arts income types

In the next section, we present an analysis of financial data gathered from Mycake.org’s Culture benchmark database, which holds data on 350 arts organisations. We analyse for Turnover/size, types of revenue streams and tangible and intangible assets. We effect comparisons on the basis of organisational size, in order gain insight into the financial profile of large versus small organisations, with a view to considering the most appropriate support mechanisms. This is important because small organisations differ from large in that they tend to be more flexible, more agile, and less risk averse, willing to take on early works and first showings, as well as playing a key role in mentoring and developing personnel.

4) Outcomes

A brief comparison of the 2010 data sliced by size of organisation – annual turnover

	2010				
	< £200k	£200-750k	£750k - £2m	£2-10m	>£10m
Sample Details:					
Sample size	21	44	15	14	5
Average turnover	approx £130k	approx £345k	approx £1.3m	approx £4.4m	approx £45.3m
Income by type as a % of turnover					
Grant Income:					
RFO	47.0%	50.1%	27.5%	38.1%	29.4%
Other Arts Council	14.9%	15.0%	14.0%	10.9%	3.3%
Trusts & Foundations	21.4%	8.6%	5.9%	3.7%	4.0%

Local Authorities	23.7%	10.5%	14.5%	7.5%	7.3%
Lottery Funds	9.0%	18.5%	5.3%	0%	1.2%
Grant in Aid	0%	0%	26.9%	0%	37.0%
Other Gov't grants	47.3%	22.2%	10.4%	2.2%	0%
Other revenue grants	38.0%	9.5%	10.4%	8.8%	11.1%
Total grant funding	78.9%	72.7%	57.4%	52.5%	51.2%
Venue based income:					
Ticket Sales	4.7%	17.0%	28.6%	29.1%	25.5%
Shop & Retail	7.5%	9.2%	3.7%	3.0%	13.8%
Café	2.2%	5.9%	8.3%	11.0%	18.5%
Space hire	2.9%	8.7%	4.0%	2.5%	1.9%
Total Venue based income	9.1%	16.0%	33.7%	42.2%	38.8%
Non-Venue Based Income:					
Corporate Sponsorship					
Private Donations					
Other sponsorship & donations					
Research Councils					
Other research funding					
Franchise, Licensing and other IP income					
Product sales					
Services & consultancy					
Ticket Sales (from other venues)					
Subscriptions & membership					
Delivery Contracts					
Commissions					
Investment Interest					
Total non-Venue based income	20.5%	18.2%	16.9%	8.4%	9.2%
Costs:					
Total Direct Costs	35.9%	35.3%	39.6%	38.8%	43.8%
Total Salaries Costs (ex NIC & Pensions)	41.2%	39.1%	34.2%	38.1%	38.5%
Pensions (ex NIC)	0%	2.5%	1.0%	1.0%	2.4%
Marketing	6.1%	3.2%	5.6%	6.1%	*
Total Revenue Expenditure	95.1%	100.4%	99.6%	100.2%	100.1
Annual Surplus/Contribution to Reserves	4.7%	1.9%	0.4%	-0.2%	-0.1

Table 1 2010 data RFO = Regularly funded organisation (Arts Council)

A brief comparison of the 2011 data sliced by size of organisation – annual turnover

	2011				
	< £200k	£200-750k	£750k - £2m	£2-10m	>£10m
Sample Details:					
Sample size	27	56	39	50	23
Average turnover	approx £120k	approx £417k	approx £1.35m	approx £4.8m	approx £35.6m

Income by type as a % of turnover					
Grant Income:					
RFO/NPO	46.2	46.9	35.8	26.8	30.3
Other Arts Council	25.1	12.3	9.5	6.8	1.6
Trusts & Foundations	20.7	14.7	11.4	7.9	4.4
Local Authorities	19.7	14	12.2	11.0	11.4
Lottery Funds	22.9	8.6	8.5	2.8	1.5
Grant in Aid	0	0	0	49.2	17.2
Other Gov't grants	3.5	8.7	9.3	10.4	11.3
Other revenue grants	37.0	23.6	15.3	27.4	4.4
Total grant funding	61.4	70.8	49.2	45.9	34.5
Venue based income:					
Ticket Sales	35.7	11.6	15.0	27.4	35.1
Shop & Retail	5.5	5.5	5.5	7.1	6.3
Café	*	5.3	7.0	7.5	6.3
Space hire	20.3	8.0	13.1	7.7	7.5
Total Venue based income	41.1	15.0	24.7	35.5	33.5
Non-Venue Based Income:					
Total Donations & Sponsorship	13.2	7.5	10.0	10.1	16.3
Corporate Sponsorship	8.5	2.4	2.8	6.3	4.3

Private Donations	10.4	7.5	6.5	4.9	16.9
Gift Aid income	*	0	8.1	*	*
Other sponsorship & donations	5.0	6.5	7.2	8.3	9.2
Product sales	7.3	4.6	4.1	1.9	2.9
Services & consultancy	8.9	7.7	15.8	11.4	32.1
Ticket Sales (from other venues)	13.7	21.3	13.8	18.8	4.5
Subscriptions & membership	4.3	4.1	6.4	4.6	0.8
Delivery Contracts	0	17.3	14.9	10.3	18.7
Commissions	47.6	21.6	25.9	*	0
Investment Interest	0.4	0.4	0.5	0.7	1.1
Total non-Venue based income	26.4	23.4	33.0	21.7	41.9
Costs:					
Total Direct Costs	41.2	40.3	44.8	39.3	45.3
Total Salaries Costs (ex NIC & Pensions)	39.9	34.5	30.7	29.8	32.4
Pensions (ex NIC)	0	1.5	1.6	1.7	1.4
Marketing	4.5	4.6	4.5	5.7	5.9
Total Revenue Expenditure	102.2	99.4	99.6	94.8	97.5
Annual Surplus/Contribution to Reserves	0.4	4.1			2.5

Table 2 2011 data RFO = Regularly funded organisation; NPO = non-profit organisation

In the above tables, ranges have been set up in accordance with turnover, income and expenditure allocated.

- RFO funding levels – the trend here is that the smaller the total turnover of the organisation the higher the proportion of total income ACE funds (RFO or

otherwise) represents. It is only once organisations get beyond the three quarters of a million mark (total turnover) that RFO funding represents approximately a third of total income

- The trend in the Total Revenue Grant Income line is therefore as we would expect having analysed the various sources of income that are contributing to it [2010– highest in the smallest organisations (78.9% of total income for organisations <£200k) and lowest in the largest organisations (51.2% for organisations >£10m)]. [2011 highest in the smallest organisations (78.9% of total income for organisations <£200k) and lowest in the largest organisations (51.2% for organisations >£10m)]. There are clearly other income sources that come in to play as organisations grow in size and enable them to reduce dependence on grant sources.
- The most significant of these in terms of percentage of total income contribution is that from ticket sales.
- The second greatest source of earned income is that derived from café and catering activities. Clearly this income stream is only available to organisations with a public venue but nonetheless it grows with organisational size in a fairly linear manner.
- Income from a shop (or other forms of retailing) is much less linear.
- Income from the hire of space (or indeed collections) is also quite erratic and shows no clear connection to the size of the organisation.
- Income from non-venue based sources such as IP, licensing, sponsorship & donations, commissions and contracts does show a relationship to the size of the organisation in that the smaller organisations (perhaps those without a public venue) have focussed more on these areas.
- Is there a ‘sweet spot’ in terms of the size of organisation that has the most sustainable or stable financial model, that is, a size of organisation which looks to be both financially sustainable without acquiring large or long term liabilities which need to be serviced. We would suggest that the very smallest of organisations (<£200k/annum) offer examples of how, at least in the early years, staying small, leveraging the enthusiasm of a community and staying focussed on a small number of goals can enable you to deliver very effectively on small budgets. However this often leads to burn out of staff and there is a limit as to

how much an organisation can be built on volunteers and a transition in to something more stable long term is usually required if the organisation is to get beyond the 3-5 year mark. As organisations get beyond the £750k/annum level we see a different picture emerging as all the slices from £750k upwards show a more diversified income structure balancing grants, tangible assets and intangible assets.

- Is there a size of organisation that is most difficult to make sustainable? Instinctively we'd suggest that the £200-£750k small to mid-sized organisation may be one of the tougher ones in that there is still a high degree of grant dependence but typically quite a small staff base and therefore little opportunity to develop a substantial senior management team or specialist departments. Many organisations at this level do not have a publicly accessible building and therefore cannot diversify their income into café, shop and space hire and ticket income may be sporadic. Income from intangible assets is unlikely to be worth as much as those from a venue either because the organisation doesn't have the expertise or because the markets for their skills and products are not sufficiently developed. This makes growth very challenging.

As organisations get bigger so their dependence on Arts Council core funding reduces. Small organisations also rely more heavily on Trusts & Foundations & Local Authorities. Thelwall (2011) argues that through the interplays currently taking place in the arts ecosystem small organisations could be acting as an unofficial support mechanism for larger organisations because of differences in their funding and business models, as it is the small organisations that undertake the most significant role in risk-taking and the development of new work. Added to this, small organisations have consistently lacked the investment in tangible assets that has been available to larger organisations. As a result, few small organisations with a turnover of less than £1m per annum achieve any substantial income from their buildings, archive or collection. Those which do so tend to be renting out space to other organisations. They also lack income from shops or cafés and have very little access to sponsorship and donor income.

For small organisations, spending tends to be concentrated in programme and staffing costs, which are closely linked to direct, first order organisational outcomes. This leads to a lack of scope for development in small organisations, compared with large ones. This reinforces the poverty trap in which many arts workers are caught, allowing scant

possibilities for promotions and pension security. The low overheads on which these organisations are run also militate against their development in the key areas of training, marketing, research and development and the accumulation of reserves. Their main, and often unacknowledged resource is to be found in their accretion of intangible assets. With judicious investment, these hitherto assets – which organisations generate naturally as part of core activities – could be converted into earned income, offering small organisations a potential safeguard against economic uncertainty. Such ‘reputational capital’ can be realised (and valued) in the form of short-term consultancies, or research contracts that yield revenues in relation to specific requests. Thus, the creation of data that connects different business models to different size organisations may be useful in enabling arts organisations to align their knowledge assets and business models accordingly, and devise appropriate strategies for growth (or not). This is an area that would benefit from further research.

Less easy to quantify, and not captured by current metrics, is what Thelwall (2011) refers to as ‘deferred value’. Through the notion of deferred value, we recognise that value created by an initiating organisation is realised long after a commission has moved beyond its jurisdiction. Artworks accumulate value throughout their lifetimes in both the public and private sectors, but the small organisations which originated them are not usually the ultimate beneficiaries of these processes. While the intangible assets of reputation and track record are strengthened, there is often an uncoupling, at the end of a project between the originator and future tangible assets. Thus, it could be argued that a higher level of grant dependence for a small organisation is justifiable if the organisation is a ‘Deferred Value Creator’. Nor is deferred value recognised in the high tech funding discourse which has become significant in the arts with the widespread permeation of digital media and processes. The Silicon Valley ethos drives faster and faster exit strategies, with an emphasis not a growing or sustaining firm, but rather, speedily setting it on (Reis; Blank). It is time therefore for a new dialogue that recognises deferred value and the contribution that small organisations have to make.

It is not just a question of tangible returns that occur post-project. The notion of deferred value resonates with the sense of small arts organisations creating the link between the past and the future, what Warren and Fuller (2011) have termed the ‘value model’ of the organisation, where longer term value (economic, social, cultural, artistic,

technical) is realised through the identity of the firm (if it can be sustained), in terms of its :

- Past, present and future products and services
- Past, present and future technologies (perhaps supported by tangibles such as proof of concept, prototype, IP)
- Past, present and future markets or organising domains (perhaps supported by market research or constructions of future industry sectors)
- Past, present and future dominant logics (extant and potential business practices, relations with stakeholders, consumer/societal behaviours)
- Past, present and future business models, relating the creation and capture of value: (e.g. economic, technological, social, cultural, artistic, environmental)
- Past, present and future identities, expertises of those involved

The value model is not a ‘real’ entity, as might be recognised in the vocabulary of ‘incorporation’ or ‘venture creation’, but is an ontological construct that reflects not only perceptions of the identity of an organisation, but also sows seeds of anticipation for the future in terms of what future value creation might be achieved . Given the fluid nature of the arts ecosystem referred to above, when discussing sustainability, it is important to think not just of sustaining a firm economically for the short term, but also, the value model for the longer term: (Figure 3).

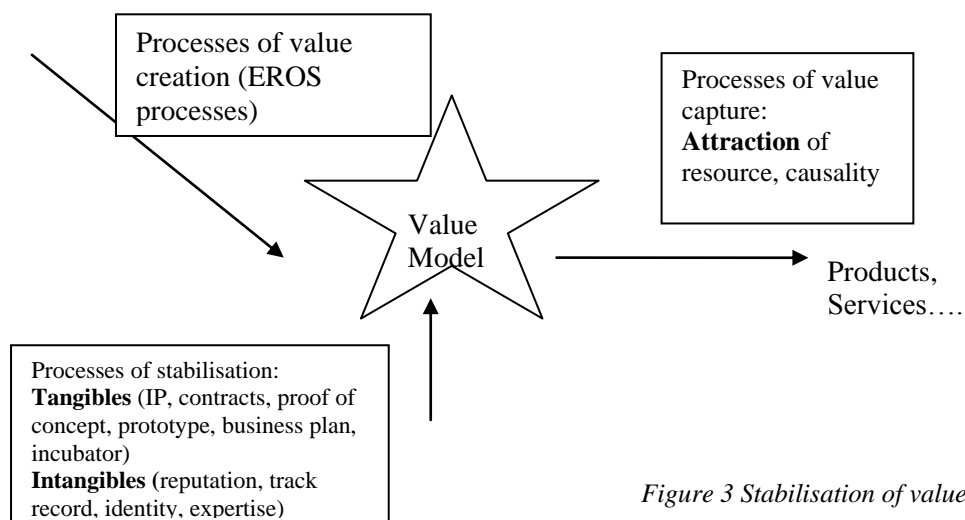


Figure 3 Stabilisation of value model

The question of how processes of stabilisation work is again, a suitable topic for further research. From the point of view of tangibles, we need to articulate funding mechanisms that relate deferred value to the creators. Considering intangibles, brand recognition, memory and inclusion in corporate, funder and societal memories is critical.

5 Conclusion

The paper contributes to understanding of the growth patterns and aspirations of small/medium sized arts organisations. In introducing the concept of deferred value, the study offers new insights to the value creation literature, suggesting business models and patterns of financial support that offer a legitimate balance between the two, in relation to organisational sustainability overall. The paper is the first to look at the issue of organisational size in relation to value streams, in order to move forward from 'one size fits all' conceptualisations that have dominated the literature thus far.

The concept of deferred value is worthy of further research because as yet, we lack the means to evaluate the relationship between the delivery approaches of small organisations, the (often intangible) assets being created in the course of their work, and the artistic, social and societal contribution they make. We also need to develop ways of measuring a wider variety of types of value being delivered by small arts organisations. We need to develop a better understanding of the variety of organisations themselves, articulating investment approaches that support them to maximise their potential within the system as a whole.

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The Internal Integrated Reporting and The Value Creation: a Case Study Approach

Federica Doni*

Dept of Business Administration, Management, Finance & Law
University of Milano-Bicocca.
Via Bicocca degli Arcimboldi, 8 20126 Milano Italy

Andrea Gasperini

Deputy secretary of the Board of Network of Italian Business Reporting
(NIBR)

** Corresponding author*

Structured Abstract

Purpose – The aim of the research is to analyse the impacts of using the Integrated Report for internal purposes: this requires, therefore, a change of perspective, that is, a transition from the external to the internal stakeholders as special players, as the reviewed players. The option to create value for investors can therefore be extended to other types of stakeholders as well, such as investor relations, senior management, corporate services, subsidiary companies, employees. Some of the new concepts introduced by the International <IR> Framework can make internal communication more transparent and can improve the effectiveness of the efforts made towards achieving the strategic goals.

Design/methodology/approach – We propose an approach based on case studies method. Case studies were selected based on the population of participants in the IIRC Pilot Programme, especially companies that expressed the will, partly through official notices, to start using IR for internal purposes. So, they were selected based on their significance, i.e. the potential contribution that each selected case study could give to the focus of the research. The following companies were thus selected: Etica SGR, Generali Group, and Vancity. The interviews concerned a number of main issues and had been designed to highlight the topics of Integrated Reporting, both external and internal. The researchers' efforts were focused on trying to find similarities and differences between the three case studies.

Originality/value – A review of the integrated reports may suggest that the companies that are pioneer in bringing to life the integrated reporting internally use such innovative tool for the following reasons: telling investors, in a more accurate and transparent way, about the value-creation process by integrating their accounting results and highlighting the creation of the value; pulling down any internal barriers between departments; responding to the increasing need for internal corporate governance and transparent external communication to the community about the actual management of intellectual capital as well; creating a consistent connection between the internal rewarding incentive

system (Performance Management), the intangible value drivers and the related performance indicators (KPIs), which provide an integrated overview of the organisation's internal and external performance.

Practical implications – The outcomes of the application could provide useful tips on how to prepare and use the internal integrated reporting since the analysis of case studies, also conducted in comparative terms, it could allow an initial outline of the framework, encourage studies on this area of interest and represent a useful empirical reference for organizations such as the International Integrated Reporting Council (IIRC), International Federation of Accountants (IFAC), Chartered Institute of Management Accountants (CIMA), the Institute of Internal Auditors (IIA), etc.

Keywords – Integrated reporting; human capital; value; internal stakeholders; sustainability

Paper type – Academic Research Paper

1. Introduction

To measure and share the “intangible assets”, where entrepreneurship means getting into the beating «heart» of a business, because this is about finding and enhancing a company's key people and processes that the creation of shared value is built upon. To do this, new and increasingly accurate analytical and reporting tools are needed, in an increasingly complex and dynamically competitive scenario.

Often, the internal measuring and management processes, as well as the external communication processes, still seem to be inadequate and unable to provide accurate, reliable information to managers and stakeholders. This means that lots of capitals are not properly reflected by traditional corporate balance sheets and reports, and even the users of such information, first and foremost investors and financial analysts, point out that the number and/or standard of the information they need and the information that is actually available in the corporate reports are remarkably different. So, a new Business Reporting structure is required (Singleton-Green, 2010).

New forms of Business Reporting are appearing, which manage to more satisfactorily and exhaustively reflect the different dimensions of a company's results, including the “intangible” ones, and to provide a wider non-financial information platform in the form of sector-specific KPIs, designed to provide more meaningful suggestions about corporate value drivers and the future financial and socio-environmental performance of an organization.

Among these, the aim of this research is the analysis of the Integrated Report, as proposed by the International Integrated Reporting Council (IIRC, 2013), of some of the companies that are regarded as the most innovative¹, as they are considered to be able to interconnect economic information and qualitative-quantitative information, mainly those related not just to economic sustainability but to environmental and social sustainability as well. The scope of the Integrated Report we analysed is to provide information about an organisation's strategy and business model, governance system and performance, while reflecting the business, political, social and environmental scenarios in which they work and providing an accurate overview of the ways they create value, both now and in the future.

The goal of such review is to consider the impacts of using such report for internal purposes: this requires, therefore, a change of perspective, that is, a transition from the external to the internal stakeholders as special players, as the reviewed players. Integrated Report definitely double up as external as well as internal reports. The option to create value for investors can therefore be extended to other types of stakeholders as well, such as investor relations, senior management, corporate services, subsidiary companies, employees. In particular, some of the new concepts that have been introduced by the International <IR> Framework, such as the option to link each kind of capital (financial, manufactured, human, intellectual, natural social and relationship capital) to a set of KPIs that provides an integrated view of performance, inside and outside of organisation, can make internal communication more transparent and can improve the effectiveness of the efforts made towards achieving the strategic goals.

Integrated reporting shifts the focus away from traditional financial reporting and looks at an organization on multiple levels. This helps to break down silos and encourages information sharing (Magarey, 2012; Holmes 2013). It also helps organizations to achieve both success and sustainability in the long term (Tilly, 2013). This approach is confirmed by the Institute of Management Accountants (IMA) which welcomed the development of the IR Framework as “an opportunity to modernize corporate reporting and corporate culture, unlock data from corporate silos and restrictive presentation formats, link operational, environmental, social and governance practices to financial performance, and make information relevant, meaningful and reliable for

¹ A listing of the IIRC pilot programme companies can be found at: <http://www.theiirc.org/companies-and-investors/pilot-programme-business-network>.

management” (IMA, 2011). As companies consider an integrated approach to reporting, their traditional performance reporting may reflect varying degrees of integration and different approaches to communicating data. Some companies have produced non-public integrated reports, which have enabled them to test systems and processes internally (PwC, 2013).

This paper is organised as follows: paragraph 2 explains the methodological approach and the design of the research, paragraph 3 provides a brief overview of earlier studies into IR, paragraph 4 is focused on the three case studies, highlighting the main topics that revolve around the internal use of IR, paragraph 5 describes the results, and finally paragraph 6 ends with some closing remarks.

2. Methodology/Design of the research

The methodology used is the case study research approach, following the methods recommended in the literature. The case study approach (Ryan, Scapens & Theobald, 2002) is, however, interesting since it may offer the option of constructing theories and generalizations based on the study of some operational cases (Mintzberg, 1979; Yin, 1981; Eisenhardt & Bourgeois, 1988; Eisenhardt, 1989). The first step in the methodological approach (Eisenhardt, 1989) identified the focus of the research, which is its most relevant aspect and has implications on data collection and the discussion of the results. Case studies were selected based on the population of participants in the IIRC Pilot Programme, especially companies that expressed the will, partly through official notices, to start using IR for internal purposes. So, they were selected based on their significance, i.e. the potential contribution that each selected case study could give to the focus of the research. The following companies were thus selected: Etica SGR, Generali Group, and Vancity

In the cases examined the benefits of such an approach can be seen in the ability to illustrate the factors that drove the companies to adopt the Integrated Report and the consequences within the planning and control function.

The research carried out features aspects of a qualitative and quantitative nature: the data examined are based on interviews, the company’s economic and financial documentation and on internal reporting documents. The interviews were conducted with the responsables and the Integrated Reporting Team: the questions were designed to explain the Internal Integrated Report design and implementation so as to illustrate the

progress achieved and the benefits in terms of company results achieved. The interview as opposed to the questionnaire approach offers greater flexibility even if the results were characterized by a certain degree of subjectivity due to the difficulties of interpreting the answers. However, this was useful for understanding the competitive context in which the company operates and the particular features of the sector to which it belongs.

The interviews concerned a number of main issues (see table below) and had been designed to highlight the topics of Integrated Reporting, both external and internal. The researchers' efforts were focused on trying to find similarities and differences between the three case studies.

The interviews were held with the managers or teams in charge of drawing up the Integrated Reports in February and March 2014: the main issues are a pattern that respondents have to adhere to, in order to have qualitatively consistent responses from the interviews. The interviews, the main tool in any qualitative survey, were quite flexible, in that the interviewees could "give priority" to some issues and discard those they regarded as unrelated to their company or the way they used the IR.

Table 1: The main issues of the interview

TOPIC	ISSUE
<i>Preliminary phase</i>	Company profile
<u>INTEGRATED REPORTING AS EXTERNAL REPORTING TOOL</u>	<ul style="list-style-type: none"> a. brief description of the drawing up of the IR as external report and indication of the reasons for the commitment to the IIRC Pilot Programme; b. comments about the <IR> Framework of the IIRC (December 2013); c. recognition of criticalities and areas for improvement within the drawing up of the IR; d. expected benefits and/or checked advantages post-adoption of the IR
<u>INTEGRATED REPORTING AS INTERNAL REPORTING TOOL</u>	<ul style="list-style-type: none"> e. motivations about the IR use also for internal purposes and the year of the IR first adoption; f. features of the design and the implementation of the IR as internal reporting tool, with particular reference to the intangible assets; g. areas of the IR use within the Human Resource Management, with particular reference to the ways of the remuneration performance; h. areas of the IR use within the process of Risk Management; i. impact of the IR on the internal process of decision-making; j. level of acceptance of the IR by the company's management and staff; k. measured and expected benefits of the IR use

	<p>for internal purposes;</p> <p>l. presence or absence of non-financial KPIs in order to measure the achievement of specific management targets and in general to determine the company's value creation;</p> <p>m. ways of the integration and/or correlation with the IR for external purposes (are there two different types of IR?);</p> <p>n. impact of the IR use on the Internal Auditing and on the Internal Auditors' assurance activity</p>
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3. Background of the studies

3.1. Integrate: internal thinking in a changed world

Two parallel reporting processes are often identified within organizations. The first is a process primarily aimed at the preparation of the annual and quarterly financial statements, the sustainability report, the corporate governance report and the remuneration report and implies the collection of data that are communicated externally to a particular stakeholder group². The second is aimed at developing corporate strategy and at providing the internal management system which is used to measure, monitor and manage operations throughout the year. Sometimes the two processes are aligned and coherent, but frequently they are not.

The design of reporting systems must define precisely the qualities of both internal and external reporting, paying attention to the discrepancies that there may be between the two in relation to different goals that are pursued and necessary connections. Internal reports are prepared mainly for management objectives and internal communication; whereas, external reporting is intended primarily as a tool for disseminating information to investors, analysts and to the financial community in the broader sense of communicating corporate strategy³. In the strategic choices of the guiding principles⁴ and

² The annual report is mainly aimed at shareholders and banks: conversely the sustainability report is aimed at social and environmental stakeholders.

³ The information in one report is not usually connected to the information in other reports, or to the corporate strategy, with the consequence that each key stakeholder group sees only a different part of the company.

⁴ International Integrated Reporting Council Guiding Principles: Strategic focus and future orientations; Connectivity of information; Responsiveness and Stakeholder inclusiveness; Materiality and Conciseness; Reliability; Consistency and Comparability.

content elements⁵ it is crucial to precisely define the goals that the organizations decided to achieve in relation to the level of quality for both forms of reporting or if is possible use only “one report” (Eccles & Krzus, 2010).

Companies with low-quality systems for both internal and external reporting put themselves in an extremely critical situation since they are able neither to control the physical and intangible resources owned by or accessible to the organization, nor to communicate to the outside reliably and concisely their ability to create value in the short, medium and long term, as well as risking signalling information which is misaligned with internal reports.

Equally problematic is the situation of those companies whose external reporting quality is higher than that of their internal reporting, since they may be put in the difficult situation of not being able to substantiate the information they are disseminating to the outside world.

Those companies with high quality internal reporting are able to exploit, through their investor relations department, communication opportunities regarding value creation, and its impact both on the organization's own capital and on that of capital owned by external stakeholders. Finally, of course, those companies with high quality internal and external reporting place themselves in an optimal position

In both systems the information used internally by management, and that communicated externally, must be consistent in a way in which greater connectivity between the organizational point of view and that of the “users” of the report allows a better mutual understanding and facilitates decision making⁶.

A check of the integrated reports of organizations that are yet considering the possibility of using this tool also for internal management purposes, highlights the following main points of attention (Gasperini, 2013):

1. Breaking down any internal barriers between departments and any entrenched “silo thinking”

⁵ *International Integrated Reporting Council Content elements: Organizational overview and external environment; Governance; Business Model; Risk and opportunities; Strategy and resource allocation; Performance; Outlook; Basis of preparation and presentation; General reporting guidance.*

⁶ *EFFAS CIC - Principles for Effective Communication of Intellectual Capital n. 1 “ ... The indicators should enhance the basis for decisions of both internal and external parties. Only those indicators that are also used for internal management are relevant for investors. To that end, indicators should exhibit a clear link to the company's future value creation”.*

One of the most significant benefits obtained by companies which have successfully undertaken a journey of integrated reporting is a better cooperation between the different departments within the organization and in particular between the finance, sustainability, investor relations, corporate governance and legal departments. This is a consequence of involving the various departments in acquiring and connecting all the information necessary to achieve an Integrated Report, so helping to break down internal barriers (the “silos”) and activating cohesive communication. Identifying a new Business Report and assigning clear responsibilities for its implementation requires support from senior management and by the governance department which plays a coordination role of. Assigning the responsibility for Integrated Reporting only to the investor relations department involves the risk that the traditional view of interpreting value creation and the historical approach adopted in the preparation of the annual financial statements continue to dominate and limit the purposes of “integrated thinking” which the process of integrated reporting seeks to inspire.

In some cases, the responsibility of creating cooperation between the various departments is assigned to the sustainability department. In other cases the finance department involves the sustainability department in addressing the various socio-environmental issues from a financial point of view. In many cases an approach of top-down coordination is finally adopted with the direct involvement of senior management⁷.

2. Shared Value

Reporting is a powerful driver for the integration of corporate social priorities into business priorities and in creating shared value. Organizations must remodel business processes in relation to the needs of society and it is therefore necessary to define an innovative way of thinking and new emerging business models.

According to M.E. Porter and M.R. Kramer the solution lies in identifying the principles of “*shared value*” which implies a simultaneous value creation story for society and organizations after having accurately identified the desires and needs of each (Porter, Kramer, 2011).

The concept of shared value can be defined as policies and operating practices that increase the organization's competitiveness and at the same time improve the economic and social conditions of the communities in which it operates.

⁷ Principally to relieve strain between the department of investor relations and those of finance on the one side with the department of sustainability and corporate affairs on the other side

Shared value is not solely the value provided to the company, or even about sharing the wealth generated but value shared with the wider community as a whole. Furthermore, it must be expanded to include economic and social value for all participating in the same value chain, thereby making business competitiveness and community well-being more closely aligned.

3. Narrate a clear overview of the Business Model

The aim of the Business Model is, in a more accurate and transparent way, to integrate the accounting results and highlight the proportion of value in order to provide a more holistic view of performance; and a better insight into strategy, operating context, governance and the impact on society and the environment as following indicated:

- addressing industry-specific factors, including trends, risks and opportunities, over the long term; and consequently the company’s performance;
- indicating timeframes for key milestones and targets, looking beyond the short and medium term to longer term horizons;
- aligning integrated reports and other key disclosures, including financial statements, Management Discussion and Analysis or Management Commentary, sustainability reports, codes of conduct and policy statements.

4. Corporate Governance

Responding to the increasing need for internal corporate governance and transparent external communication to the financial community about the actual management of intellectual capital, the Board of Directors must be able to disclose information with a “forward-looking” approach that enables stakeholders to gain a more informed understanding of the market value of the organization compared to its book value.

Table 2: Governance element – Transparency and accountability

<i>Principle/s</i>	<i>Summary recommendations</i>
9.1. The board should ensure the integrity of the company’s integrated report	<p>9.1.1. A company should have controls to enable it to verify and safeguard the integrity of its integrated report.</p> <p>9.1.2. The board should delegate to the audit committee the evaluation of sustainability disclosures.</p> <p>The integrated report should:</p> <p>9.1.3. be prepared every year;</p> <p>9.1.4. convey adequate information regarding the company’s financial and sustainability performance; and</p>

	9.1.5. focus on substance over form.
9.2. Sustainability reporting and disclosure should be integrated with the company's financial reporting	<p>9.2.1. The board should include commentary on the company's financial results.</p> <p>9.2.2. The board must disclose if the company is a going concern.</p> <p>9.2.3. The integrated report should describe how the company has made its money.</p> <p>9.2.4. The board should ensure that the positive and negative impacts of the company's operations and plans to improve the positives and eradicate or ameliorate the negatives in the financial year ahead are conveyed in the integrated report.</p>
9.3. Sustainability reporting and disclosure should be independently assured	<p>9.3.1. General oversight and reporting of sustainability should be delegated by the board to the audit committee.</p> <p>9.3.2. The audit committee should assist the board by reviewing the integrated report to ensure that the information contained in it is reliable and that it does not contradict the financial aspects of the report.</p> <p>9.3.3. The audit committee should oversee the provision of assurance over sustainability issues.</p>

Source: Institute of Directors Southern Africa – King Code of Governance for South Africa 2009.

5. What gets measured gets done

Following a consolidated axiom proposed by Tom Peters (Peters, 1987) it is essential that all strategic operations and the supervision of economic and socio-environmental performance be focused upon the protection and development of those assets that really reflect the company's value and maybe rate as impaired those assets that are no longer considered able to generate value in the short, medium and long term.

In traditional reporting systems decision makers usually focus primarily on internal tangible assets, whereas intangibles are often overlooked in light of the fact that they can hardly be measured and checked because of the several restrictions imposed by accounting principles on the reporting of internally-generated resources, nor can they be used as collateral in funding transactions. As for the specific features of intangible assets, this kind of approach apparently prevents decision makers from identifying the most appropriate strategies to find the way out from the systemic crisis, because current measurement and assessment methods widely lack accuracy and standardization in themselves, unlike those adopted for tangible resources. It is therefore essential for what

is immeasurable to become measurable by identifying the characteristics which new metrics and KPIs should possess to be considered useful also by institutional investors and financial analysts.

6. Performance Management

To synthesise a consistent connection between the internal rewarding incentive system, the intangible value drivers, and the related key performance indicators (KPIs) it is possible to provide an integrated overview of the organisation's internal and external performance. Such connection helps avoid major risks when profit is not related to "actual economic profits" but just to standard accounting results.

The strategy to generate sustainable competitive advantages through people management practices is certainly complex, and many authors believe that the modality of remuneration referred to as "*pay for performance*" has a positive impact on business results. When companies set the remuneration system correctly, their employees increase their effort to the achievement of business objectives and, indirectly, their personal objectives⁸.

Moving from the remuneration sphere of the employee to that of managers, this issue takes on a different character partly enriched with new problems / opportunities.

If it is true that, in both cases - the intention of performance-related remuneration is to improve the productivity through the motivation, provided by business results. However, continuous dependence on the manager is not only a good practice management of Human Capital; it is a necessity in order to establish the correct balance between ownership (especially when it is very fragmented) and management. This dilemma named the "agency problem" is a concept which was defined by the Corporate Governance and Remuneration Committee, seen its most effective solution and a key strength⁹.

The remuneration issue is a complex one, rich in implications for the entire management of the company. It can even be said to be among the key determinants of success, and means the strong shifting of focus from "*what*" a manager is paid, to the real issue of "*how implicitly and explicitly*" a manager is paid (Jensen, & Murphy 1990).

⁸ Toskich B., "*The strategy of fried egg*", "...not rewarding an employee who better contributes to the company's success involves the conclusion that are paying for his time, not his effort. The result will flatten or will fall quickly. The absence of reciprocity between pay and performance discourages those who produce, encourages people demotivated and deprives the company the right gain". Itaca, 1996

⁹ Alternative solutions are represented by monitoring the rights of shareholders and the market or from the information requirements of the law such as the U.S. Sarbanes-Oxley Act (2002); Mohan S. (2004), Bonner S.E., Palmrose Z.-V., Young S.M. (1998), Grundfest J.A., Perino M.A. (1997), Hartzell J.C., Starks L.T. (2000), Strahan P.E. (1998).

7. Risk Management and internal reporting

Where possible, disclosed information on a company's capital¹⁰ must be accompanied by an assessment of the risks inherent in each indicator. This should include those possible future events and their associated probability that might endanger a company's operating performance. It is evident that these risks are also part of business processes and it is necessary to be aware of the fact that all corporate assets are subject to risks, both public and private, which sometimes make it impossible to implement them, jeopardizing future results, and these threats are most likely to occur. As for human capital, for example, a company should consider the possibility that employees may leave the company, and the higher the probability, the more it should be considered a threat. However, the degree of risk also depends on how much the person in question is crucial to the company. The risk is high if the person who may resign has knowledge/experience that is particularly significant to the entity (Gasperini, Raso, 2011).

Risk tolerance and risk appetite are not negative in themselves and a large number of risk management methods include internal management processes through which risks are accepted rather than reduced, hedged through recourse to financial markets and transferred to third parties. In particular, companies have to implement adequate strategies to reduce unnecessary risks and focus resources only on risks they deem acceptable and which determine a higher yield¹¹.

It is therefore possible to build a business model for each company by identifying its specific risk factors and by linking them to information on capital, where risks having an impact on operating profit are divided into two categories (Gasperini, 2010):

a. the first category includes "public risks", which have the same degree of impact on the competitiveness of all companies and is beyond their full control, although some risks can be mitigated by resorting to the financial market and the management may consider hedging measures based on the size of these risks and of the costs they involve;

b. the second category includes "private risks" and is applies to any company insofar as these risks are due to unavailable adequate intangible resources, rather than to poor management of those to which the company has access. These risks can be monitored directly by the company through an appropriate management and disclosing strategy.

¹⁰ *International Integrated Reporting Council Capital: Financial capital; Manufactured capital; Intellectual capital; Human capital; Social and Relationship capital; Natural capital.*

¹¹ *Yoko Ohta "Value Creation through Intellectual Asset – Based Management and Business Risk Quantification", CMA Senior Researcher Quantitative Research Department Nomura Securities co. Ltd.SAAJ may 2007*

With reference to private risks that may be associated with intangible assets, the following ones are likely to be connected with the dimension of structural capital:

- inadequate documentation on business processes;
- complex organizational structure;
- inability to identify inherent risks such as risks to the business model or reputation;
- loss of know-how;
- insufficient internal control systems;
- weak and/or insufficient corporate procedures;
- inadequate protection of intellectual property.

The following risks can instead be connected with the dimension of human capital:

- inadequate board skills and inability of non-executive directors to exercise control;
- unstable and vulnerable management and staff turnover;
- inappropriate incentives, both implicit and explicit;
- insufficient leadership on ethics and culture;
- wrong interpretation and processing of information;
- loss of know-how acquired from previous experiences;
- decisions based on personal opinions;
- dependence on key staff;
- inadequate level of competence and/or limited circulation within the company;
- failure to create an environment that accepts change.

Finally, there follow several risks connected with the dimension of relational capital:

- vulnerability related to the possible loss of customers and/or partners;
- inconsistent internal communication and information flow;
- conflicts with trade unions and non-sharing of corporate restructuring plans;
- requests by providers of guarantees and restrictive terms of payment;
- loyalty of relationships to individuals but not to the company;
- threats that may undermine the value of the brand.

3.2. Overview of the literature

An overview of earlier studies into Integrated Reporting is still quite limited, as it is still at an early stage of development, since IRs are a corporate reporting system that has recently just been launched (Eccles & Krzus, 2010). However, an extensive study has already been carried out on this topic by both academics and practitioners in the field of Intellectual Capital (Edvinson, 1997; Sveiby, 1997; Roos et al., 1997; Holland et al., 2003; Boedker et al. 2005; Marr et al., 2005) and Corporate Sustainability Reporting (Klok, 2003; Daub, 2007; Gray, 2010; Adams et al., 2011; Porter & Kramer, 2011; Fifka, Drabble, 2012; Frias-Aceituno et al., 2012; Parisi, 2012; Orth et al., 2012) in theoretical and practical terms. Above all, scholars are focusing their attention on the companies that take part in the IIRC Pilot Programme, some of which have been investigated as case studies by scholars. A non-exhaustive list of studies on companies using Integrated Reporting systems is provided below.

Table 3: Overview of case studies on Integrated Reporting (IIRC Pilot Programme)

AUTHOR	PAPER/BOOK	COMPANY/IES
Parrot, Tierney (2012)	Integrated Reporting, Stakeholder Engagement, and Balanced Investing at American Electric Power, <i>Journal of Applied Corporate Finance</i> , Vol. 24, No. 2	American Electric Power
Gasperini (2013)	Il Vero Bilancio Integrato. (The True Integrated Report), IPSOA, Wolters Kluwer	American Electric Power; Eskom Holdings SOC Limited; Vancouver City Savings Credit Union (Vancity); ENI SpA;
Gasperini, Doni. Pavone, (2013)	The integrated report in the South Africa mining companies listed on the Johannesburg Stock Exchange (JSE): analysis of non-financial information and impacts on external disclosure. paper presented at 36th EAA Annual Congress, Paris, Dauphine, 6-8 May.	AngloGold Ashanti Limited; Gold Fields Limited;
Marvyn King, Leigh Roberts	Integrate: Doing Business in	Sasol Limited;

(2013)	the 21 th Century	Gold Fields Limited.
Di Donato, Bordogna, Busco (2013)	Busco et al. (ed.), Integrated Reporting. Concepts and cases that Redefine Corporate Accountability, Springer	ENI
Mio, Fasan (2013)	Busco et al. (ed.), Integrated Reporting. Concepts and cases that Redefine Corporate Accountability, Springer	ENEL
The Institute of Internal Auditors (IAA) (2013)	Integrated reporting and the emerging role of the internal auditing, IAA	Clorox
Granà, Ceccacci (2013)	Busco et al. (ed.), Integrated Reporting. Concepts and cases that Redefine Corporate Accountability, Springer	Eskom

This research may contribute to the existing literature in regard to two different fields:

1) the recent studies on the field of the integrated report are focused on issues relating to the guidelines laid down by the International <IR> Framework, recently revised (IIRC, December 2013) (Busco et al., 2013; Abeysekera, 2013), or on issues related to sustainability or intellectual capital (Branwijck, 2011; Eccles & Saltzman, 2011; Paoloni et al., 2012; Jensen & Berg 2012; Stubbs & Higgins, 2012; Parrot & Tierney, 2012; Babber, 2013; James, 2013, 2013a; Ewings, 2013) or the change made in terms of improving financial reporting and disclosure to the external stakeholders (Reid, 2012; Hickman & Tisiak, 2013). There are few studies on the use of integrated report internally and on the evaluation of the potential benefits for the internal stakeholders (Paoloni et al., 2012).

2) The integrated report could also serve as the tool to create a link between external and internal reporting in order to provide boards or senior management a realistic understanding of how to create value and to provide them with adequate information in order to facilitate the assessment of the risks and opportunities relating to the company's value creation story. This research may offer a contribution to the research area of "measuring and reporting of intellectual capital" and "managing intellectual capital and intellectual assets in the workforce" within the Knowledge Management Theory (Ross et al., 1997; Stewart, 1998; Marr & Schiuma, 2001; Bontis & Choo, 2002; Marr & Ross, 2005; Parisi, 2012).

The research could provide useful tips on how to prepare and use the internal integrated reporting since the analysis of case studies, also conducted in comparative terms, it could allow an initial outline of the framework, encourage studies on this area of interest and represent a useful empirical reference for organizations such as the IIRC, IFAC, CIMA, PwC, CPA, IA, IIA; NACD, IABC etc., (Oberholzer, 2011; Whitehouse 2013; Barry, 2013; Stefee, 2013; Gillan, 2013, IIA, 2013).

4. The case studies: ETICA SGR, GENERALI GROUP and VANCITY

4.1. ETICA SGR

Author: MARCELLO COLLA¹²

Company profile

Etica Sgr (henceforth Etica) is a Socially Responsible Investing company. Since the beginning of its activity, its aim has been finding companies and governments whose environmental, social and governance impacts were better than their peers. The whole Etica Sgr business model is based on the idea that investing in stocks and bonds issued by responsible organizations has a double benefit: improving financial return in the long term but also improving worldwide practices by actors on the markets.

On the one hand, a sustainable approach to business leads companies to a better comprehension, and as a result to a better management, of a wider set of risks, no longer limited to economic and financial ones, but including also environmental risks, social risks, and so on. In Etica Sgr view, this leads to a more sound business model, a better understanding of the context that each company faces, and in the end to better economic and financial returns.

On the other hand, investing in responsible companies can drive them more and more to comply to higher standards, in order to be able to make it into responsible investors' portfolios. Moreover, investors are increasingly engaging companies in order to improve their behavior towards different stakeholder groups.

Integrated Reporting as an external reporting tool:

Since our analysis is mainly based on data provided by companies through their sustainability reports, it has been a natural consequence for Etica to adopt the same reporting standard it asks companies to comply to. Moreover, in 2010, when we started

¹² Paragraph 4.1. has been written by Marcello Colla, Administrative Area Responsible. You can reach Marcello at mcolla@eticasgr.it.

building our CSR reporting framework, Integrated Reporting was starting to gain momentum, so we decided to go that way, even though there was not at the time any reporting framework directly related to Integrated Reporting. We decided to use GRI guidelines to outline topics and indicators, but to integrate financial, economic, environmental, social and governance data in a single document. We had the great advantage of not having issued any sustainability report in the past, so we did not have to bring together different documents, and moreover CSR is in our business model since the beginning, so it was very natural for us to treat every different information as part of the same picture.

The main idea underlying our first Integrated Report in 2010 was to be accountable especially towards companies we were investing in, but also to a wider group of stakeholders: investors, suppliers, distributors, employees, the local community. The first approach was in this sense certainly mostly an external reporting approach. And we quickly realized that Integrated Reporting was in fact not only quite new, but also that efforts made to integrate information were appreciated also by the market. Our first report was among the three finalist at “Oscar di Bilancio”, a prize promoted by FERPI that aims at finding the most transparent annual reports. The following year we were awarded the prize, and this strengthened our belief that this was a good way to communicate our results.

Something quite interesting happened on the second year of our integrated reporting experience. We decided to start engaging with stakeholders in order to define the content of our report. On the first edition we just selected the information based on our idea of what was relevant and interesting, but the following year we wanted something more. We then decided to try and get in touch with different stakeholder groups, using two different tools. First, we had a survey involving our investors, employees, suppliers. Then we organized a focus group involving representatives of other stakeholder groups, mainly NGOs, business partners, and CSR experts. Our idea was to better shape our report because we wanted it to be relevant to users, and actually read.

Integrated Reporting as an internal reporting tool

It turned out, though, that the most relevant achievement of the involvement process, more than shaping the report content itself, was to open to a dialogue with different stakeholder groups, and better understanding that:

- different stakeholders had different usage of Etica Sgr Integrated Report: some actually read it, some others honestly admitted that the focus group was the occasion for them to get to know it even existed;

- some of them were very eager to be involved, while for others it was something close to an annoyance (actually some workshop were aborted since the stakeholders didn't respond at all);

- differences in the relative importance each stakeholder group gave to different information were much less relevant than we expected.

Opening a dialogue with stakeholders was not only, not even mainly probably, about Integrated Report content, rather than about having hints about how to better meet their demands. This, in our view, was particularly true for the stakeholder group we expected to be the least interested in our report: **employees**.

In a Company like Etica Sgr, whose size is now around 20 employees, the flow of information should be quite understood, but it definitely is not. In the last 6/7 years, our size grew very fast, starting from only 5 to 20. That is four times the original size, and this changed a lot of things in terms of work flows, responsibilities, duties, but also information and participation. Only a few years ago, every piece of information was easily known by everyone, since we were working side by side in a single room, there was no need of specific tools to inform people. Now things have changed: new headquarters, every department in its own room, which is much better for concentration but of course requires tools to ensure every relevant information is known to everyone. Of course the tools were built up, but there is other information, at a higher level, that are more difficult to transmit: they are about values, mission, about why are we doing what we do. In a word, about impacts.

Surprisingly enough, involving employees into shaping the report content lead us to understand that a part, in some cases relevant, of our impacts were unknown to people working at Etica Sgr. This was more true with people who have been working for Etica Sgr for a shorter time. Questions arose about our social impact through investments, about environmental impacts and so on, and the feeling that the whole integrated reporting process was a good way of engaging people about Etica Sgr values was clear.

This, among other things, was a starting point to change our process of integrated reporting. Given our dimension, every piece of information can be found and collected by the Administration department, who is in charge of the reporting, and actually our first

report was almost entirely shaped and compiled by the Administration only. Increasingly, in the following years, we involved every other department, in order to have them providing data but also describing those impacts they were most involved in creating. This way, our Research Department became responsible for every information regarding our Socially Responsible Investing and active ownership activities, the Sales Department for information about training towards our distributors and so on.

Of course, this way of restructuring the process was the most logic and efficient, especially for a fast growing company but it also had interesting side effects, such as:

- building a “culture” of data. Every department is well aware that it will have to provide data, and in this sense is much more attentive to saving data during the year, so that it will be easier to report at the end of the period;
 - focusing more attention to activities that actually have an impact on the data provided by the department, since it became known that they will be reported on;
 - raising interest also in activities for which other departments are in charge.
- Inserting every person's activity into a “bigger picture” helped employees to better understand what happened in the Company besides the work they were directly doing, and what the social, environmental and economic impacts of the Company as a whole were.

Moreover, during the first year of integrated reporting, we worked at our employees variable remuneration. Up to that point it was only linked to two economic indicators: ROE and Cost/income. We decided to introduce environmental indicators, and ones that were under direct control of each employee: paper internally used, toners, and electricity consumption. This helped raise more awareness about environmental impact, and in the end about the Integrated Report, where that impact is described.

The report had an impact also on another internal stakeholder: the Board of Directors. Given Etica Sgr peculiarities, the integrated reporting process had a strong commitment from the board and the CEO, actually the idea was sponsored by them. But it became a sort of top-down-back to the top process, since developing this tool led the organization to engaging the board in different ways.

The first edition of the report was a mere reporting on what happened in the past, and it had no strategic perspective. Since the second edition, though, some parts were introduced that involved and engaged the board much more: a chapter about the strategies of the company for the future, and a list of improvement goals set by the company, and

against which it would report in the following editions. This evolution was due on the one hand to the shaping of Etica's first formalized strategic plan, on the other hand to best practices around the world in the field of integrated reporting.

Disclosing future strategies in a public report meant committing to reaching goals either economic, social, environmental and in the field of corporate governance. This has been, and still is, a strong commitment for the board, and it helps keeping an even stronger focus than would have otherwise been kept on both financial and non financial performances.

Year after year, the goals are becoming more specific, and now each goal is disclosed together with a time frame, one or more KPIs (if possible), a target level for the KPIs. Presently, the time frame for the goal setting is a period of three years, the same period as the strategic planning one, and each year we report against the goals we had set. This will also lead to a change in internal reporting to the board, with ESG indicators reported probably on a quarterly basis together with financial ones.

In conclusion, our Integrated Report has undergone, in only four years, a lot of development, both in the contents, and in the way it is used.

It is increasingly becoming more integrated and less combined, even though a lot of way still has to come especially concerning the intangible assets, and a real integration of information. In this sense, combining G4 and the IIRC framework, or choosing one of them, will be next year's main challenge.

Moreover, the document is becoming a tool to help manage the company, giving information but also setting goals and consequently shaping internal reporting. We strongly believe that real integration is strongly needed to help understand companies real value creation.

4.2. GENERALI GROUP

Author: MASSIMO ROMANO¹³

Company profile

Generali Group is one of the leading global insurance and financial entities, led by Assicurazioni Generali S.p.A., established in Trieste in 1831. It has always been

¹³ Paragraph 4.2. has been written by Massimo Romano, the Head of Group Integrated Reporting. You can reach Massimo at Massimo_Romano@Generali.com.

internationally oriented and is now present in more than 60 Countries. At the end of 2013 the Group's insurance turnover was over € 66 billion.

As regards its core insurance business, the life product line of Generali Group comprises savings and protection policies, which account for the majority of its portfolio, alongside the Health business and Supplementary pension policies. In the property & casualty segment the Group is currently focused on the retail market, offering coverage for the entire insurance portfolio. Furthermore, Generali is one of the world's major players in the field of assistance, through the Europ Assistance Group, which provides worldwide services in the motor, travel, health, home and family segments.

The Group has also expanded its business from insurance to a full line of asset management, properties and financial services. In particular, the Banca Generali Group is one of Italy's leaders in the personal financial services market.

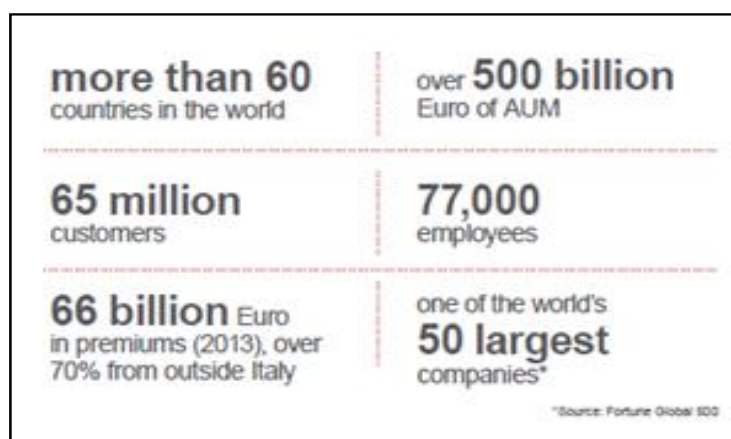


Fig. 1: An overview of Generali Group

Integrated Reporting as external reporting tool¹⁴:

Generali has always supported a “one report” approach that would allow us to avoid a proliferation of reports. Following this approach - and to not create a separate integrated document as other peers do - we created a document within the Annual Report.

In line with the various alternatives envisaged by the International <IR> Framework, the Group has decided to prepare and present an integrated report in response to both this Framework and the existing compliance requirements. So, our report is made up of a

¹⁴ The Team Integrated Reporting (IR) includes Annamaria Bradamante and Nicola Padovese, who are the authors of the part focused on company profile and IR as an external reporting tool.

concise Integrated Review that becomes an Annual Integrated Report including all information (see following diagram)

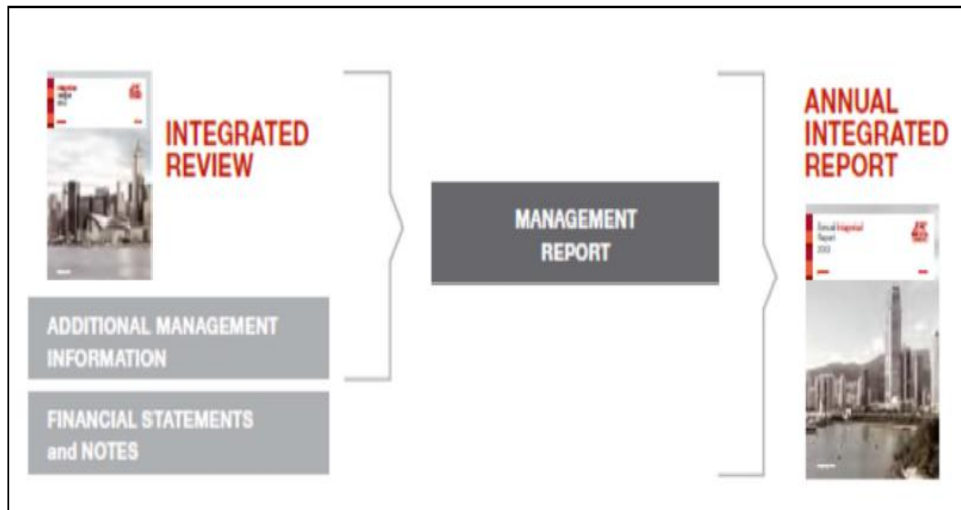


Fig. 2: Annual Integrated Report

Generali has participated in the Pilot Programme promoted by IIRC since 2012 as a result of the strong belief that this new approach to corporate reporting represents an innovative and effective way to communicate the Group’s ability to create value in a sustainable manner over time.

By participating in the pilot, Generali has contributed to the development of '<IR>' framework (see following topic), with particular reference to the principles, content and practical application of <IR>.

Among the many comments on the Consultation draft we sent to the IIRC at mid July as members of the Italian Pilot programme, in the final version was in fact welcomed the “one report” concept, very crucial for Generali.

The draft version stated that “the IR is another report”. This was considered a huge “step back” and moreover is moving to the opposite direction respect to where, through the efforts towards integration, companies are currently going and what the investors are expecting from them, when they ask for ESG information.

In addition to that, it was better specified the concept of the report audience, shifting the ‘primary’ qualifier from *report audience* to *report purpose*.

Other aspects - such as concept of value, criteria for the presentation of changes in information estimates, reporting boundaries and corrections of errors compared to previous periods - should be further improved, but the General is confident that the IIRC is in the right direction.

The most critical element in the preparation of IR has been the identification of the relevant information for our Group. At first sight, this seems to be an easy task but the real problem is that each person in the organization has its own perception “about matters that substantively affect the organization’s ability to create value over the short, medium and long term”. The topic “materiality” has long been debated and has been solved through a process which led to an identification of the main stakeholders and then the analysis for each stakeholder on which information is relevant. This process has been key to fulfill the IR framework.

Additionally, the identification of new information to be provided has led to the need to interact with different departments of the company previously not involved in the preparation of the disclosure. The organizational and communicative effort has been significant.

The IR shows more clearly what is the link between the company’s objective, governance, the remuneration policy and performance. Those elements are also better contextualized in the reference environment. The specific disclosure on main stakeholders also forced to pay greater attention to the accuracy of specific reporting and consequently a clearer focus on performance achievements.

Finally, all together the set of information provides a more forward-looking vision and elements narrated serve to provide a clearer picture of an organization in a simpler and concise way.

Integrated Reporting as internal reporting tool¹⁵

The Generali Group explore using Integrated Reporting internally

The interview with Massimo Romano who leads the Generali’s group integrated reporting team highlights the following aspects: “*The Generali Group, an international insurance company based in Italy, is a pioneer in bringing to life the Integrated Reporting “internally”*”. Indeed he discusses the benefits that they are detecting”. “*The Integrated Reporting (IR) is a process based on Integrated Thinking, focusing on the*

¹⁵ *The Team Internal Integrated Reporting (IIR) includes Massimo Romano, Barbara Sticchi and Rubens Pauluzzo, who are the authors of the part focused on IR as internal reporting tool.*

organization's value creation story over the time. An Integrated Report is a concise communication about how the organization's strategy, governance, and performance lead to creation of value in the short, medium, and long term, in the context of its external environment. The Group's Integrated Report for 2014 will be published on Thursday 13 March". "Accordingly, the Group Integrated Reporting Team have started internally this journey a couple of years ago, with the 2013 Internal IR finalized last summer while now the colleagues are working on the version for 2014 (scheduled for June 2014). The Internal IR is a report, technically a power point presentation of around 20 slides, focused on the vision, mission and business model of the Group Integrated Reporting department, its performance and the future outlook, all contents being coherent with Generali Group framework - One of the biggest benefit from Internal IR is that we have begun to break down thinking silos inside our own department -"

Generali Group has participated in the IR Pilot Programme promoted at worldwide level by the International Integrated Reporting Council (IIRC) since 2012. The Team's Internal IR tracks all the capitals (financial, human, social and organizational). Each capital has a number of KPIs, enabling to deliver **an integrated view of performance**, inside and outside the organization.

The KPIs are aligned with the **Performance Management program** to increase both the transparency of the team's internal communication and the engagement of the colleagues towards the targets (see the tables below regarding the Performance 2013).

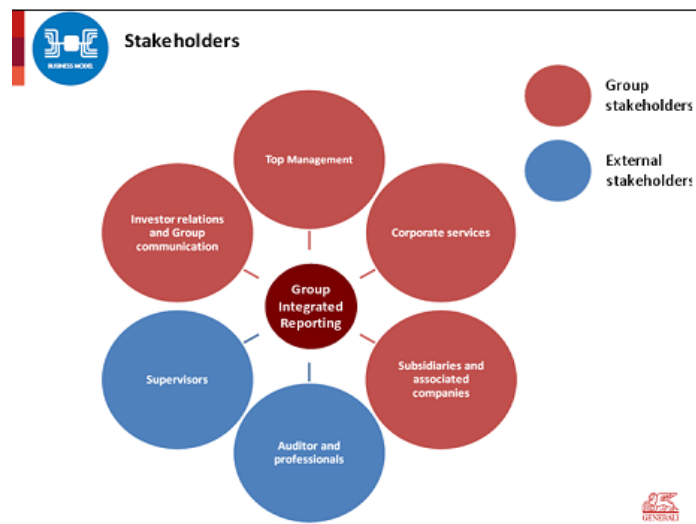


Fig. 3: Stakeholders

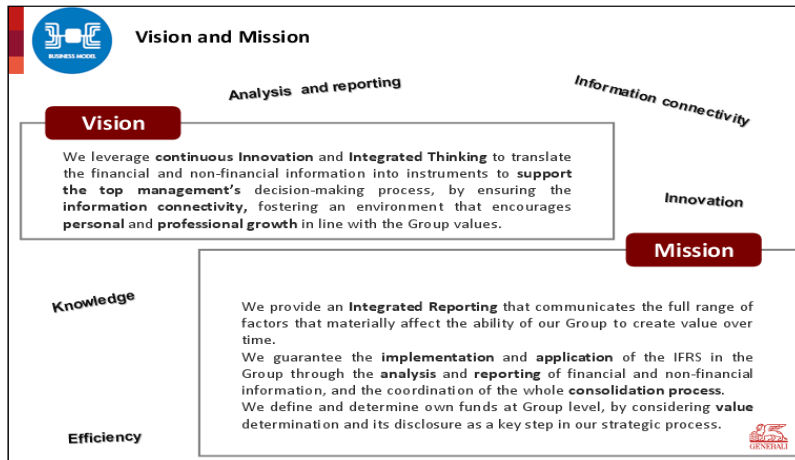


Fig. 4: Vision and Mission of Generali Group

Table. 4: The capitals content

RELEVANT CAPITAL (K)	CONTENT	GIR'S VIEW
Human K	<i>People's competencies, capabilities and experience, and their motivations to innovate</i>	GIR's core assets are knowledge and competencies of our people. These factors must be widespread through our department leveraging and mixing up different professional experiences and diversity. Our people is naturally oriented to innovate and continuously improve their hard and soft skills
Organizational K	<i>Tacit knowledge, systems, procedures and protocols</i>	The pillars of a strong operating model to guarantee an excellent quality and assurance to the reporting are: <ul style="list-style-type: none"> • formalization and robustness of procedures • reliable and efficient IT systems • shared know-how
Social relation K	<i>The institutions and the relationships within and between communities, groups of stakeholders and other networks, and the ability to share information</i>	<ul style="list-style-type: none"> • creation of a network through our integrated reporting and our people • Internal sharing the Group's core values

	<i>to enhance individual and collective wellbeing</i>	and external promotion
Financial K	<i>The pool of funds that is available to the organization</i>	Optimized allocation of assigned budget in order to create added value for our people and internal and external stakeholders

Table 5: Indicators of Human Capital







		GROUP INTEGRATED REPORTING			AG	GENERALI GROUP
		2013	2012	2011		
	Total	36 (100%)	28 (100%)	29 (100%)		
	Men	27 (75%)	21 (75%)	21 (72%)	59.1%	54.4%
	Women	9 (25%)	7 (25%)	8 (28%)	40.9%	45.6%
	Managers	10 (28%)	6 (21%)	6 (21%)	24.4%	15.5%
	Employees	25 (69%)	21 (75%)	23 (79%)	75.6%	84.5%
	Exchange	1 (3%)	1 (4%)			

Table 6: Indicators of Human Capital






		GROUP INTEGRATED REPORTING			AG	GENERALI GROUP
		2013	2012	2011		
	Average age	33.3	31.7	32.3	42.9	41.0
	Average seniority in Generali	5.6 years	4.4 years	5.7 years	15 years	12 years
	Mobility outflows	24 (last 6 years)	24 (last 5 years)	16 (last 4 years)		
	Mobility inflows	23 (last 6 years)	16 (last 5 years)	13 (last 4 years)		
	Overall international mobility	<p>Out = 4 resources (Luxembourg, Switzerland, Spain, and Czech Rep.), of which 1 in the last year</p> <p>In = 2 resources (UK branch and Germany), of which 1 in the last year</p>				

Table 7: Performance 2013

RELEVANT CAPITAL (K)	TARGET DESCRIPTION	TARGET INDICATOR	DONE
Human K	<ul style="list-style-type: none"> GIR employee's satisfaction survey 	<ul style="list-style-type: none"> participation rate > 87% Overall rate >= good 	√
	<ul style="list-style-type: none"> Developing our human k 	> 4 initiatives to develop human capital	√
Organizational K	<ul style="list-style-type: none"> Number of days to produce the preliminary figures of P&L KPI during interim period 	T+15	√
	<ul style="list-style-type: none"> TOM Target Operating Model project 	On/Off	√
	<ul style="list-style-type: none"> Setting up and implementing the new finance department for Generali solo 	On/Off	√
	<ul style="list-style-type: none"> Mastering IFRS evolution (IFRS 10, IFRS 4 ph 2..) 	On/Off	√
Social relation K	<ul style="list-style-type: none"> Improving external disclosure (Integrated management reporting, corporate segment, source of profit for life operating result) 	On/Off	√
	<ul style="list-style-type: none"> Cc survey on GIR quality of service 	On/Off	To be done
Financial K	<ul style="list-style-type: none"> Improvement of the allocated budget (index= final/budget; index< 100% improved budget, vice-versa in the opposite case) 	Index < 100%	√

Note: o/s = outstanding point; n/a = not applicable; T= closing date of the quarter

4.3. VANCITY (Vancouver City Savings Credit Union)¹⁶

Author: JOANNE WESTWOOD

Company profile

¹⁶ Paragraph 4.3. has been written by Joanne Westwood, Management Accountability Reporting at Vancity, Canada. You can reach Joanne at Joanne_Westwood@vancity.com.

Vancity is a values-based financial co-operative serving the needs of half a million member-owners through 57 branches in British Columbia. It has a vision to Redefine Wealth by using all of its \$17.5 billion in assets to support the long-term needs of the people it serves, and their communities. Besides being a living-wage employer and carbon neutral, Vancity is a member of the Global Alliance for Banking on Values, an independent network of values-based banks using finance to deliver sustainable development for underserved people, communities and the environment. It is recognized globally for its transparent and progressive reporting practices, and was the first Canadian organization to join the International Integrated Reporting Council's (IIRC's) pilot programme.

Integrated Reporting as an external reporting tool:

Vancity's journey to integrated reporting

Vancity has voluntarily produced externally verified public reports documenting its social and environmental performance and impact since 1997. Its reporting practices are driven by the Board of Directors, who view accountability and transparency as key elements of good governance and values-based banking.

Vancity first considered producing an integrated report—an annual report that would bring together financial and sustainability information together in one document—in 2005. It commissioned research on leading practices and implications, and it began to align its financial and sustainability reporting processes and streamline sustainability data collection and verification. However, it was the launch of Vancity's vision in 2008 that was the key driver: Vancity's vision required it to integrate sustainability into its strategy and decision making, and to extend its definition of success beyond traditional metrics.

Vancity published its first integrated report in 2010. Integrated reporting provided a platform for the organization to tell its story to members in a connected, consistent and credible way, and to explain how its key activities, rather than making a profit to benefit the community, benefit the community in a profitable way.

Research has shown that Vancity's reports are highly valued by employees and members, who find them educational, comprehensive, easy to read, believable and effective in validating the reasons why they choose to bank or work at Vancity. It's reports are also a meaningful platform for ongoing communication and engagement with members, employees and others. For example, it uses the report as a tool to validate existing, or identify emerging, community or broader sustainability issues members care

about—issues that affect their personal well-being, or the communities where they live and work. It also uses the report to ignite conversations about the ways Vancity might play a role in addressing these issues.

Reporting principles and guidelines

Vancity prepares its integrated annual reports in accordance with the Global Reporting Initiative's (GRI) G4 **Sustainability Reporting Guidelines**. It also adheres to the **AA1000 principles**, and—more recently—its reporting practices are informed by the IIRC's Integrated Reporting (<IR>) Framework.

While these frameworks are often perceived as relevant to organizational disclosure, the real value is when they are applied more broadly to inform how an organization runs its business. They all speak to the importance of long-term thinking and using the results of stakeholder engagement to inform strategy and decision-making. They also emphasize the importance of understanding the organization's social, environmental and economic operating context, and having systems in place to prioritize and respond to key business and sustainability risks and opportunities, including those raised by stakeholders.

Integrated reporting as an internal reporting tool

Key changes and insights gained from integrated reporting

Arguably the most significant and positive change since it integrated its annual and sustainability reports was the alignment of its reports with its Three Year Plan (business strategy) and internal performance reports. Vancity believes the key information, measures and targets it uses internally to measure success, inform decision-making and reward its employees should be the same as those it presents to its members in its annual reports. In other words, it believes an integrated report should mirror internal reality. This is an important concept within the <IR> Framework.

To support this transition, Vancity made three important changes to its management and reporting practices. First, it consolidated two scorecards into one organizational scorecard—the scorecard that management used internally to track the organization's performance against its strategic priorities, and the scorecard that it published in its sustainability reports, which included additional non-traditional social and environmental targets. Progress against the organizational scorecard is reported to the executive team and Board of Directors quarterly; to all managers at quarterly performance updates; and—since 2011—to members in the annual report. Second, it aligned the structure of its annual reports to the framework used in its quarterly performance reports. Third, for the

first time in 2014, it made its future-looking **Three Year Plan**—the outcome of its annual strategic planning process—available to members, community partners and peers online, and invited feedback on it. It included a summary and link to the Three Year Plan in its report.

By applying the <IR> framework, Vancity also improved specific areas of its reports. It strengthened the section on external operating context, which talks about significant external trends and developments that could materially impact the organization, including stakeholder insights. It also strengthened how it communicated the linkages between governance, risk, strategy, and KPI, while recognizing it would benefit from more alignment through a common, organization-wide understanding of priority (material) issues. A further improvement was a shorter, more focused report by elevating the conversation to a more strategic level. However, it has not applied all the concepts included in the <IR> Framework. For example, Vancity's reports do not refer to the five capitals as it does not use this language internally.

Other key benefits included efficiencies and reduced costs (although this was never a key driver) as well as improved non-financial data management systems.

A commonly asked question is what comes first, integrated reporting or integrated thinking? The answer probably depends on the organization and its motivation for integrated reporting. Vancity believes it is hard to fake an integrated report, and that organizations should be aware that integrated reporting is quick to reveal if there are disconnects between an organization's business strategy and sustainability priorities. In this way the process of pulling together an integrated report can facilitate meaningful discussions where disconnects exist, and some changes will likely occur as a result.

Areas of disclosure it plans to strengthen include better articulation of its key risks and opportunities, and clearer linkages between financial and sustainability performance.

Assurance

At this time, there are no methodologies for external assurance on an integrated report. Vancity chooses to have independent assurance on key sustainability performance data and information, as well as on its adherence to the AA1000 principles of Inclusivity, Materiality and Responsiveness. In 2013, Vancity transitioned to a single assurance provider (KPMG) for both the financial statements audit and sustainability assurance engagement. As well as being more efficient than using two separate firms, this has resulted in greater collaboration across the organization and highlighted opportunities for

more ‘integrated thinking’ across Vancity. However, the outcomes of the integrated assurance process remain separate, e.g. two Management Letters, two audit opinions, due to strict rules covering financial audits as well as timing constraints. Vancity hopes it will eventually be able to include one, integrated assurance statement in its reports.

Challenges of the <IR> Framework

Vancity views the following as some of the more challenging aspects of the Framework that would benefit from further discussion and clarification.

Audience and the definition of value

Vancity believes the Framework, rather than defining the audience as ‘providers of financial capital’, should allow organizations to state who the intended audience of their integrated report is. This could allow organizations who choose to take a broader, more inclusive approach to running their business to clearly differentiate themselves from organizations who choose to focus sustainability efforts through the lens of the investor. It also believes the organization should be required to clearly state how it defines value, and who the organization is creating value for.

Materiality

The <IR> Framework, GRI Guidelines, and AA1000 principles all define materiality differently, and—while none of the frameworks appear to directly contradict each other—they have different emphases and audiences. Guidance on the key differences between the different frameworks and how they complement each other (or not), particularly when it comes to materiality, would be helpful for organizations struggling to determine the right approach for them.

Vancity believes reports need to reflect what the Board and management are strategically focused on, and so a materiality process for the purposes of report disclosure alone will no longer be sufficient and would lead to a disconnect between the information contained in the integrated report and the information used by the Board and management. One approach Vancity is considering is incorporating the principle of materiality, as defined by the GRI, into its existing enterprise risk management process, thus formally broadening the current approach to risk.

Performance indicators

An ongoing challenge for Vancity is balancing conciseness with completeness, especially when it comes to performance indicators. The <IR> Framework does not include specific performance indicators. This makes sense as material issues are

necessarily different for each organization and region, so there cannot be a set of common KPIs applicable to all organizations. In addition to using the GRI, Vancity reports additional data and information related to its co-operative nature, its business strategy and values-based banking. And it's currently working on a set of community impact metrics.

The Framework does provide guidance on performance indicators and suggests, among other things, that they be (a) consistent with information used internally by management, (b) focus on the matters identified through an organization's materiality process. If an organization is truly integrated, (a) and (b) should arguably be the same—but how often this is the case? (See also comments on materiality above).

The role of the Board vs. Management

The <IR> Framework suggests that those charged with Governance (in Vancity's case, the Board of Directors) should include in the Report a statement that sets out its responsibility for the integrated report, including an opinion on whether the integrated report is in accordance with the <IR> Framework. A challenge for Vancity, if it formally adopts the Framework, would be ensuring its Board has the capacity and knowledge to do this. It is also grappling with the role Senior Management and/or the CFO play in the preparation and presentation of the report, in general and vs. the Board. (A recent study from Deloitte in South Africa found that integrated reports were stronger when a Committee, rather than the CFO alone, oversaw its preparation. This makes sense given the collaborative nature of integrated reporting).

The benefits of an integrated approach

Vancity believes an integrated approach to management and reporting simply means a better-run business. Management and employees take a broader and longer-term view to making decisions and have a deeper understanding of the external context in which they operate, including the views of multiple stakeholders. Such an approach can lead to the early identification of emerging risks and highlight opportunities for strategic differentiation. Other key benefits include:

- breaking down operating silos across the organization (e.g. between divisions and departments);
- a complete and consistent view of the business, where external reporting reflects internal reality;

- a common understanding of priority topics and stakeholder needs and expectations, addressed through one business strategy.

Vancity anticipates its understanding of the linkages between its sustainability and financial performance and impact will evolve and ultimately demonstrate that Vancity (and other organizations) can both have a positive impact on people and communities and be profitable. Simply put, Vancity believes that if it does the right things for its members, profitability and sustainable growth will follow¹⁷.

5. Discussion of results

A review of the three case studies prompted the following considerations about the main topics listed in Table 1.

Companies profile

The three case studies are companies dealing with the financial sector: above all, they have a sustainable, transparent approach to work and are quite sensitive to the impact of their business on the local community. This is shown by their descriptions of their lines of business as well as by the presentation of their visions and missions and/or Business Models, if provided. In other words, the following topics came to the fore

- Etica points out that its core business is investing in “**responsible organisations**”, and the reasons for such choice is reaping benefits in terms of Business Model, better relations with the local community and environment, and therefore an even better financial performance;
- Generali works in insurance and personal financial services; the company’s mission is focused on integrated thinking in support of managerial decisions;
- Vancity stands out, in that it uses finance to deliver sustainable development for underserved people, communities and the environment, as well as for its transparent and progressive reporting practices.

Integrated Reporting as an external reporting tool:

In short, the topics came to the fore:

- All three case studies extensively describe the process that led to their drawing up of the IR and the improvements they got from it: above all, at first the drawing up of

¹⁷ Visit vancity.com to find out more, and to view or download a copy of Vancity’s Annual Report or Three Year Plan.

the first IIR was based on the (GRI) G4 Sustainability Reporting Guidelines (Etica SGR), G4 and AA1000 principles (Vancity) and on the IR Framework (Generali).

- Generali and Vancity have been participating in the IIRC Pilot Program since 2012, and both claim they are deeply motivated by such initiative and share the key traits that inspire the drawing up of the IR. In particular, Generali and Vancity took part in the development of the latest version of the IR Framework (December 2013) and seem to be remarkably involved in and proactively cooperating with the IIRC.

- Even if it does not participate in the IIRC Pilot Program, Etica describes the process that led it to draw up one report, i.e. the Integrated Report, as required by the sustainability reporting standards of their client companies.

- Etica drew up an IR in 2010, based on the requirements of the GRI framework, as there were no guidelines about how to draw up such document. Vancity too drew up its first Integrated Report in 2010, while Generali did it in 2012.

As to comments about the <IR> Framework of the IIRC (December 2013), a key role is played by both Generali and Vancity, while Etica thinks that the IR should be built around a combination of G4 and the IR Framework, or either one should be chosen. In particular, Generali and Vancity point to some criticalities of the IR Framework, such as:

1. audience and the definition of value;
2. materiality;
3. performance indicators;
4. the role of the Board vs. Management;
5. the six Capital contents (only for Vancity which does not adopt the IIRC definition of six Capitals);
6. criteria for the presentation of changes in information estimates;
7. reporting boundaries;
8. corrections of errors compared to previous periods.

As to expected benefits and/or checked advantages after the adoption of the IR, the following topics came to the fore:

1. more transparent disclosure;
2. better relations with different stakeholders' groups;
3. cost savings;

4. better understanding of the link between the company's target, governance, remuneration policy and performance.

Integrated Reporting for internal use

The three companies proved to be quite keen on using the IR for internal purposes, describing different uses and purposes of the IIR. The three companies widely share the Integrated Thinking concept, which the drawing up of the IIR must be based on. The following points are worth pointing out:

1. Involvement of different stakeholders' groups, both internal and external (for example, through a survey or focus group);
2. wide involvement of internal stakeholders: the employees;
3. involvement of internal stakeholders: the Board of Directors;
4. stronger strategic perspective and disclosure of future strategies;
5. link between the employees' variable remuneration, two economic indicators (ROE and Cost/income) and one environmental indicator (Etica);
6. integrated view of performance (KPIs are connected to the five capitals (Generali));
7. Performance Management program (better team's internal communication).

6. Conclusions

A review of the three case studies found the following, about the internal use of the Integrated Report:

1. alignment of the Internal Integrated Report (IIR) with the strategic plans;
2. involvement of employees and management;
3. implementation of KPIs, in keeping with the employees' remuneration;
4. high level of acceptance of the IR by the company's management and staff;
5. better deployment of the company's key risks and opportunities;
6. clearer links between financial performance and sustainability performance.

There are still a few topics that have not been clearly outlined yet and that undoubtedly still need to express their full potentials, and they will be eventually considered too, such as:

- areas of application of the IIR within the Risk Management process;

- impact of the IIR on the internal decision-making process;
- impact of the IIR use on the Internal Auditing and on the Internal Auditors' assurance activity¹⁸.

“Over the last three years, the IIRC has built consensus around the idea that the current corporate reporting model must change to meet the needs of today’s business and investment environment”, says Richard Chambers, who is the President of the Institute of Internal Auditor (IIA). However, a message of deep change is not only given by the IR as an external reporting tool, but by the IIR as well: this makes a deeply innovative business reporting tool even more revolutionary, and it is such tool that will drive a major transition to Integrated Management (Piermattei, Venturozzo, 2011).

There are the following limitations of the research carried out: the internal use of the integrated report is still at an early stage, there is lack of referral guidelines, the role of accountants in the preparation of this new report is difficult and crucial. It is also necessary to consider that companies that have joined to the Integrated Reporting Pilot Programme have different characteristics in terms of assurance, internal control framework, staff organization, performance measurement models and sustainability performance management.

Keywords – Internal Integrated reporting; case study; performance, internal stakeholders; sustainability.

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Integrated Reporting for Universities? Austrian Public Universities as an Example

Otto A. Altenburger , Michaela M. Schaffhauser-Linzatti *

University of Vienna
Oskar-Morgenstern-Platz 1
A-1090 Vienna, Austria

* *Corresponding author*

Structured Abstract

Purpose - This paper discusses whether the new framework for Integrated Reporting can be applied to universities. Being a young, so far not standardized instrument, Integrated Reporting can be defined as *“a process founded on integrated thinking that results in a periodic integrated report by an organization about value creation over time and related communications regarding aspects of value creation”* (<http://theiirc.org/>).

Design - To answer the research question, we first take the basic ideas behind the International Integrated Reporting Framework released by the International Integrated Reporting Council (IIRC). The IIRC is a joint foundation of the The Prince's Accounting for Sustainability Project (A4S), the Global Reporting Initiative (GRI), and the International Federation of Accountants (IFAC) which signed a Memorandum of Understanding with the International Accounting Standards Board (IASB). We then present the framework of the annual reporting requirements for the Austrian public universities according to the Universities Act 2002: Among others, they include the financial statements and the Intellectual Capital Report which are both regulated by law and detailed by corresponding orders. The financial statements are derived from the Austrian Commercial Code and demand the publication of a balance sheet, an income statement, notes, and the audit opinion of the auditor. The Intellectual Capital Report is the first worldwide to be reported obligatorily. It follows the theoretical model of ARC Seibersdorf and consists of narratives as well as numerous ratios which shall illustrate the human capital, structural capital, and relational capital of a university. To answer the research question, we finally contrast the requirements of the International Integrated Reporting Framework and of the Universities Act 2002 and its orders to reveal similarities and differences in regard to publishing obligations. That's why we can work out the applicability and usefulness of the International Integrated Reporting Framework for universities in general and for Austrian universities in particular. Moreover, we can derive strategies to improve universities' governance by means of published information.

Originality -This research is one of the first to present the International Integrated Reporting Framework which was released on December 9th 2013 at a conference. It is also the first to discuss its relevance and applicability for reporting on universities.

Practical implications - On a national basis, the results of our research will be discussed with the Austrian Federal Ministry in charge of universities which is constantly

improving its reporting system on universities by amendments of the Universities Act 2002 and its corresponding orders. As Austria already has been the pioneer in the introduction of the Intellectual Capital Report, other European countries might follow. On an academic level, the results reveal that the International Integrated Reporting Framework cannot be implemented for universities without adaptations. However, they open a field of discussion to derive new perspectives on reporting on universities.

Keywords - International Integrated Reporting Framework, Intellectual Capital Report, financial statements, universities, Austria

Paper type - Practical paper

Introduction – Aim of the Paper

Reporting of universities to the general public beyond reporting to governmental authorities or statistical offices is a topic which gains increasing relevance. How should university reports look like? There are many different suggestions and regulations, but up to now there is no ideal concept that fulfils the needs of the stakeholders and can be implemented in a practical way.

The situation is similar to the present discussion on reporting of enterprises – with one important difference: Annual financial statements, also for groups of enterprises, are well-established and well-known reporting instruments, accepted worldwide (irrespective of details differing depending on the specific accounting standards applied). There is, however, more and more feeling of unease with these reporting instruments; they are not seen as delivering the kind of information stakeholders are demanding, namely “value reporting”. As a consequence, additional reports have been suggested or recommended, mainly social reports, environmental reports, and sustainability reports. They primarily contain non-financial information and may be very interesting for stakeholders, but due to the information overload they might lose sight of the wood for the trees.

At present, the possible solution is seen in so-called “integrated reports”. Up to now, there is no generally accepted definition; a typical example reads as follows: Integrated Reporting “is a process founded on integrated thinking that results in a periodic integrated report by an organization about value creation over time and related communications regarding aspects of value creation. An integrated report is a concise communication about how an organization’s strategy, governance, performance and prospects, in the context of its external environment, lead to the creation of value in the short, medium and long term.” (<http://www.theiirc.org/>) Financial and non-financial data shall not only be

combined in one single report, but integrated to draw an overall picture of the organization's business model and outcomes.

Integrated reporting is of utmost topicality because the International Integrated Reporting Framework (IIRF) has been launched on December 9th, 2013. It is written primarily in the context of private for-profit enterprises, but with the intention of being applicable, "adapted as necessary", to public and not-for-profit organisations as well.

This paper discusses whether this framework is applicable to universities. The analysis is undertaken from an Austrian perspective because Austrian public universities have to publish Intellectual Capital Reports annually in addition to their financial statements and these reports are somewhat comparable to such integrated reports.

The following sections 2 and 3 present the International Integrated Reporting Framework and the Intellectual Capital Reports of the Austrian universities. In section 4, the posed question "Integrated Reporting for universities?" will be answered. Finally, conclusions are drawn.

1. The International Integrated Reporting Framework

The International Integrated Reporting Framework has been developed by the International Integrated Reporting Council (IIRC) in a process of five steps:

September 2011:	Discussion Paper "Towards Integrated Reporting – Communicating Value in the 21 st Century"
July 2012:	Draft Outline of the framework
November 2012:	Prototype of the framework
April 2013:	Consultation Draft of the framework (launched for comments by the public on April 16 th , 2013; 359 comment letters were received)
December 2013:	Publication of the framework

The IIRC has been founded in August 2010 by a common initiative of

- The Prince's Accounting for Sustainability Project (A4S, The Prince is the Prince of Wales, the British successor to the throne, Prince Charles),
- The Global Reporting Initiative (GRI), and
- The International Federation of Accountants (IFAC)

and is a global coalition of investors, companies, regulators, standard setters, the accounting profession and NGOs. By means of a Memorandum of Understanding, also the International Accounting Standards Board (IASB) is involved.

To foster Integrated Reporting, the IIRC has issued the so-called “Framework” which is structured as follows:

Executive Summary

Part I – Introduction

1. *Using the Framework*
2. *Fundamental Concepts*

Part II – The Integrated Report

3. *Guiding Principles*
4. *Content Elements*

Glossary

Appendix

The **Fundamental Concepts** include value creation, the value creation process, and the so-called “capitals”:

- Financial capital
- Manufactured capital
- Intellectual capital
- Human capital
- Social and relationship capital
- Natural capital

The capitals are stocks of value that are increased, decreased, or transformed through the activities and outputs of the organization. They are the resources and relationships used and affected by the organization. The ability of an organization to create value enables financial returns to the providers of financial capital interrelated with value creation for other stakeholders and society at large.

The **Guiding Principles** for integrated reports are:

- Strategic focus and future orientation
- Connectivity of information
- Stakeholder relationships
- Materiality
- Conciseness

- Reliability and completeness
- Consistency and comparability

Most of these principles are easily understandable. “Consistency” means consistency over time, “comparability” refers to other organizations. Comparability will be difficult to achieve because the Framework does not prescribe certain specific content elements like financial reporting standards.

The **Content Elements** integrated reports shall include according to the Framework are topics to be covered:

- Organizational overview and external environment
- Governance
- Business model
- Risks and opportunities
- Strategy and resource allocation
- Performance
- Outlook
- Basis of preparation and presentation

The description of these elements is complemented by general reporting recommendations. The key statement of the Framework is that each organization is called to create its own integrated report, following the aims and guidelines laid down in the Framework.

2. The Intellectual Capital Report of the Austrian Universities

Since the fundamental Austrian university reform by the Universities Act 2002 which created autonomous corporations instead of administrative bodies appended to the responsible federal ministry, a completely new reporting system for the Austrian public universities has become effective. The universities now have to apply double-entry bookkeeping and to annually draw up financial statements similar to enterprises which have to be audited by certified public accountants (in addition to the Federal Audit Office which investigates special matters on an irregular basis).

An essential element of the reporting system is the Intellectual Capital Report. Austria has been the first country worldwide to make annual Intellectual Capital Reports obligatory, not for enterprises, but only for public universities. These universities are

mainly funded by public sources. The Intellectual Capital Reports play an important role in the budgeting process of the universities. A substantial part of public funds is assigned by performance agreements between the responsible federal ministry and the respective university. These agreements are concluded for periods of three calendar years (not academic years, the current period covers the years 2013 to 2015). The Intellectual Capital Reports have to document to which degree the goals agreed upon have been met.

Format and structure of the universities' Intellectual Capital Report are determined by a decree (order) of the responsible federal minister. At present, the Intellectual Capital Report Order from 2010 is in force which has been slightly amended in 2012 and 2013. According to this order the Intellectual Capital Report consists of three parts:

- a narrative part describing mainly the university's activities, social goals and self-imposed objectives and strategies (important topics are priorities in research and advancement of the arts respectively, study programmes and continuing education, inter-university co-operation, increasing internationalism and mobility, human resources development and promotion of women),
- a great number of numerical data, and
- a standardized report on the fulfilment of special objectives laid down in the performance agreement in force.

The numerical information is arranged according to the following classification:

1. Intellectual capital
 - 1.A. Human capital
 - 1.B. Relationship capital
 - 1.C. Structural capital
2. Core processes
 - 2.A. Teaching and continuing education
 - 2.B. Research and development / Advancement of the arts
3. Outputs and impacts of the core processes
 - 3.A. Teaching and continuing education
 - 3.B. Research and development / Advancement of the arts
4. Special data for Universities of Medicine

The current Intellectual Capital Report includes 28 ratios which are, however, further deepened by stratification factors such as gender, nation, field of studies, etc. Additional 5 ratios are demanded for universities of medicine.

3. Is the Framework Applicable to Universities?

The Austrian universities' Intellectual Capital Reports follow the Framework in several central aspects:

- identical basic concept: one report, aimed at showing the reaching of goals, presenting a great variety of mainly non-financial data
- combination of quantitative and qualitative information
- compliance with the majority of the Guiding Principles
- containing most of the Content Elements
- financial information could be integrated (e.g., the document containing the Intellectual Capital Report of the University of Vienna comprises the financial statements as well, although as a separate section)

Guiding Principles rather ignored are materiality and conciseness: As the Intellectual Capital Report has to present all data required by the order as a minimum it is not possible to concentrate on selected aspects of special importance. Connectivity of information is also reached only to a limited extent: Due to the detailed regulations it is difficult to draw a holistic picture.

Missing Content Elements are risks and opportunities as well as outlook (except for a requested outlook concerning the fulfilment of special objectives laid down in the performance agreement for the rest of the current agreement period). The “business model” is not described explicitly, but seems to be implicitly clear to a great extent.

As the universities are allowed to include additional information in the Intellectual Capital Report it would be possible to follow the Framework as far as risks and opportunities and outlook are concerned – with the reservation that the outlook might not be informative enough due to the universities' dependence of public funding which cannot be predicted reliably for years beyond the current performance agreement period. Also the organizational model (“business” is not an adequate term for universities) could be presented.

The notion of “value creation” can be applied to universities without problems because it is meant to refer to all kinds of “capitals”. As the Framework allows for an adaptation of the single capitals the concept of capitals is fully compatible with the Austrian universities' Intellectual Capital Report, especially with its classification of intellectual capital.

4. Conclusions

The International Integrated Reporting Framework is applicable to universities and could become a good basis for university reporting. The Austrian public universities' Intellectual Capital Report is following this framework to a great extent which could even be enlarged but it is impossible to comply with it completely as long as the current regulations concerning these reports are in force. Therefore, these regulations should be amended in a way which enables concise readable reports conveying value to the universities' stakeholders.

The Knowledge Management in Czech Industrial Enterprises

Josef Dobřický*

Department of Economics and Management, Head of department
STING ACADEMY private business college in Brno
Stromovka 1, 637 00 Brno, Czech Republic

Jiří Marek, Lubomír W. Novotný

TOSHULIN, a. s.
768 24 Hulín, Czech Republic

** Corresponding author*

Structured Abstract

Purpose – This paper builds on Special Track No. 7 “Intellectual Capital Knowledge Management Practices and Value Creation in Different Countries and Regions” and deals with the implementation of knowledge management in Czech industrial enterprises. The paper consists of three consecutive parts – the first part presents results of research focused on the usage of knowledge management in Czech enterprises, the second consecutive part is dedicated to knowledge, which is used in the complex production process in a high-end industrial enterprise. The last part of the paper is dedicated to the usage of value management as one of the most effective methods of using intellectual capital in innovative business processes.

Design/methodology/approach – The first part of the paper presents the results of research conducted in knowledge management area in Czech industrial enterprises. The second part is an internal view of a specific high-end enterprise which is focused on machine tools – vertical turning lathes. The paper sets the knowledge which each department needs for the successful management of knowledge. The next part shows the methodology and the use of value management – as one of methods of using intellectual capital within the enterprise. This section provides a brief technical-theoretical interpretation of value management and also a concrete example of the results of its use in innovation processes in manufacturing of machine tools.

Originality/value – The paper is completely original in the context of the Czech approach to the usage of knowledge management within Czech companies and can contribute to the approach to this topic. It is hence logical that this article is consecutive to the Special Track No. 7.

Practical implications – All three interrelated parts of the paper are linked to practical implications, whether they concern a relatively general approach of the research of knowledge management usage in Czech enterprises, or defining the knowledge necessary for successful management and production of individual products in various parts of a particular Czech industrial enterprise, or in the last part is the introduction

of value management methods which have been successfully used in top rated Czech industrial enterprises for more than 40 years.

Keywords – Knowledge management in Czech enterprises, Knowledge used in industrial enterprise management, Integration of knowledge in an enterprise, Value management.

Paper type – Practical Paper

The purpose of this paper is to familiarize the forum of IFKAD 2014 Conference with the situation of the knowledge management implementation in conditions of industrial enterprises in the Czech Republic and especially with specification of this situation at one of the leading manufacturers of CNC machine tools – vertical lathes. The text of our paper deals with more complicated and sophisticated products which originate based on confrontation of a customer's wish with possibilities of the enterprise. Therefore, the paper does not deal with knowledge management at origination of products with the consumer nature made in mass production, even if the perceptions mentioned below are valid for these products in many cases too. We are aimed at markets with industrial products which are characterized by a smaller number of customers, their sizes, complexity of products, inflexibility of delivery, variation of inquiries and usually by customers having great demands.

1. Introduction

The comprehensive application of the classical knowledge management, as it is mentioned in many methodical books, can be seldom found in our industrial enterprises. As examples, it is possible to mention one of our biggest energetic giants – ČEZ (Czech energetic plants) and a rather small-sized company Darkmay.

Knowledge management is still in the background of companies' interests in the Czech Republic and it is mostly developed and applied in supranational companies or bigger enterprises, as Marešová stated [Marešová 2010]. A lot of enterprises, especially of smaller ones, do not anticipate that there is knowledge management available, but they surely uses some of its parts.

In autumn 2009 a questionnaire survey was realized on the topics "Survey of the knowledge management state at enterprises in the Czech Republic" [Marešová 2010]. The survey was performed in cooperation of University in Hradec Králové, of Per Partes Consulting, s.r.o company and of European Union. The target of this survey was to map current standpoints of enterprises with regard to knowledge management. 1 000 organizations operating in the Czech Republic were addressed, these were from all branches and the survey was focused to middle-sized and big companies. 132 questionnaires were completed (the survey was anonymous). 3 areas were investigated:

1. What leads companies to the interest in knowledge management and in which stage they are currently:

- Why have you aimed to knowledge management?
- What results do you expect?
- Which knowledge is crucial one for you?

2. Company's environment as a tool specified to support, gain and share knowledge:

- How is crucial knowledge gained and shared ?
- Which barriers and risks of knowledge management are the most topical ones for you?

3. Methods and particular procedures connected with knowledge management and applied at the company:

- Which methods do you use to assess company's performance efficiency and which could be also used to measure results of knowledge management?
- How do you use knowledge management methods for innovation processes?

The brief analysis of collected answers resulted in the following conclusions:

a) Following reasons were mentioned why to implement knowledge management:

- reduction of costs (44%),
- increase of competitiveness (42%),
- need to develop individualized "tailored" products (28%),
- utilization of information technology possibilities (27%),
- increase of the extent of artificial intelligence incorporation in a product (12%).

b) Following knowledge management benefits were mentioned:

- improvement of business strategy (59%),
- trade improvement due to better knowledge of customers' needs (54%),
- expectation of bigger team spirit at company's work (30%),
- increase of company's value (31%),
- reduction of costs (26%),
- easier discovery of new business opportunities (32%).

c) Companies mentioned the following facts regarding to their own knowledge management utilization:

- knowledge management is not introduced as a whole in most cases (34%),
- company's management leaves initiative to individuals (62%),

- projects are realized for whole-company strategy (13%),
- business has been based on knowledge management (14%).

d) Companies considered the following knowledge to be crucial:

- knowledge of customers and their needs (68%),
- knowledge of the market and market possibilities (40%),
- knowledge of competitors and their strategy (38%),
- knowledge of the potential of immaterial intellectual assets for development of company's strategy (6%).

e) Forms how to gain and share knowledge were:

- regular trainings of customers (61%),
- common informal discussions in working teams (52%),
- controlled discussion or brainstorming (33%),
- sharing of documents in the information system (30%),
- creation of knowledge database (11%).

f) Barriers at knowledge management implementation were:

- problematic evaluation of employees' knowledge (30%),
- assessment of the knowledge management contribution by the company (29%),
- unclear returnability of investments to knowledge management (25%),
- unwillingness of people to share knowledge (26%).

g) Area of knowledge utilization were:

- searching of innovation possibilities (51%),
- complying with customers' wishes (37%),
- creation of a "tailored" product for a customer (32%).

If the results of the knowledge management survey in Czech enterprises are compared, they are rather similar to the results of surveys in other countries. Nevertheless, it is typical for our survey results that few enterprises (almost the negligible number of them) have the systematically and completely implemented methodology of knowledge management available and they work only with its parts and they are probably satisfied with application of these parts.

2. Knowledge management inside enterprises

Co-authors of this paper have personal long time experience in value management utilization in our enterprises. It is possible to mention applications of value management which can be considered to be one of the most effective methods used in innovation processes aimed at development of new products or at reduction of costs, or at both matters at the same time, thus at increase of the essential parameter which value management works with and which is called "customer value". The customer value is the proportion between customer's satisfaction with product parameters and costs necessary for product utilization.

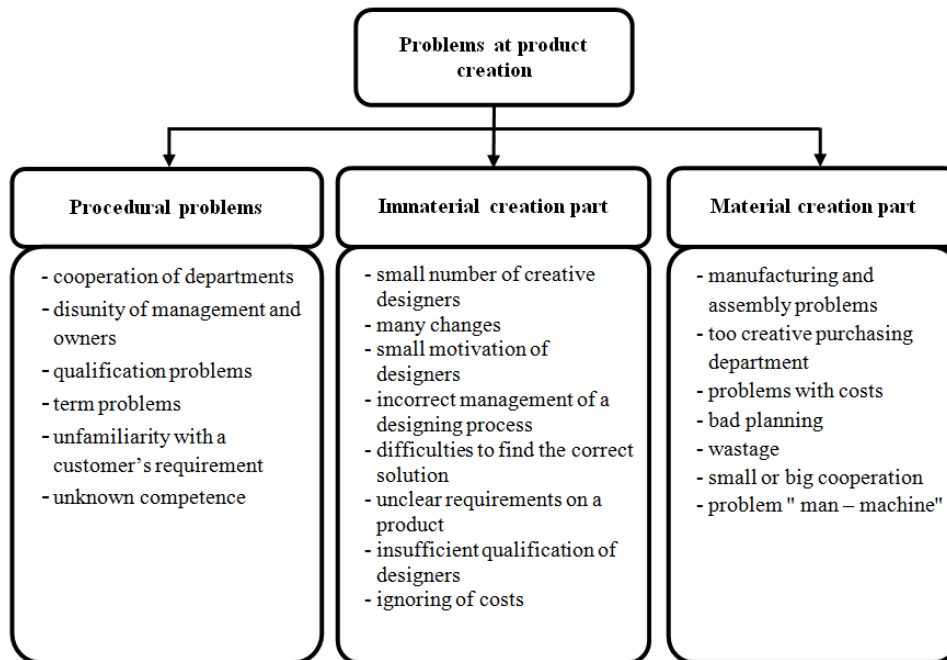


Fig. 1 Problems at product creation

Of course, it is necessary to use the system knowledge management in the whole product origination chain to obtain the high product customer value. Zelený (Zelený 2007) emphasizes "that knowledge is and it will forever remain the primary capital form and the permanent source of competitiveness. A traditional enterprise usually buys a lot of technology, it implements various functions and it collects a lot of data and information. Subsequently, the enterprise buys information systems and it fixes obtained information and information flows. Then, it borrows a lot of money ("capital"). In the

end, the enterprise finds that it has lack of knowledge and wisdom to find and reach the correct targets". There is no other possibility left that to agree to Zelený's statement. If knowledge is not managed sufficiently and if it is managed in the way described by Zelený, process problems will arise with product creation and these problems will be shown in the material part of product creation as well as in the immaterial part of product creation.

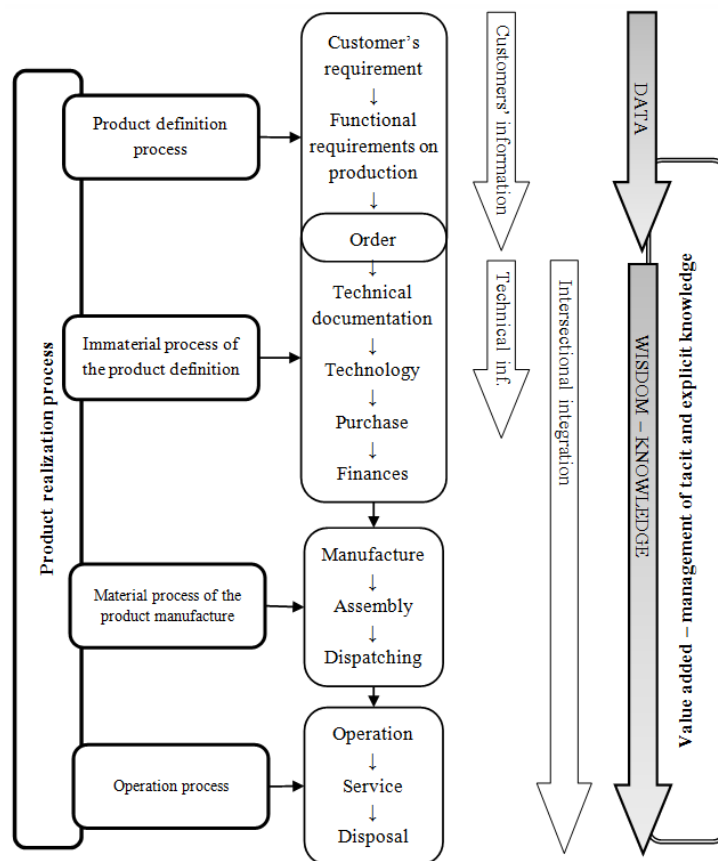


Fig. 2 Knowledge management in the product life cycle

Product creation has changed considerably at the turbulent time of current economy. Organization complexity of manufacturing companies, the demanding character of technology, integration of manufacturing technique and information technology have influenced economy and they have their considerable impacts also on product creation. The problems which can occur at product creation are given in the following Fig. 1.

The mentioned problems represent an example of those things which must be eliminated by knowledge management (Fig. 1). They are classified in three separated areas, but practice is more complicated, because these areas are interconnected together. This must be mastered by knowledge management.

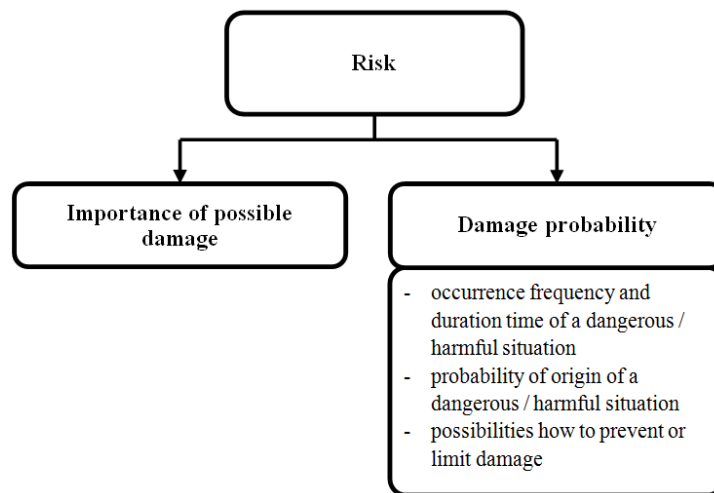


Fig. 3 Risks and possible damages

In our paper we would like to point out how a product originates in particular stages and which knowledge it is necessary to work with in these stages. We present a simplified model of product origin, beginning at expression of customer's needs, through its commercial, designing and technological processes and finishing with its delivery to the customer. This model is shown in Fig. 2.

All links of the product process mentioned in Fig. 2 are characterized by the fact that operations performed in one step (section) have smaller or bigger impacts on operations in the following section. It is important to minimize negative impacts. The negative impacts are connected with such terms as damage, damage management and probability of damage origin. Damage risk management is the essential tool of knowledge management, therefore it is necessary to mention it here. We are able to manage the damage origin risk by means of the risk analysis in each step of the product origin process. Detailed investigation of risk elements (Fig. 3) is provided by the risk analysis which is finished by the classified risk assessment and it should be also completed by damage estimation.

2.1 Knowledge and knowledge management in the commercial department

Employees of the commercial department are the first ones who are in a contact with the customer. These people define more or less customer's needs. Based on his or her knowledge and in cooperation with the technical and economical departments, the qualified employee of the commercial department informs the customer about the possibility how to fulfil the customer's wish, including the preliminary price determination. This process results in the offer elaboration and the offer must include the description of technical execution and the price. The well-elaborated offer can have a crucial impact on its profitability. When the offer is confirmed by the customer, this means in fact the end of possibilities to perform principal changes.

The following knowledge is managed in the commercial department:

- communication with commercial partners and customers,
- transfer of information about innovations in the company's production program to the customer,
- comments on impulses from commercial partners and customers and giving of these impulses,
- ability how to present the company,
- creation of new commercial contacts,
- elaboration of offers for commercial partners and customers,
- elaboration of purchase contracts,
- marketing activities,
- providing of warranty and after warranty customer care.

The followings risks are managed in the commercial department:

- incorrectly concluded contract relations and forms of their providing,
- good product calculation (profitability, loss rate),
- all other conditions connected with the product delivery (especially speed),
- unfamiliarity with customer's solvency,
- unfamiliarity with legislation in the customer's country.

All of this knowledge can be concentrated in the following formalized terms called:

- **Market intelligence** (reporting resulting from information about the particular market, its size and character, trends and directions of the future development, finding of new opportunities, detailed information about priority countries),

- **Competitor intelligence** (reporting about competitors, export strategies of other countries and manufacturers in the same branch and in the same country, etc.),
- **Product intelligence** (identification of possibilities how to improve the product quality to support export, costs, benchmarking, etc.),
- **Customer intelligence** (reporting about plans and activities of customers, exporters, associations, unions, chambers).

Note: Competitor intelligence and product intelligence are also in the focus of knowledge in the technical department (development, designing).

Unfortunately, the mentioned necessary knowledge which should be (must be) mastered by the commercial department are managed unsystematically. The appropriate attention is paid to this knowledge only in two limit cases:

- a) if an order is a great and interesting one,
- b) if there is lack of orders.

The following is necessary to manage knowledge in the commercial department successfully:

- to elaborate and maintain permanently customer databases,
- to elaborate and maintain permanently competitor databases,
- benchmarking of competitor offers,
- training of export staff about changing technical and manufacturing possibilities of the company,
- to keep databases of offers and implemented orders,
- cost analyses of profiling company's offers,
- training of staff about government export programs,
- standardization of processes for elaboration of contracts and contextual standardization of contracts,
- systematical education of people with regard to customers,
- systematical education of people with regard to offered products and their confrontation with customer's requirements,
- language education,
- to increase awareness about technical trends,
- to follow events on markets and export interests of the country.

2.2 Knowledge and knowledge management in the technical department

The technical department consists of a few sections having different contents of work. Therefore, knowledge management is very extensive in the technical department. The core of the technical department is the designing office which is clearly the base of the company's success on the market. The designing office decides up to 80 % about costs necessary for manufacture and moreover, the designing office is also responsible for product innovations which are the base of the company's competitive advantage on the globalized market. Designing can be characterized as a process where a solution of technical issues is found by means of various approaches and this solution serves to satisfy customers' needs as well as company's needs.

The designer works with the following knowledge:

- mathematics, physics and other sciences,
- customer's needs,
- limiting standards, superordinated restrictions and safety regulations,
- company's technological possibilities,
- company's assembly possibilities,
- ability of manufacturing and assembly,
- technical parameters of competitive products,
- team work,
- application of up-to-date designing support software,
- economical impacts of decision making at designing,
- economy of the future production,
- product intelligence and customer intelligence (see the previous item).

There are four essential approaches to designing available (Fig. 4). These are "attempt – error", intuitive designing (based on the existing knowledge and experience), procedural designing (based on methodical instructions) and designing based on theory (system approach).

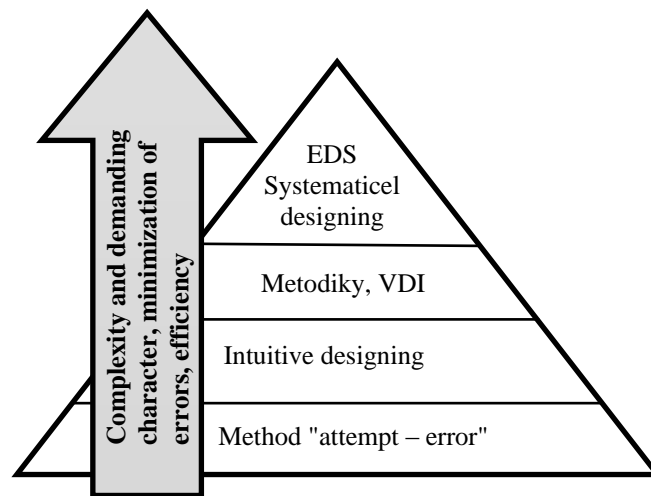


Fig. 4 Strategy of knowledge utilization at designing

When the demanding character of thinking is considered, the method "attempt – error" is the simplest method how to solve conceptual and structural designing issues. Its principle is based on a solution of the particular issue which is realized without any excessive methodical analyses, only on the base of designer's consideration.

Intuition is a higher degree how to solve conceptual and structural designing issues, applying designer's experience. Moreover, this problem solution way originates spontaneously, subconsciously, as a result of inspiration, fantasy or imaginations. The essential prerequisite for creative activity is the thorough and deep mastering of the topic, which requires intelligence as well as rich experience and education. Strong will and concentration are necessary to master the topic. Time required for preparation and collection of sources comes before a technical task is solved. The solution comes after long and exhausting work.

Methodical procedures represent the important contribution in methodology how to solve conceptual and structural designing issues. Methodical procedures originated in Germany (finally, the matter was standardized in the VDI 2221 directive called System approach to designing of technical systems and products).

Systematical approaches are called Engineering Design Science (EDS) abroad. EDS is a relatively new science branch which has been developing in the world since the forties and in our country since the sixties of the last century. After a lot of development stages,

in the last decade the development of EDS knowledge reached the qualitatively new level which can be designated as the support of knowledge integrated system designing.

The following knowledge is managed in the technical department:

- designer's creative and innovation knowledge and abilities,
- transfer of customer's requirements to a new design,
- competitors' similar solutions and patent purity connected with it,
- knowledge of simple similar designing solutions,
- comments from the service department and their inclusion to designing documentation,
- application of the maximum quantity of standard, typified and unified parts,
- consideration of operating conditions at designing (tropical climate, extreme cold, etc.),
- providing of warranty and after warranty customer care,
- application of the minimum number of non standard manufacturing procedures.

The followings risks are managed in the technical department:

- functionability of the designed solution,
- whether the new solution is really the optimum one in its technical and economical aspects,
- ability of manufacturing and assembly,
- whether the criteria selected to assess the optimum design are the same ones as customer's ideas,
- whether operation (wear of parts) does not disturb the product function during the warranty time,
- the purchasing department may not report the replacement of a prescribed part by another purchased part,
- non conforming manufacture and assembly with manufacturing documentation,
- unauthorized customer's interventions during the product warranty time.

The following is necessary to manage knowledge in the technical department successfully:

- systematical education of designers,
- to develop and build strategic knowledge management,

- elaboration and systematical maintenance of knowledge databases with internal rules, solutions already implemented, results of measuring and experiments, assembly procedures, successful and unsuccessful technical solutions, etc.,
- regular, systematical and controlled exchanges of information and designers' experience,
- to be in a contact with another company's sections, most of all with the service department,
- to keep the databasis of competitive technical solutions and parameters,
- benchmarking of competitive offers,
- to keep the databasis with realized offers,
- creation and maintenance of technical conditions of the own products,
- motivation to be creative, precise, professional, to perform radical innovations, etc.

2.3 Knowledge and knowledge management in the purchasing department

The purchasing department has the role to decide after an agreement with designers, which parts and assembly groups shall be purchased as ready-made ones (motors, bearings, hydraulic elements, etc.) and which materials shall be provided to manufacture the own parts. The purchasing department also determines which services or cooperations shall be purchased (if the cooperation department is included in the purchasing department). However, purchasing cannot be only understood as a service fulfilling the requirements given by the particular sections participating in product creation. Decision making becomes the strategic matter at purchasing and it can contribute to better quality and rapid course of creation of a new product. Decision making with regard to operative purchasing and strategic purchasing is connected with it. Strategic purchasing searches suppliers, it determines prices and elaborates contracts. Operative purchasing makes orders, provides transport, input inspection, delivery to the assembly department, etc.

The following knowledge is managed in the purchasing department:

- searching of subsuppliers and assessment of their offers,
- elaboration of high quality subdelivery contracts,
- elaboration and maintenance of the databasis with potential suppliers,
- observation and assessment of warranty claims,

- observation of the share of the target determined costs of products in subdeliveries,
- to limit the storage only to necessary items (do not bind unproductive capital).

The followings risks are managed in the purchasing department:

- well-timed delivery and its impact on the complete product delivery to the market,
- completeness of the delivery including the accompanying documentation and certificates,
- quality of subdeliveries (especially if the subsuppliers are changed to non proven ones),
- connectability of a purchased element to the assembly group.

The following is necessary to manage knowledge in the purchasing department successfully:

- systematical commercial and technical education of people in the purchasing department,
- education how to master interpersonal relations and communication,
- maintenance and renewal of the databasis with subsuppliers,
- observation of the current development work and trends in the designing and production departments and keeping of professional relations with these departments.

2.4 Knowledge and knowledge management in the production planning department and in the technology department

There is interconnection between the designing, technology and purchasing departments. Complexity and the demanding character of designing and purchasing processes results in the fact that designing solutions influence approximately 70 to 80 % of manufacturing costs, 20 to 30 % of costs are specified for technological processes. The manufacturing (technological) process consists in processing of semi products to their final shape. Two subprocesses can be distinguished here – the manufacturing process and the technological process. The manufacturing process represents all operations performed on a part and made in a particular sequence. The technological process determines how the manufacturing process shall be performed. It determines the particular machine, tools,

jigs and length of single operations. These activities are labour intensive ones and they require a lot of knowledge.

The following knowledge is managed in the technology and technological production planning department:

- creation of manufacturing procedures,
- parameters, sequence, time requirements, etc. of manufacturing operations,
- assessment of designing documentation regarding to the prescribed shape deviations, position deviations, accuracy, surface quality, etc.
- company's machinery and manufacturing capabilities with regard to the required manufacture,
- integration of changes to the technological procedures and manufacturing documentation,
- innovations on the market with tools and manufacturing technology,
- knowledge of workpiece chucking and designing of jigs,
- change procedures.

The followings risks are managed in the technology and technological production planning department:

- reality of time schedules of the production plan for manufacture of parts,
- capacity workload of the particular manufacturing centres,
- breach of technological discipline,
- unexpected outage time of machines.

The following is necessary to manage knowledge in the technology and technological production planning department successfully:

- to keep databases with technological procedures and their updating,
- solution of contradictory technical requirements and opinions of designers and technologists,
- assessment of manufacture of a single part in the complete context,
- to apply up to date software tools for automatized creation of technological procedures.

2.5 Knowledge and knowledge management in the financial department

The financial department is one of the departments which determine competitiveness of products on the global market, because it monitors costs of the product from the contract conclusion with the customer up to the product dispatching to the customer.

The following knowledge is managed in the financial department:

- real data for accounting,
- optimum company's financing,
- application of company's financial analyses.

The followings risks are managed in the financial department:

- changes of the exchange rate,
- lack of finances specified to cover orders,
- lack of finances specified to cover company's cash flow,
- unwillingness or inability to pay customer's obligations.

Knowledge management in the financial department is a very complicated and specific activity which is due to its contents beyond the possibilities and aiming of this paper. Management of the relations among the company's financial strategy, manufacture and costs, the prices and internal costs of the particular company's sections can be considered to be the crucial knowledge.

2.6 Knowledge and knowledge management in the production department

The production department has the task to manufacture the planned quantity of parts in the stated terms, to perform controlling of the manufactured assortment and operative and strategic manufacture management. The principal role in manufacture is represented by standardization and typization (standardized input sources, materials, manufacturing equipment, technological procedures, etc.). Complexity of production is conditioned by the fact, whether this is single part production, small lot production, series production or mass production. Because this paper describes single part production or small lot production of complicated manufacturing devices, our attention is aimed especially at these production types. The knowledge mentioned below must be managed at such production types.

The following knowledge is managed in the production department:

- knowledge of human and technological capacities within the enterprise,
- uniform, complete and economical utilization of manufacturing means,

- purposeful layout of manufacturing means with regard to the material flow (material, energy) and immaterial flow (information),
- profitable execution of manufacturing operations,
- searching and elimination of reasons, why non conforming parts are made,
- preventive service and maintenance.

The followings risks are managed in the production department:

- failures of manufacturing means, especially of strategic technology,
- non observance of the required quality prescribed by manufacturing documentation,
- breach of prescribed technological procedures,
- non conforming parts are not excluded from processes (and they are passed on the assembly).

The following is necessary to manage knowledge in the production department successfully:

- to build and to keep the qualified state of manufacturing technicians,
- to implement their professional and safety training,
- assessment (statistic and factual assessment) of the performed manufacture, past errors and utilization of results for training of people and to improve the quality of manufacturing processes,
- to observe accuracy and failure rate of manufacturing devices and to manage preventive service and maintenance,
- to choose and to influence purchase of new machines (based on monitoring of newly developed products which will come to manufacture).

2.7 Knowledge and knowledge management in the assembly department

Assembly is the last link in the technological chain of the material part of product realization. The assembly core is that two or more parts take a position to each other which is defined by drawings (by designing) and by technological procedures. The main operations performed during assembly are manipulation, putting together and connection.

The assembly process can be realized by various assembly types (Fig. 5). Internal assembly is performed at the manufacturer in the manufacturing enterprise on one workplace (immobile assembly) and if the particular parts are put together on various workplaces, we speak about mobile assembly. At this assembly way it is necessary

to keep the assembly cycle time between particular assembly groups and assembly subgroups. External assembly is performed at subsuppliers which supply the particular assembly subgroup to the manufacturer and the manufacturer builds this subgroup (the subgroup is integrated) to the whole unit in the own company (energetic chains including hoses and cables, gearboxes, etc.). The special kind of mobile assembly is represented by the automatic assembly line, where the band transports the particular parts to the particular assembly workplaces specified to make assembly subgroups.

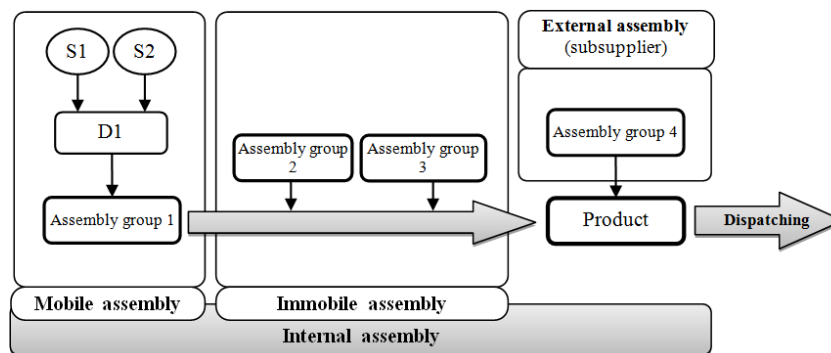


Fig. 5 Assembly types and their interconnection

The following knowledge is managed in the assembly department:

- well timed work finishing,
- uniform material delivery to the assembly workplaces,
- purposeful layout of manufacturing means with regard to the material flow (material, energy) and immaterial flow (information),
- profitable execution of manufacturing operations,
- elimination of reasons, why non conforming parts are made,
- preventive service and maintenance.

The followings risks are managed in the assembly department:

- non observance of the required quality and accuracy prescribed by manufacturing documentation,
- it is impossible to assemble the particular parts,
- delivery of a non conforming part to the assembly and its late discovery,
- breach of prescribed assembly and technological procedures,
- failures at delivery of parts to the assembly.

- The following is necessary to manage knowledge in the assembly department successfully:
- to build and to keep the team of qualified assembly technicians and their knowledge,
- to solve immediately the delivery of non conforming parts to the assembly,
- to provide the information feedback to the designing department and to the production department,
- to manage exactly relocation of people between the particular assembly workplaces,
- observance of time limits for partial assembly operations,
- to apply methodology and procedures of the final testing of the assembled product.

2.8 Knowledge and knowledge management in the dispatching and transport department

Dispatching and transport of finished products shall be performed while the product is properly fixed in a package or on a transport pallet. The package or the transport pallet must provide the protective function (to protect the product against its outside damage), the manipulation function (to provide easier manipulation with the product at its loading and unloading), the technical function (easy putting together and packing, suitability for the particular transport type and the particular region), the ecological function (recycling, no emissions of harmful substances) and the information function (information about the product and the transport destination). In the globalized world the product is delivered to the regions which are still more and more distant. Therefore, it is important to select the correct transport kind. Transport is usually included in the product acquisition price. The following transport kinds are used to transport goods: road transportation, railway transportation, river and sea transportation, air transportation and combined transportation.

The following knowledge is managed in the dispatching and transport department:

- selection of the suitable packing technique,
- volume minimization of the transported order,
- optimum transport ways,
- issue of correct documents in dependence on the customer's country type,

- determination of the suitable shipper.

The followings risks are managed in the dispatching and transport department:

- well timed product supply to the customer,
- suitable product package,
- origin of damages at loading and unloading,
- product ability to be transported
- transport insurance.

The following is necessary to manage knowledge in the dispatching and transport department successfully:

- to watch price policy of shippers and their reliability,
- to watch varying transport possibilities,
- to watch transport quality of past orders to the same region.

3. Role of knowledge management at the integrated product development

The integrated product development can be understood as a process, where a customer and particular departments of a manufacturing enterprise work together, e. g. by means of project proceedings or by means of another tool (may be using common sense). This process results in origination of a product having the optimized quality and price during the minimum time period.

The integrated product development must use company's sources, which are of course represented also by knowledge and knowledge management, to find a suitable way how to manage workers, managers and other staff in the engineering, production and marketing areas and to work together – to develop efforts throughout the whole company with the target to be competitive.

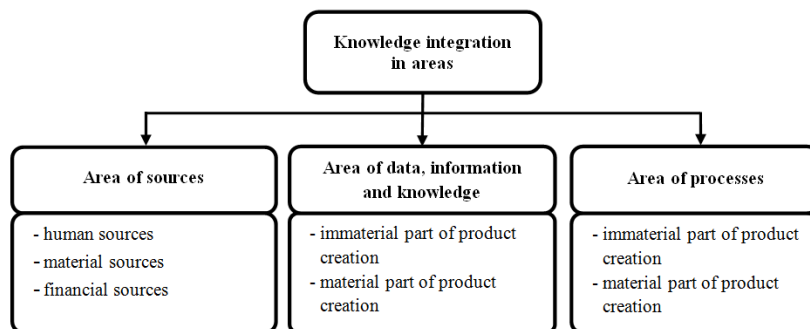


Fig. 6 Role of knowledge management in integrated production

In the first stage of attempts with "integration" the activity was aimed at integration of data which originated at designing (drawings) together with another section following with the activity, i. e. technological production preparation (technological procedures). These outputs had the character of instructions for other sections. Then, data of other company's sections started to be used (data of service and production, commercial and financial departments). The reason to do it was the reaction on often changes in creation of all documents connected with product origination. Suppliers of subdeliveries started to join too. CIM (Computer Integrated Manufacturing) – i. e. production integrated by a computer – began to come into existence.

Practical experience showed that such data integration itself does not mean achievement of competitiveness on the market. Recent approx. 20 years have confirmed that it is necessary to go one degree higher, over data integration and to start to manage knowledge – introduction of knowledge management to all enterprise management sections. This must be done with all attributes belonging to management of the knowledge enterprise (Section No. 2).

Reasons of insufficient knowledge management are shown in failures originated in the particular sections and these failures can be e. g.:

- incorrect offer and incorrectly concluded contract due to unfamiliarity with detailed customer's requirements,
- bad determination of the dispatching date due to unfamiliarity with manufacturing capacities,
- insufficient transfer of customer's requirements to the internal order in the enterprise,
- errors in technical documentation due to incorrect knowledge management in the designing department,
- changes due to unfamiliarity with exact customer's requirements,
- errors in continuity of assembly groups due to unqualified purchase of subdeliveries,
- bad manufacturing and assembly technology due to unfamiliarity with requirements of the designing department,
- unprofessional dispatching due to non-consideration of transport conditions,
- it is impossible to perform service due to incorrect designing inputs, etc.

Fig. 7 shows the idea about integrated connection of knowledge required to say about an enterprise that this enterprise is managed based on knowledge (knowledge enterprise). Cross arrows show that integrated knowledge transfer does not occur in the linear way, but this transfer is a rather complicated selection process which passes through the company's hierarchy. So, the company's management need not have all knowledge as their subordinates and staff need not have all knowledge as their management. Passing of knowledge through processes and sections and its progressive building are matters of time, finances and quality of management people. Integrated connection arises step by step and it is impossible to implement it at once en bloc. Nevertheless, it is possible to say that each partial knowledge process introduced to the enterprise can contribute to increase its competitiveness, regarding to the increase of the technical product level and especially regarding to reduction of its costs. Efforts of knowledge management are focused on these fields even at the current time.

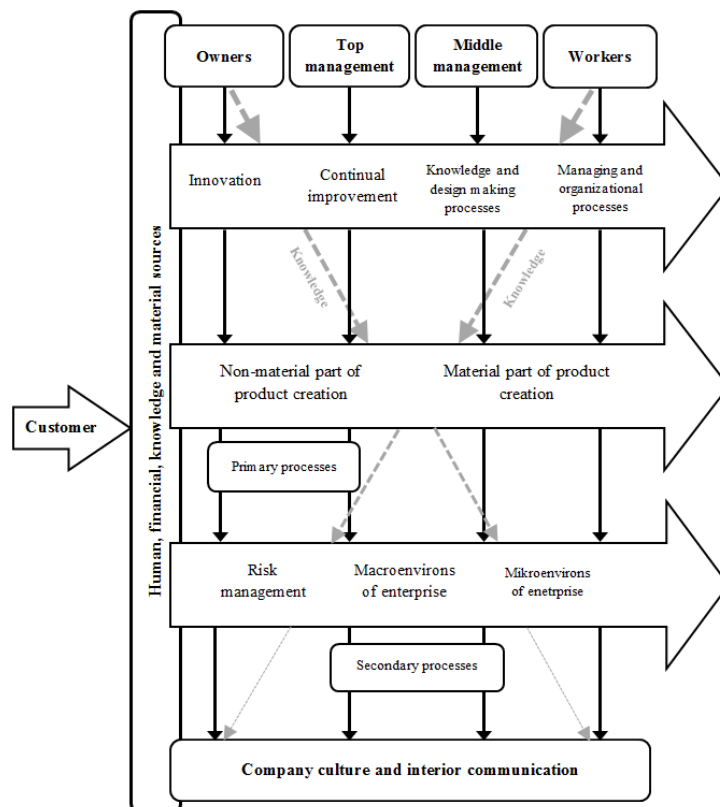


Fig. 7 Knowledge management integration in a manufacturing enterprise managed as the "knowledge" enterprise

4. Value management - one of the best tools of knowledge management

The current worldwide development trend of industrial and social processes takes place especially on the level of the development dynamics of intellectual resources and their reflection in application of knowledge management in practice. This paper does not avoid mentioning and describing shortly one of very efficient methods which use intellectual resources in companies. Ian Brinkley [Brinkley 2009] is famous due to his motto "Companies, which are able to understand how important is to know what their knowledge is, are able to use this knowledge to the maximum possible measure. These are their corporate knowledge assets." And especially the value management is one of very strong intellectual assets which companies can use very thoroughly and to a considerable extent.

Value management was formed based on war experience of American engineers – designers and businessmen who faced shortage of necessary raw materials. The solution was found by application of substitute materials and by corresponding modification of design and technologic processes which satisfied fully all needs of customers, especially from armament industry at that time. On the base of that practice in General Electric Company L. D. Miles, a young and creative supply officer was charged to implement this intention [Miles 1961]. He started to outline systematically the functional approach at reducing of costs, where the major idea was to search substitute solutions based on the fact, that the function of the explored object must remain the same one, because this function is particularly interesting for the customer. Miles called the methodology made in this way Value Analysis, because the basis for analyses of designs of substitute solutions was the ratio between Performance and Costs which was called Value by L. D. Miles, the author of this method [Miles 1971]. The methodical process was formulated in the sequence of 5 essential questions:

1. WHAT IS IT? (What object is this?)
2. WHAT DOES IT MAKE? (What does it make, which functions has the object?)
3. HOW MUCH DOES IT COST? (Which costs are necessary to provide the object function?)
4. WHAT ELSE CAN PROVIDE THESE FUNCTIONS? (Which other ideas and designs can provide these functions in a high quality?)
5. HOW MUCH DOES ANOTHER POSSIBILITY COST? (Which costs are necessary to provide the functions by new designs?)

Immediately after the war this resulted in the fact, that the approach verified in this way became one of many tools to reduce manufacturing costs also in peace-time production, and it is necessary to say that this tool was one of the most efficient tools. It spread all over the world. In 1965 this method was applied in so called socialist economy for the first time. It was in the Czechoslovak Republic, in Zetor Brno, tractor company. This essential methodical process remained unchanged for more than 60 years. However, what was successively changed in particular countries, was more precise specification of this process, usually in some more detailed years, as it is witnessed e. g. by methodology given in the Czech and European standard Value management ČSN EN 12973: 2000.

In the past years Czech professor Vlček (Vlček 2002) with the collective, created successively the comprehensive concept of the value management system based on the knowledge with classical value analysis. The value management system consisted in four types of tasks which are called application disciplines of value management and result in increasing of the product customer value. These are:

1. **Value analysis** which represents an effectively made set of methods and means, whose sense is to improve the analysed object by searching an improved solution of its functions, with the target to increase its customer value (improving its utility parameters or reducing its manufacturing costs or by the combination of both possibilities).

2. **Value designing** (value engineering) represents an application of the value approach when creating a new object (product, process, investment, organization structure) in respect to obtain a higher degree of innovations. Also here, the target is to design a new product with higher customer value.

3. **Value product strategy** is a continuous process in well managed companies, by means of which these develop their production programs. The production program set in this way must be: competitive and exportable. Product strategy has also the task to decide about attenuation programs and about modernization of current products.

4. **Inverse value** analysis is a special case of value analysis. It consists in searching a more efficient object utilization using the value approach.

The following Fig. 8 shows the position and importance of value management in the strategic management system of the enterprise and its application in value production strategy (it is necessary to begin there), through value projecting at new products up to its utilization to improve existing products.

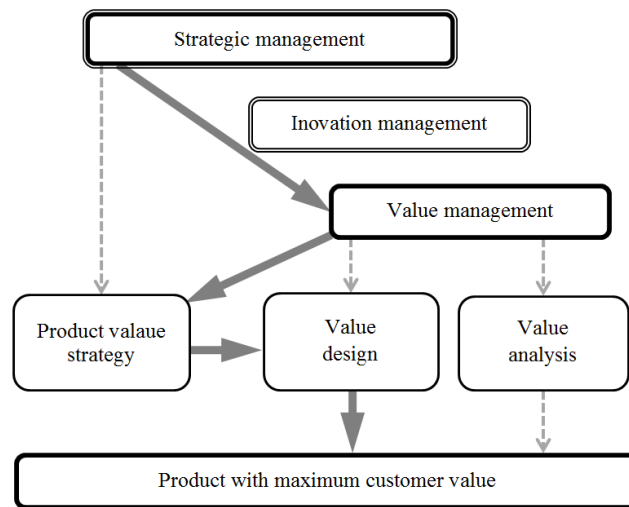


Fig. 8 Application of Value Management in the innovation structure of the enterprise

The Customer Value belongs to the key terms in market economy. Czech technical standards harmonized with EU characterize "value" or the general understanding of the customer value as "relation between satisfaction of needs and sources used to obtain this satisfaction". The mentioned relation can be described by the following formula:

$$\text{Customer value} = \frac{\text{Satisfaction of needs}}{\text{Used sources}}$$

after quantification:

$$\text{Customer value} = \frac{\text{Benefit amount}}{\text{Total customer costs}}$$

This defined value is not the absolute category but a relative one, which is conditioned by a different purchasing position of every customer. The manufacturer offering his products on the market takes into account that it is not possible to try to obtain the maximum benefit, but it is necessary to find the parameters characterizing the benefit amount on such a level which will be suitable for the particular group of customers, for that segment for which the product is intended. So, **the benefit must be optimized**, not maximized. On the other hand, total costs, i. e. manufacturing ones as well as user ones, and also the **price for the final customer must be minimalized**, which creates the premise of a commercially successful product.

Customer value will be increased (based on the previous considerations) in the following four cases:

1. when benefit increases and total costs do not change,
2. when benefit increases and total costs decrease,
3. when benefit remains the same and total costs decrease,
4. when benefit decreases more slowly than total costs.

These are four ways to company's higher prosperity, competitiveness and commercial success.

It follows logically from the above mentioned customer's and manufacturer's standpoints, that both parties must meet in the common field which is the effort to obtain the maximum customer value. The maximum customer value creates the core of commercial success and competitiveness of products and services. This maximum customer value seems to be a certain intersection point of customers' economical interests and manufacturers' economical interests. The following Fig. 9 shows all mentioned ways how to increase customer value.

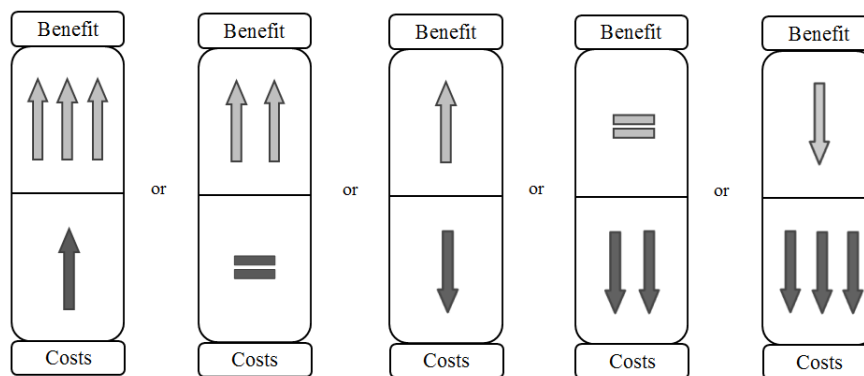


Fig. 9 Possibilities how to increase customer value

Application of value management is based on the unique organic combination of four key principles which are (Vlček 2002):

- management style (concentration on a customer, maximization of customer value),
- utilization of those terms: function, creativity, quantitative assessment of benefit and used sources,

- human dynamics (high quality communication creates environment for synergy of economical, technical and managing skills, abilities and knowledge within team work),
- respecting of environment (external environment – laws, standards and restrictions, internal environment – company’s policy, company’s organization architecture, know-how, etc.),
- methods and tools (preparation and elaboration of value management projects, methods and technique used at elaboration of value management projects).

The VUSTE research institute in Brno where the first realization of value analysis was performed was successively established as a control and development centre for implementation. It kept this task up to its end in 1990. From the seventies up to the nineties the implementation was performed on the basis of contracts with the particular plants, where the plants had about 50 designers and technologists trained at the same time. This was done in the form of work training organized in teams having 6 – 8 people who solved company’s particular smaller projects using this training form. In such a way they connected theoretical education with its immediate realization in solved projects.

After the 1989 revolution the approach of single plants was changed considerably. After the stabilization of companies, in many cases also under the influence of new owners, they started to come back to searching of methods which can be used for innovations of their products, e. g. to increase their utility value or to reduce manufacturing costs and very often to perform the both. It was done and it is still done in such a way that the companies hire an external and skilled specialist, whose priority is not to train workers in value analysis, but together with the set team of company’s specialists, to solve more complex projects having the exact innovation target. Since 1990 the co-author of this paper has solved almost 40 projects of value analysis and value engineering as a methodical leader of teams in various plants. It is necessary to say that the plants reserve very little time for the projects, so in many cases it is not possible to apply the full scope of value analysis methodology, but only its reduced form keeping all essential methodical elements, especially functional analysis, application of creative work methods, assessment of subjects, etc. In spite of that, the work results of teams working under the external specialist’s leading are very good, even excellent. It seems to be almost unbelievable that all projects showed good results in the mentioned implementation companies.

The Tab. 1 [Dobřický 2009] shows an example of the output from the value product strategy realization and from the value designing. This is only a data selection in range of machine tools because there is no room here to perform the detailed study of the particular items in the rather extensive analysis.

Tab. 1 Example of the output from the value product strategy realization and from the value designing

Company	Year	Machine	Savings [%]
ZPS	1993	Machining centres MCFV 80, 100, 120	17,1
	1994	Electrical outfit MCFV 80, 100, 120	33,9
	1994	Multi-spindle automatic lathe SAY 6/32 mech. sk.	26,7 15,2
ZPS - SV	1998	Lathe CNC S50 Fan.	17,5
Kovosvit MAS	2000	Application at Masturn MT 50 CNC	3,5
		Application at Masturn MT 70 CNC	
	2003	Semi-automatic lathe SPM16	11,5
		Application at SPU 20	
		Application at SPU 40	
	2004	Vertical machining centre MCV1270R	11,1
Application at MCV 1000			
Application at MCV 2000			
	2004	HI Unit-built lathe SP	
TOSHULIN	2009	Vertical lathe SKG 40	31,7
	2010	Vertical lathe SKY 20	6,3
	2010	Vertical lathe SKL 12 ECO	51,7
	2011	Machine for machining of railway wheels EXPERTURN 1400	11,2
ŠKODA MACHINE TOOL	2011	Spindlestock of horizontal boring and milling machine HCW	4,9

Conclusions

1. The presented article combines three areas of knowledge management utilization in Czech enterprises. The first deals with research and its use in Czech enterprises. The second attempts to define the knowledge used in a high-end industrial enterprise and the third part presents the use of long-term utilized innovative method - value management and its contribution to cost reduction and the finding of successful innovations on progressive machine tools.

2. Comprehensive utilization of knowledge management is not typical for Czech enterprises. Yet it is possible to find enterprises that could be labeled as learning enterprises and some even bear the label “knowledgeable”.

3. What is much more popular and has a long and successful tradition in the Czech Republic, including proved and positive results, is the theoretical development and practical utilization of value management methodology.

4. The whole article, even though it is complex, gives a relatively comprehensive picture of the real state of knowledge management in Czech industrial enterprises.

Wealth Creation in the Knowledge Economy. Reflections on the case of Spain

José María Viedma Marti

Polytechnic University of Catalonia, Barcelona, Spain.

Abstract

Purpose - After an introductory approach on the definitions and main characteristics of the knowledge economy the paper focuses on the three following purposes: 1) Discovering from the existing relevant literature on competitiveness, innovation and intellectual capital at the macro level which are the principles and theories that guide nations' wealth creation in the knowledge economy context. This part tries to answer two fundamental questions: Who creates wealth? How wealth is created? 2) Finding out the suitable methodology or framework in order to enable an in-depth diagnosis of a nation's actual knowledge driven competitiveness foundations, with the aim to aiding in the definition of the possible vision, objectives and lines of action to embrace in order to enable innovation and sustainable economic growth. 3) Applying the suitable methodology or framework for an in-depth diagnosis of the Spain crises and using the insights given by the in-depth diagnosis for having some light on the future economic development possibilities and on lines of action to be taken in order to foster innovation and sustainable economic growth.

Design/Methodology/Approach - This practical research falls among the design science research approach that tries to find out methodologies for solving practical problems. Having in mind the practical objectives of purpose 3, the methodology approach for purpose 2 will be the following: According with principles and theories of wealth creation there is a close relationship between wealth creation and competitiveness and consequently trying to find out methodologies and frameworks for an in-depth practical diagnosis of a nation's knowledge driven competitiveness foundations, leads us to the World Competitiveness Report from World Economic Forum (WEF) and World Competitiveness Yearbook from International Institute for Management Development (IMD), the two most relevant considering their up to date data bases, historical performances and scientific approach. Intellectual Capital community methodologies at the macro level are also considered as alternative approaches to the competitiveness frameworks. Finally we finish the review and valuation of competitiveness and IC macro dimension frameworks considering NICBS (Nations' Intellectual Capital Benchmarking System) and enhanced NICBS methodologies as the more suitable for the above in-depth mentioned diagnosis. In essence the approach followed in purpose 3 has been a review of scientific literature on competitiveness and IC macro dimension with the exclusive aim of finding out the practical framework that could make it possible an in depth analysis of a nation knowledge based competitiveness foundations.

Originality/Value - The paper is fully original because the in-depth economic reflection on the crisis of Spain is performed using methodologies and frameworks that consider

knowledge and other intangibles as the main foundations of competitiveness, innovation and sustainable economic growth.

Theoretical/Practice implications - The reflections arising from the paper have mainly practical implications and will guide in the decision making process not only savers and investors but also government and institutional authorities.

Keywords - Competitiveness, innovation, intellectual capital, intangibles, knowledge based development, nation.

1. Introduction

During the last fifteen years some fundamental changes have occurred in the world and more specifically in the way the world economy creates wealth.

These changes are summarised by Laurence Prusak (Neef, Dale 1998) as follows:

- A) The globalization of the economy, which is putting terrific pressure on firms for increase adaptability, innovation, and process speed.
- B) The awareness of the value of specialized knowledge, as embedded in organizational processes and routines, in coping with the pressures of globalization.
- C) The awareness of knowledge as the distinct factor of production and the role in the growing book value to marked value ratios within knowledge-based industries.
- D) Cheap networked computing, which is at last giving us a tool for working with and learning from each other.

Since 1998, when Prusak wrote about the changes, an unstoppable progress on multimedia and information and telecommunication technologies has completed the above mentioned four changes.

Reflecting on the content of the changes we arrive to the conclusion that knowledge has become the fundamental factor of wealth creation in the present economy, because there is no sustainable advantage other than what a firm knows, how it can utilize what it knows, and how fast it can learn something new.

As a consequence of such great importance of knowledge as an economic factor a new phrase or expression has become almost commonplace. It is the phrase “knowledge economy” or the equivalent “knowledge-based economy”. There are many definitions of

this phrase or combined concept and two of them have been selected for the relevance in their content. They are the following:

“... one in which the generation and exploitation of knowledge has come to play the predominant part in the creation of wealth. It is not simply about pushing back the frontiers of knowledge; it is also about the most effective use and exploitation of all types of knowledge in all manner of economic activity” (DTI Competitiveness White Paper 1998)(Brinkley, 2008)

“economic success is increasingly based on upon the effective utilisation of intangible assets such as knowledge, skills and innovative potential as the key resource for competitive advantage. The term “knowledge economy” is used to describe this emerging economic structure” (Economic & Social Research Council 2005)(Brinkley, 2008)

The purpose of the paper is double:

First finding out the suitable methodology or framework in order to enable an in-depth diagnosis of a nation’s actual knowledge driven competitiveness foundations, with the aim to aiding in the definition of the possible vision, objectives and lines of action to embrace in order to enable innovation and sustainable economic growth.

Second applying the suitable methodology or framework to the in-depth diagnosis of the Spain case and using the insights given by the in-depth diagnosis for having some light on the future economic development possibilities and on lines of action to be taken in order to foster innovation and sustainable economic growth.

2. Wealth Creation in the Knowledge Economy

Wealth creation in the knowledge economy context is closely linked with the concept of competitiveness. There are many definitions of country competitiveness. Among them one of the most cited is the OCDE official definition that follows:

“The degree to which a country can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the long term”.(OECD “official” definition 2002)(Garelli, 2002)

At the same time relationships among country competitiveness, wealth creation and knowledge economy are stressed in the following citations:

“Nations themselves do not compete, rather, their enterprises do. There is no doubt that competitive enterprises are the main engines of a country's competitiveness”.

“The role of nations in shaping the environment in which enterprises operate influence their competitiveness”.

“Competition among nations can be seen in the areas of education and know-how. In a modern economy, nations do not rely only on products and services, they also compete with brains. The ability of a nation to develop an excellent education system and to improve knowledge in the labor force through training is vital to competitiveness”. (Garelli 2002)

“It is well understood that sound fiscal and monetary policies, a trusted and efficient legal system, a stable set of democratic institutions, and progress on social conditions contribute greatly to a healthy economy.

I have found that these factors are necessary for economic development, but far from sufficient. These broader conditions provide the opportunity to create wealth but do not themselves create wealth.

Wealth is actually created in the microeconomic level of the economy. Wealth can only be created by firms. The capacity for wealth creation is rooted in the sophistication of the operating practices and strategies of companies, as well as in the quality of the microeconomic business environment in which a nation's companies compete. More than 80 percent of the variation of GDP per capita across countries is accounted for by microeconomic fundamentals. Unless microeconomic capabilities improve, macroeconomic, political, legal, and social reforms will not bear full fruit”. (Porter 2005)

And because wealth can only be created by firms, the following Peter Drucker citations on efficiency and effectiveness will complete the landscape of wealth creation principles in the knowledge economy at nation or country level. They are:

Efficiency is the ability to get things done correctly. Managers who are able to minimize the cost of the resources they use to attain their goals, are acting efficiently.

Effectiveness, on the other hand, is the ability to choose appropriate objectives. An effective manager is one who selects the right things to get done. A manager who selects an inappropriate objective is an ineffective manager. No amount of efficiency can compensate for lack of effectiveness. The manager's need to make the most of opportunities implies that effectiveness rather than efficiency is essential to business. The pertinent question is not how to do things right, but how to find the right things to do, and to concentrate resources and efforts on them. (Drucker, 1967)

The above fundamental citations pave the way for the more systematic description of wealth creation foundations in the knowledge economy that follows:

The advent of the knowledge economy has fundamentally changed the basis of wealth creation in modern social communities and knowledge and other human based intangibles have become the fundamental resources for wealth creation.

The theoretical foundations of wealth creation in the knowledge economy are mainly found at the micro level in the modern strategic management discipline and more specifically in the three well known following perspectives: the resource based view, the dynamic capabilities based view and more recently the knowledge based view.

These theoretical foundations at the micro level have to be complemented at the macro level with recent developments on what is called strategic management of intangibles in cities, regions and nations. These recent developments are based on a complex body of principles and theories, such as institutional and evolutionary economics, cultural and social economics, systems theory, systems and innovation, triple helix, regional science and more recently knowledge based development.

Based on the above mentioned theoretical foundations some basic principles on wealth creation in the knowledge economy context can be deducted (Viedma & Cabrita, 2011). They are the following:

1. A free-market economy with inclusive democratic political institutions is the sine qua non condition for sustainable economic and social development.
2. Wealth or poverty of a specific nation is strongly dependant on the number of competitive or excellent companies that the specific nation has.
3. Government does not create wealth but contributes to facilitate or to hinder wealth creation.

4. An excellent or competitive company is the one that achieves long term extraordinary profits due to the fact that has a business model with sustainable competitive advantages.
5. In the knowledge economy sustainable competitive advantages are mainly based on intangibles. Consequently strategic management of intangibles or intellectual capital becomes a fundamental task.
6. In order to achieve business excellence strategy perspective is the key one.
7. Business excellence is always due to good strategy formulation and superior strategy implementation.
8. Good strategy formulation and superior strategy implementation is always a human task and strongly depends on the quality of the top management team and the key professional people.
9. In a continuous changing environment business models quickly get out-of-date and as a consequence of that, innovation in business models¹ becomes an urgent need.
10. In any company the essential activity to perform is always innovation in the business model so it can be converted in an excellent or competitive business model.
11. Companies alone do not create wealth. They need the collaboration of other companies, universities and research institutes, financial institutions, government and other organisations and institutions and specially the existing ones in the cluster, region or nation where the company is located. In other words they need to be active part of a territorial open innovation system and of, what some authors like to call, knowledge based ecologies.
12. When in principle 5 we state that strategic management of intangibles or intellectual capital is a fundamental task for gaining and sustaining competitive advantages we refer mainly to companies but strategic management of intangibles needs also to be applied to the government of clusters, regions or nations in order to build territorial open innovation systems or knowledge based ecologies.

¹ We consider, in this particular context, that innovation in business models, encompass all types of innovations, including products, services, processes, technical, management, etc.

Following the criteria of the above principles this paper is dealing with wealth creation at the macro level in the knowledge economy context and consequently mainly considers knowledge based ecologies that have been mentioned in principle 11. Because that reason some more details are given on these ecologies.

As it has been said before in the knowledge economy firms alone are unable to create wealth. They need to be part of a suitable micro cluster, cluster, region or nation where innovation is considered a key competitiveness factor and where knowledge and learning capabilities (i.e. technical and learning skills and capabilities, knowledge infrastructure, networking capacity, values systems and attitudes) are the main ingredients that conduce to innovation systems and innovation processes. That means that governments should play a role, not only in providing macroeconomic stability, adequate incentives, and the technology and financial infrastructure for firms to compete, but also in promoting the types of linkages (across the triple helix of industry, government and universities) and institutions and a collaborative trust-based innovative culture, that are the sine qua non conditions for a sustainable economic development.

3. Finding out methodologies and frameworks for an in-depth diagnosis of a nation's knowledge driven competitiveness foundations.

Trying to find out methodologies and frameworks for an in-depth diagnosis of a nation's knowledge driven competitiveness foundations, we quickly realize that World Competitiveness Report from World Economic Forum (WEF) and World Competitiveness Yearbook from International Institute for Management Development (IMD) are the two most relevant considering their historic performance and scientific approach. The analysis of alternative methodologies and frameworks other than the two mentioned above has not been made in this paper. More information dealing with this analysis can be found in RICBS (Viedma&Martins 2006). The criteria for selecting these methodologies have two support points. The first point concerns the scientific foundation and the second point refers to the systematic information on competitiveness of developed economies, which over a long period of time these methodologies have provided.

In section 3.1 we will note the main competitiveness methodologies and frameworks.

Next in section 3.2 we will describe the IC community frameworks or in other words the IC community contributions to enable an in-depth diagnosis of a nation's knowledge driven competitiveness foundations.

Subsequently in section 3.3 we will introduce NICBS as the methodology that synthesizes and embodies the micro and macro principles of wealth creation formulated and described in section 2.

Finally in section 3.4 we integrate the WEF competitiveness framework into the NICBS framework in order to produce the Enhanced NICBS framework, that later on will be used for reflecting on the case of Spain.

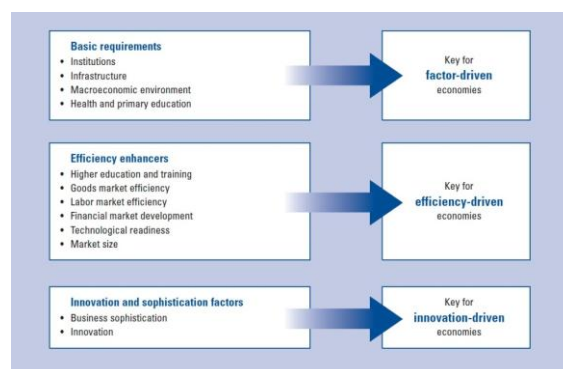
3.1 Competitiveness frameworks.

We have stated in section 3 that the two main methodologies and frameworks were the following:

World Competitiveness Report from World Economic Forum (WEF) (Schwab, *et al*, 2011) and World Competitiveness Yearbook from International Institute for Management Development (IMD 2010).

There are other methodologies such as the European Innovation Scoreboard (EIS2011) and K4D (K4D2011) World Bank that cover specific aspects and consequently are less relevant considering the specific purpose of the paper.

Following in figures 1 and 2 we illustrate the main factors or components of the two above mentioned methodologies.



Source: The Global Competitiveness Report 2012–2013.
http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2012-13.pdf

Figure 1: The 12 factors of competitiveness of W.E.F. (Klaus *et al*, 2011 pp.9)

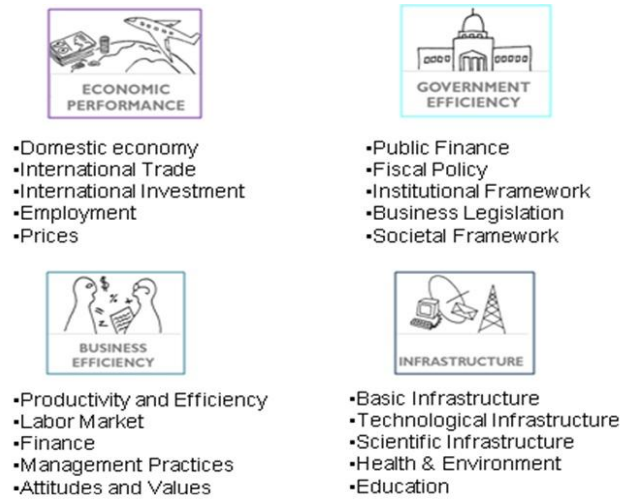


Figure 2: The I.M.D. World Competitiveness Yearbook 2009 4 factors.
<http://www.imd.org/news/WorldCompetitiveness2013.cfm>

3.2 IC Community frameworks

Considering that the mode of wealth creation has shifted from a mass-production economy to an economy of knowledge, where the key drivers of growth are intangible (Romer 1986; Drucker 1993), national level IC has recently emerged as a new topic of research, where the focus is on understanding intangible drivers of national wealth creation.

The IC community efforts have crystallized in a set of IC models at nation level. Some of these models are noted in figure 3 that follows.

Country	Author/year	STRUCTURE					
European Union	Bounfour, 2003	Resources, processes and outputs.					
	Andriessen y Stam, 2004	Human, structural and relational.					
Spain	Martins and Viedma, 2005	Region's Competitiveness Intellectual Capital Platform and Microcluster's Competitiveness Intellectual Capital frame.					
OECD	Hervás and Dalmau, 2007	Human and educational, technological infrastructure, linkages, firm's strategies, business policy, social block, market block, economic performance.					
51 countries	Stähle and Bounfour, 2008	Economic performance, government efficiency, business efficiency, and infrastructure on a national level (structure from IMD Competitiveness Report).					
		From Skandia Navigator					
		Financial	Human	Market	Process	Renewal & Development	Others
Sweden	Stenfelt et al., 1996; Rembe, 1999		x	x	x	x	
Israel	Pasher, 1999		x	x	x	x	
Malasya	Bontis et al., 2000	x	x	x	x	x	
Spain	Pomeda et al., 2002		x				Technological and Social
Arab Region	Bontis, 2004	x	x	x	x	x	
Nordic Countries	Yeh-Yun and Edvinsson, 2008		x	x	x	x	

Figure 3. IC Community contributions. Source: Hervás-Oliver, J.L.; Rojas,R.; Martins,B.; Cervelló-Royo,R. (2011) "The overlapping of national IC and innovation systems", *Journal of Intellectual Capital*, Vol. 12 Iss: 1, 111 – 131

A more systematic approach of IC community contributions can be found in a new recently issued book on National Intellectual Capital (Yeh-Yun Lin.C, Edvinsson Leif, 2011), where National Intellectual Capital Models proposed by individual researchers are listed. An excerpt of this list with some key features is given in figure 4.

Initiatives	General Basic Model	Structure	Indicators
Sweden (Rembe, 1999)	Navigator Skandia	- Human Capital - Market Capital - Process Capital - Renewal Capital	Financial indicators Descriptive indicators
State of Israel (Edna Pasher & Associated, 1999)	Navigator Skandia	- Human Capital - Market Capital - Process Capital - Renewal & Development Capital	Financial indicators

Arab Region (Bontis, 2002)	Navigator Skandia	- Financial wealth - Human Capital - Market Capital - Process Capital - Renewal Capital	Descriptive indicators. Intangibles indicators. Financial indicators.
Malasya (Bontis, 2002)	Navigator Skandia	- Financial wealth - Human Capital - Market Capital - Process Capital - Renewal Capital	Descriptive indicators. Intangibles indicators. Financial indicators.
Sweden (SPRING PROJECT 2002)	Navigator Skandia	- Business Recipe - Human Capital - Structural Capital - Relational Capital	Innovation indicators. Competence indicators. Industrial indicators. Company- Universities indicators.
Madrid, Spain	Navigator Skandia	- Human Capital -Organizational capital -Technological capital -Relay capital -Social capital	Descriptive indicators. Intangibles indicators Innovation indicators
Finland (Stähle and Pöyhönene 2005)	Navigator Skandia	-Human focus -Market focus -Process capital -Renewal & development focus	Industrial indicators National indicators Financial indicators

Figure 4. IC Comunity contributions from Yeh-Yun Lin.C and Edvinsson Leif, 2011
Source: Revised from Pomedá et al.(2002)

In addition C.Y.-Y.Lin and L. Edvinsson have proposed a new National Intellectual Capital Measurement Model that includes a carefully selection and validation of indicators. In figure 5 we include the variables in each type of capital of their model.

Variables included in National Intellectual Capital Model

Human capital index

1. Skilled labor a
2. Employee training a
3. Literacy rate
4. Higher education enrollment
5. Pupil-teacher ratio
6. Internet subscribers
7. Public expenditure on education

Market capital index

1. Corporate tax a
2. Cross-border venture a
3. Culture openness a
4. Globalization a
5. Transparency a
6. Image of country a
7. Exports and imports of services

Process capital index

1. Business competition environment a
2. Government efficiency
3. Intellectual property right protection a
4. Capital availability
5. Computers in use per capita enterprises
6. Convenience of establishing new firms a
7. Mobile phone subscribers

Renewal capital index

1. Business R&D spending
2. Basic research a
3. R&D spending/GDP
4. R&D researchers a
5. Cooperation universities and enterprises
6. Scientific articles a
7. Patents per capita (USPTO þ EPO)

Source: Yen-Yun Lin, C. and Edvinsson, L. (2008), "National intellectual capital: comparison of the Nordic countries", *Journal of Intellectual Capital*, Vol.9 No.4, pp.529-530.

Figure 5. The variables in each type of capital of C.Y.-Y.Lin and L. Edvinsson' model.

Finally we would like to stress that some researchers are discussing the IC community contributions. In that sense they are arguing:

National level IC has recently emerged as a new topic of research, where the focus is on understanding intangible drivers of national wealth creation. However, given that reporting and valuation systems for national competitiveness already exist, why is an IC perspective needed? (Stahle and Poyhonen 2005)

The IC perspective should re-focus to return to its original roots, and to concentrate on knowledge-creation and innovation. (Stahle and Poyhonen 2005)

3.3 NICBS framework.

In this section we describe the highlights of NICBS methodology and framework. NICBS is a methodology that synthesizes and embodies the micro and macro principles of wealth creation formulated and described in section 2. Some excerpts of the main features of NICBS (Viedma & Martins, 2006) are given as follows:

"NICBS was primarily conceived as a *learning strategy tool* to help nations, and the micro clusters within them, make the transition (from S_n to S_{n+1} in Fig.6) to more competitive knowledge economies by:

- 1) Enabling an *in-depth diagnosis* of the nation's actual knowledge-driven competitiveness foundations.
 - What are the resources, competencies, traditions, patterns of behaviour, etc. that act as path-dependencies in the nation's way to growth?

2) Aiding in the definition of the *possible* vision, objectives and lines of action to embrace sustainable economic growth.

- What is the model of excellence that we want for the nation?
- What competencies, values and attitudes should we promote to enable innovation and sustainable growth?

3) Developing *awareness* of a nation's potential risks and opportunities.

- How does the nation cope with change?

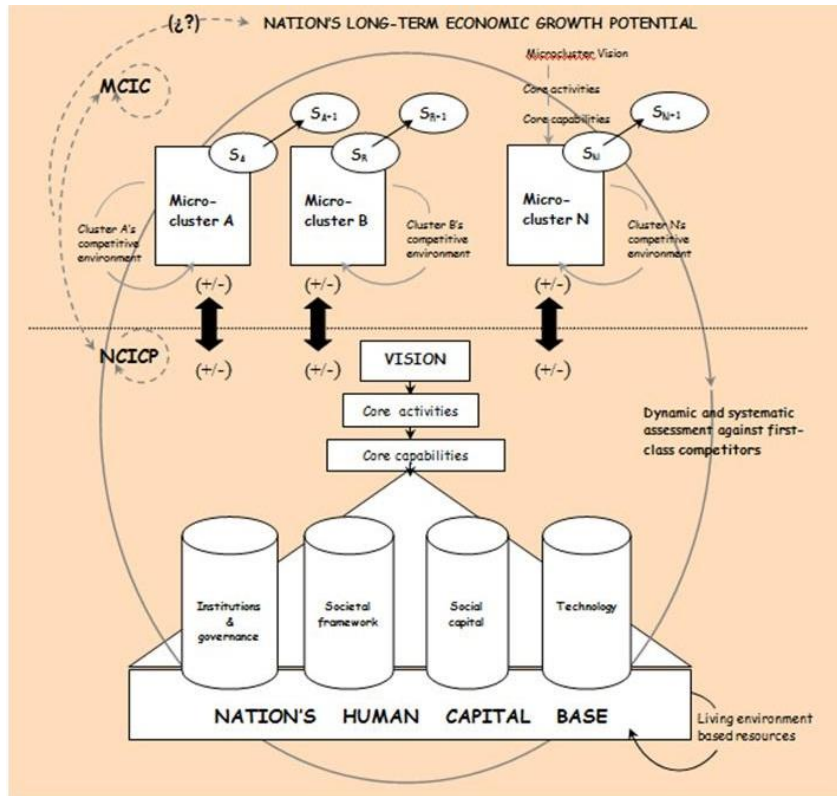
Specifically, the first two points are basically attained through disclosure skills and *competencies*; social and legal frameworks; technology upgrade and use; market access and openness; the quality of primary education, universities and research centres; industry-based collaboration, etc. for both the nation as a whole and each of the core microclusters. The third point, to which we assign the greatest importance, is the result of a dynamic and systematic assessment of the nation's innovative capacity, in the face of first-class competitors, and a process of cross-fertilised analysis. Moreover, carrying out a rigorous diagnosis (point 1) is an essential step before embarking on the definition of the vision and the objectives (point 2).

Figure 6 depicts the NICBS's main constituents and linkages, which are subsequently explained.

The general structure of the NICBS is grounded in regional innovation systems theory (Andersson and Karlsson, 2002; Carlsson et al., 2002; Enright and Roberts, 2001; Cooke and Schienstock, 2000; Cooke et al., 1997) and more specifically on the Furman et al. (2002) model for assessing a nation's innovative capacity and Viedma's (2003) Cities' Intellectual Capital Benchmarking System (CICBS), chiefly in relation to the nation's microclusters' capacity for competitiveness. It is made up of two sub-models and the linkages between them, as well as a set of indicators and extensive questionnaires to operationalise them. The nation's competitiveness intellectual capital platform (hereinafter NCICP) represents the bundle of core resources and competencies (capabilities, when tied to the vision and objectives) that are bound together by core activities. In conjunction with the norms, guides and principles set by public and private institutions (*institutions and national governance* building block); the technological skills and capabilities (*technology* block); the environmental quality of life, as determined by public services, cost of living, and other territorial endowments (*living-environment-*

based resources block); and an educated, skilled and values-nurtured human broad base with the aim of creating, sharing and using knowledge (*human capital* and *social capital* blocks), these core resources and competencies condition economic actors' patterns of behaviour, shape the nation's culture, and determine the extent to which the nation as a whole is capable of supporting and fostering an innovative and competitive productive system as displayed by the microclusters. In essence, the NCICP represents the intricacies of resources and relationships that, *assuming* macroeconomic stability (*economy performance* block), can either boost or hinder microclusters' wealth creation capacity.

However, to gain a comprehensive view of the nation's capacity to grow, we must consider the micro clusters' ecology of value chains and supportive business environment—as that is where an economy's real possibilities for growth reside—and also the quality and density of information and knowledge exchanges between the two subsystems, which is what the nation's microclusters' competitiveness intellectual capital frame (MCICF) aims for: to unveil the microeconomic environment and capacity for innovation at each of the nation's core micro clusters. The MCICF builds mainly on Porter's (1990, 1998) cluster-based theory of competition and Viedma's (2003) methodology for assessing micro clusters' core competencies. Finally, the *linkages* between the national competitiveness platform and the micro clusters account for the strength of the system as a whole. It is the density, quality and dynamism of these exchanges that grants the system the mechanisms for self-renewal and the ability to generate knowledge-driven ideas that enable long-term economic growth (see thick black arrows in Figure 6).”



Source: Viedma, J.M. & Martins, B. (2006) "The region's intellectual Capital benchmarking system: enabling economic growth through evaluation". *Journal of Knowledge Management*, Vol.10 Iss:5, 41– 54

Figure 6. NICBS's main components and linkages.

3.4 Integrating WEF competitiveness framework in the NICBS framework = Enhanced NICBS.

Section 3.3 has supported NICBS as the most complete methodology for an in-depth diagnosis of a nation's knowledge driven competitiveness foundations. Nevertheless and because systematic information on the indicators and factors of the different building blocks that integrate the NCICP is not available for the specific cases of Spain we considered that an imaginative solution was needed in order to make it possible an in depth diagnosis of Spain knowledge driven competitiveness foundations.

The imaginative solution comes from integrating WEF competitiveness framework in the NICBS framework or more precisely from replacing in the NICBS framework the

NCICP platform by the WEF competitiveness framework. We will call the new generated framework Enhanced NICBS and its structure is shown in figure 7.

The enhanced NICBS framework essentially improves the WEF competitiveness framework with two fundamental constructs :

The Humans Capital Base and the Microclusters' Competitiveness Intellectual Capital Frame (MCICF).

The Human Capital Base refers to what people know, what they do and what they can do. Human Capital Base it's about people Knowledge and current economic activities. What they can do in the future is strongly dependent on what they know and specially what they are doing now.

The Microclusters' Competitiveness Intellectual Capital Frame (MCICF) refers to main economic activities where people are working and are developed in the so-called clusters and microclusters'. Knowing the core activities, core competences and core capabilities on the main firms in each particular microcluster as well as the clusters' competitive environment, give as light on the nation's wealth creation potential. Special considerations deserve R+D activities because are central to the generation of new knowledge.

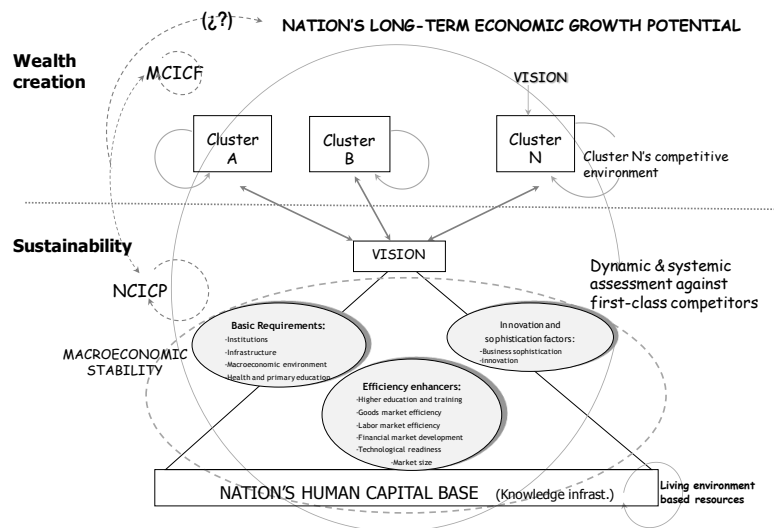


Figure 7. Enhanced NICBS: Main Structure & Key Elements

4. Using enhanced NICBS framework for reflections on the case of Spain.

The NICBS framework give us the possibility for an in depth diagnosis of a nation's knowledge driven competitive foundations.

In sections 4.1 and 4.2 some of the main features corresponding to the case of Spain are described.

4.1 Reflections on the case of Spain

Reflections on the case of Spain are mainly taken from 2.1: Country/Economy Profiles of the Global Competitiveness Report 2013-2014 (Schwab, 2013). Figures 8 and 9 show the details of Spain's Global Competitiveness Index and The most problematic factors for doing business.

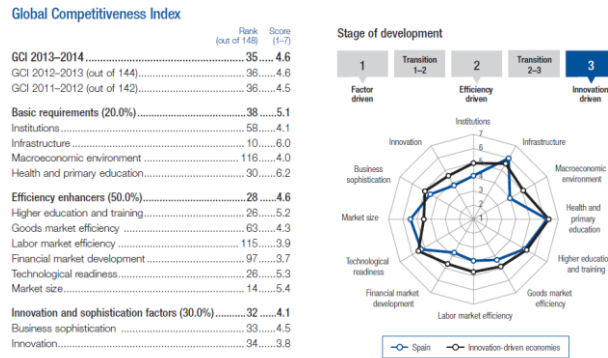
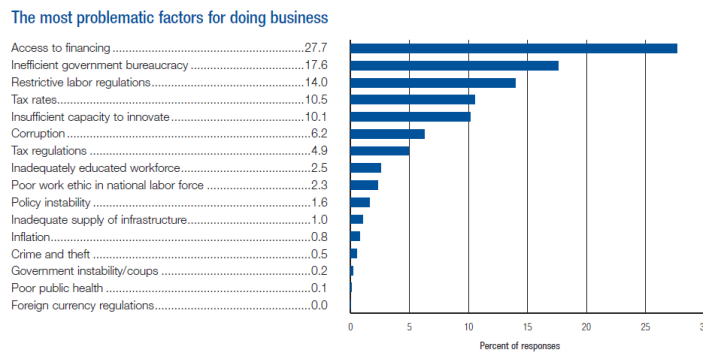


Figure 8. Spain. Global Competitiveness Index.



Note: From the list of factors above, respondents were asked to select the five most problematic for doing business in their country and to rank them between 1 (most problematic) and 5. The bars in the figure show the responses weighted according to their rankings.

Figure 9. Spain. The most problematic factors for doing business.

Some comments on the content of both figures are given next:

“Despite the current difficult conditions, Spain goes up one notch in the rankings to 35th place.

The country continues to leverage its traditional competitiveness strengths in terms of a world-class transport infrastructure (6th), a good use of ICTs (23rd), and—despite the high unemployment rate—a large and skilled labor force, thanks to one of the highest tertiary education enrollment rates in the world (8th). Moreover, the country has started to address some of its most pressing challenges. In the past year, Spain undertook sharp public budget cuts that will help improve its still weak macroeconomic situation; it also implemented a series of structural reforms to improve the functioning of its goods, labor, and financial markets. The liberalization of certain services, the implementation of a labor market reform to mitigate the rigidities of a dual labor market, and the restructuring of the banking system are all measures aimed at improving the efficiency in the allocation of resources, whose full effects are likely to become more visible in the medium term. As a result of these and other measures at the European level, the country has obtained access to international financing markets at a more affordable cost than it had at the time the previous edition of this Report was released. However, this situation has not translated in an improvement in access to financing for local firms— which still suffer from an important credit crunch—to upgrade or transform their production facilities. Access to financing is regarded as the most problematic factor for doing business, and the country ranks very low in terms of the ease of accessing loans (138th) or other sources of financing, either through equity markets (101th) or venture capital (105th). In addition, the reduction of both public and private budgets for research and innovation could hamper the capacity of local firms to innovate (57th) and contribute to the economic transformation of the country. Addressing these weaknesses will be crucial in order to bridge the competitiveness gap with Northern European economies the country continues to suffer”.

The above reflections correspond with NCICP, the lower part of the NICBS model, the one that gives sustainability to the whole system.

The paper does not cover MCICF, the upper part of NICBS where the wealth is essentially created, because there is not systematic and up to date information available

on clusters, microcluster and economic sector. Same way the paper does not cover Nation`s Human Capital Base because there is not systematic and up to date information.

5. Conclusions.

After an introduction on the fundamental changes that have occurred in the world and more specifically in the way the world economy creates wealth, the paper tries, in section 2, to highlight the close relationship between wealth creation and competitiveness and to formulate the principles of wealth creation on the knowledge economy context.

Relying on the principles of wealth creation in the knowledge economy, section 3 tries to find out the suitable methodology or framework in order to enable an in-depth diagnosis of a nation`s actual knowledge driven competitiveness foundations. For achieving this specific purpose a critical review of competitiveness frameworks and IC community frameworks are carried out. Next and as a consequence of the critical review we conclude stating that probably NICBS is the most complete and comprehensive methodology. Nevertheless and for practical purposes we decided in section 3.4 to integrate WEF competitiveness framework into the NICBS framework producing what we call Enhanced NICBS framework.

Finally and in section 4 we use the Enhanced NICBS framework for reflecting on the case of Spain. Nevertheless the reflection is incomplete because the lacks of available information on micro clusters` competitiveness intellectual capital frame (MCICF), where wealth is fundamentally created. Future quality research is needed in this particular issue for achieving better results in the in-depth diagnosis and in Human Capital Base where wealth is fundamentally originated.

The paper tries to contribute in the search for methodologies and frameworks that facilitate at a nation level to an in-depth diagnosis of actual knowledge driven competitive foundations, giving at the same time some light on the future economic development possibilities and on lines of action to be taken in order to foster innovation and sustainable economic growth.

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Intellectual capital and value creation in Spain: Making the transition from a brick-based economy towards a knowledge-based economy

Josune Sáenz *, Nekane Aramburu, Marta
Buenechea

Deusto Business School, University of Deusto
Camino de Mundaiz, 50
20012 San Sebastián, Spain

** Corresponding author*

Structured Abstract

Purpose – The aim of this paper is to diagnose the intellectual capital (IC) of Spanish companies so as to provide the basis for guiding the transition from a “brick-based economy” towards a knowledge-based economy. Moreover, the interplay between IC stocks (i.e. static IC), knowledge management (KM, i.e. dynamic IC) and human resource management (HRM) policies and practices will be studied as a key determinant of value creation through innovation.

Design/methodology/approach – Setting out from the contextualization of Spanish economy in the European Union, the relevance of the research will be first justified. A theoretical model proposing the connections between IC stocks, KM practices, HRM policies and practices, and innovation performance will be then presented. Finally, the research model will be tested in a set of 101 Spanish companies using structural equation modelling (SEM) based on partial least squares (PLS). Previous to hypothesis testing, descriptive analyses will be provided that will help to identify the weaknesses and strengths of the companies analysed in terms of IC.

Originality/value –The interplay between IC stocks (i.e. static IC), KM (i.e. dynamic IC) and HRM policies and practices has been clearly neglected in previous research in the IC domain. The research reported in this paper will contribute to fill this gap by providing a comprehensive picture of these relationships vis-à-vis innovation performance.

Practical implications – The results obtained deliver useful guidance to company managers so as to how to boost their companies’ IC and enhance their innovation performance.

Keywords – Intellectual capital, Knowledge management, Human resource management, Innovation, Spain.

Paper type – Academic Research Paper

1 Introduction

As the recent economic crisis shows starkly, poor performance in the science and technology domain goes hand-in-hand with greater difficulties to cope with economic downturns and increasing pressure from emergent economies. In the European Union, all countries that have experienced a cumulative negative GDP evolution during the period 2008-2013 except Ireland are moderate or modest innovators (i.e. countries whose innovation performance is below the average of the European Union), whereas all European innovation leaders and followers (i.e. countries whose innovation performance is above the EU27 average) have experienced a positive growth. In particular, Sweden is the European absolute leader in the innovation domain and the country whose GDP has experienced the highest increase during that period: +26%.

The relevance of knowledge and technology for economic growth has been long considered in the field of Economics (Schumpeter, 1934; Solow, 1957; Augier and Teece, 2005). Technological innovation increases the amount of output achievable for a given quantity of labour and capital (Solow, 1957; Schilling, 2011) and thus boosts economic growth. However, economic history highlights the relevance of not only technological innovation, but also organizational innovation (e.g., introducing new ways of organizing production and distribution) (Fagerberg and Godinho, 2005). The development of mass production in the US and of just-in-time systems in Japan constitute clear examples of extremely relevant organizational innovations that allowed both countries to “catch-up” (i.e. to narrow the gap in productivity and income vis-à-vis leader countries) at different points in history (Fagerberg and Godinho, 2005).

The Innovation Union Scoreboard 2013 shows that Spanish economy is very far from being technology-driven. R&D expenditure in the business sector and non-R&D innovation expenditures are well below the EU27 average (47 and 32 points below, respectively), the same as PCT patents applications and patent revenues from abroad (63 and 88 points below, respectively). In the same vein, employment in knowledge intensive activities and knowledge intensive services exports are also below the EU27 average (13 points and 52 points below, respectively).

With this “brick-based profile” and huge public deficit (10.6% of GDP in 2009), the economic crisis triggered in 2008 has hit Spain dramatically. The cumulative decline in GDP from 2008 to 2013 has been 5.96% (source: INE) and the unemployment rate has risen from 11.3% to 26.4% during the same period. The largest drop in GDP has occurred

in the construction sector, where the decline rate has been 46.04% (and 54.71% in terms of employment). As a result, the weight of this sector in Spanish economy has fallen from 12.47% in 2008 to 7.16% in 2013. The services sector is the only one that shows a slightly positive evolution in GDP (+0.7%), although employment has also been destroyed there (-7.81%). In the case of agriculture and manufacturing, GDP has diminished 3.60% and 3.35%, respectively, and employment has dropped 5.01% and 22.80%, respectively.

In view of this terrible macroeconomic picture, it is clear that Spain has been completely unable so far to substitute employment in low-technology sectors showing lowering demand and/or fierce competition from emerging countries with employment and wealth creation in knowledge intensive ones. Of course, this is a long-term endeavour that requires massive investment in human capital qualification, together with a proactive industrial policy to ensure the transition towards an economy primarily based on knowledge. However, austerity measures implemented to reduce the public deficit risk curtailing capabilities for future development, as they involve important cutbacks in education and research. During the period 2008-2012, public expenditure in education has diminished 8%, whereas public expenditure in R&D has decreased 4.33%.

In this context, and considering that companies constitute the main economic agent to lead a country towards competitiveness and wellbeing, and that even low-technology sectors may be able to generate additional value through unique value propositions (Porter, 2008) based on servitization (Neely, 2008; Baines et al., 2009) and innovation, the aim of this paper is to provide a diagnosis of Spanish firms' intellectual capital (IC), as well as to shed light on the relevance of the latter on value creation (and more particularly on innovation), showing the specific elements that companies should work on to improve performance.

As Subramaniam and Youndt (2005) point out, "it is widely accepted that an organization's capability to innovate is closely related to its intellectual capital" (p. 450). In the case of this paper, the static and dynamic views of IC will be considered (Kianto, 2007; Kianto et al., 2010). Whereas the static approach of IC focuses on knowledge-related stocks controlled by the firm, the dynamic approach focuses on the activities and related behaviour through which IC stocks are managed. As a concept, IC management is very close to knowledge management (KM) (Kianto et al., 2010). Thus, activities and behaviour that allow knowledge to be created, shared, learnt, enhanced, organized and

utilized (i.e. knowledge management practices) (Abell and Oxbrow, 2001) will be studied.

Moreover, considering that knowledge management is intrinsically a human activity (although it could rely heavily on the use of information technology – IT), human resource management (HRM) policies and practices (i.e. policies and practices related to recruiting and selection, training and development, performance evaluation, compensations and job design) will also be considered. Actually, HRM policies and practices, together with organizational culture and organization structure and design constitute organization system-level determinants of organizational behaviour (i.e. what people do in organizations) (Robbins et al., 2010).

In particular, the interplay between the static and dynamic dimensions of IC together with HRM policies and practices and their influence on innovation will be analysed. More precisely, KM practices are suggested to mediate the relationship between HRM policies and IC stocks. In other words, it is believed that the influence of HRM policies and practices on IC stocks takes place mainly by means of triggering KM supportive behaviour that enables knowledge assets to be developed, used and preserved. Moreover, it is suggested that IC stocks mediate the relationship between HRM and KM practices, on the one hand, and innovation performance, on the other hand (i.e. HRM and KM practices are relevant as far as they permit knowledge assets to be developed, used and preserved).

2 Theoretical background

Although several studies have analysed the influence of IC stocks on innovation (e.g. Subramaniam and Youndt, 2005; Brookes et al., 2007; Menor et al., 2007; Wu et al., 2007; Wu et al., 2008; Delgado-Verde et al., 2011; Leitner, 2011; Carmona-Lavado et al., 2013; Castro et al., 2013), and of KM (i.e. dynamic IC) on innovation (e.g. Darroch and McNaughton, 2003; Gloet and Terziovski; Darroch, 2005; Ju et al., 2006; Palacios et al., 2009; Vaccaro et al., 2010; Kianto, 2011; Mangiarotti, 2012; Lee et al., 2013), as well of HRM policies and practices on innovation (e.g., Jiménez-Jiménez and Sanz-Valle, 2005; Li et al., 2006; Beugelsdijk, 2008; Saá-Pérez and Díaz-Díaz, 2010; Santangelo and Pini, 2011; Jiang et al., 2012; Yanadori and Cui, 2013; Zhou et al., 2013), there are very few studies that have analysed them together.

Actually, four studies have been found that analyse the interplay between HRM policies and practices and IC stocks vis-à-vis innovation (López-Cabrales et al., 2009; De Winne and Sels, 2010; Cabello-Medina et al., 2011; Wang and Chen, 2013) and one study that analyses the interplay between HRM policies and practices and KM with regard to innovation (Camelo-Ordaz et al., 2011).

In their study of companies from most innovative Spanish industries, López-Cabrales et al. (2009) found that the uniqueness of employees' knowledge (i.e. a variant of human capital) mediated the relationship between collaborative HRM practices and innovation activity. Meanwhile, De Winne and Sels (2010) found that both human capital and HRM were important determinants of innovation in small start-ups aiming at an innovation strategy. Later on, following previous research from López-Cabrales et al. (2009), Cabello-Medina and colleagues (2010) found that human capital uniqueness mediated the relationship between HRM practices such as empowerment and employee selection based on learning potential and interpersonal abilities, and firm innovativeness. Finally, Wang and Chen (2013) found that organizational and social capital in Chinese firms mediated the relationship between HRM (in particular, high-performance work systems) and incremental innovative capability, whereas social capital was the only mediator in the case of radical innovation.

As far as HRM and KM are concerned, Camelo-Ordaz et al. (2011) found that HRM practices contributed to knowledge creation and innovation through the generation of the affective commitment necessary for employees to be willing to share their knowledge.

This scarcity and specificity of studies raises the need for further research that provide a more comprehensive picture of the relationships between HRM policies and practices, KM, IC stocks and innovation performance, both in terms of the simultaneous inclusion of the three antecedents of innovation performance, and in terms of the array of HRM and KM practices considered and the variety of IC stocks included. This paper aims to fill this gap by addressing both challenges simultaneously.

Hereafter, a detailed view on IC stocks (i.e. static IC), KM practices (i.e. dynamic IC) and HRM policies and practices will be provided.

2.1 Intellectual capital stocks (static IC)

As was said in the Introduction section, IC stocks represent the static dimension of IC. In most studies IC resources have been split up into three main components: human

capital, structural capital and relational capital, based on a sufficiently established categorization (e.g. Edvinsson and Malone, 1997; Bontis, 1998). Nevertheless, the conceptualization of these categories differs depending on the IC perspective adopted: limited to knowledge or holistic (Sáenz and Aramburu, 2011).

In the first case, IC is considered to be the sum of all knowledge firms utilize for competitive advantage. This is the point of view of authors such as Stewart (1997), Nahapiet and Ghoshal (1998), Sullivan (1998), and Youndt et al. (2004). In the holistic perspective, however, IC would be conceptualized as the sum of all intangible resources companies use to compete successfully, not only knowledge. This would include employee loyalty, motivation and flexibility; leadership and management style, organizational culture and incentive schemes; brand image and corporate reputation, to name but a few (Marr, 2006). Authors such as Roos et al. (1997), Bontis (1999) and Marr (2006) are closer to this second perspective.

In both cases (knowledge and holistic perspective), human resources (i.e. human capital) are thought of as the living and thinking part of intangible resources (Marr, 2006). They do not appear on corporate balance sheets because people are not owned: they offer their services under employment contracts (Grant, 2008). In the knowledge perspective, human capital would include the knowledge, skills and abilities residing with and utilized by individuals (Schultz, 1961; Youndt et al., 2004), whereas in the holistic one additional elements such as people attitudes, motivation and commitment would also be included (Marr, 2006; Bueno et al., 2011).

Differences between the knowledge and holistic perspective are deeper when it comes to conceptualizing structural capital and relational capital. In the case of the knowledge perspective, the type of knowledge considered lies at the basis of the distinction made between organizational (i.e. structural) and social (i.e. relational) capital. The former refers to the institutionalized knowledge and codified experience (i.e. “explicit knowledge”) residing within and utilized through databases, patents, manuals, structures, systems and processes (Youndt et al., 2004), whereas social capital is the knowledge embedded within, available through and utilized by interactions among individuals and their networks of interrelationships (Nahapiet and Ghoshal, 1998). Of course, this second definition refers to “tacit knowledge” and it is important to note that the networks and interrelationships mentioned could be both internal and external to the firm.

In the case of the holistic perspective of IC, the location of knowledge and other intangible resources lies at the basis of the distinction made between structural and relational capital. In accordance with this, structural capital refers to the knowledge and other intangible resources that stay within the company when the employees have left (Bueno et al., 2011). In other words, it encompasses the organization's essential operating processes, the way it is structured, its information flows and databases, its leadership and management style, its culture and incentive schemes, as well as intellectual property rights (Marr, 2006). Conversely, relational capital refers to all resources linked to the external relationships of the firm with customers, suppliers or R&D partners (Meritum Project, 2002). Those resources could be related to knowledge, but they could refer to other intangible assets as well, such as brand image, customer satisfaction, customer loyalty, negotiating power, etc.

In the case of this paper, the knowledge perspective of IC will be adopted and human, structural and relational capital will be conceptualized accordingly. However, in the case of human capital an exception will be made and employees' motivation will also be included. The reason for that is very simple: employees' knowledge, abilities and skills are useless unless they are motivated to use them.

Beyond traditional IC components, recent studies suggest the possibility of adding new elements. Thus, we expand the focus further on renewal capital and entrepreneurial capital (Aramburu et al., 2014). "Renewal capital" refers to the capability of organizations to continuously renew its activities through learning, acquiring new skills and creatively changing its operations (see e.g. Kianto et al., 2010). "Entrepreneurial capital" can be conceptualized as the capability to develop activities of an entrepreneurial nature within organizations (see Erikson, 2002; Bueno et al, 2011). Both capabilities (as any other organizational capability) could be seen as manifestations of organizational knowledge (Grant, 2008) and therefore could be considered as part of IC.

While both concepts – renewal capital and entrepreneurial capital – have been coined earlier, they have been used very infrequently in IC research (Aramburu et al., 2014). In this study, we pursue to conceptualize and measure both of them within the broader IC framework.

2.2 Knowledge management practices (dynamic IC)

While the static approach to IC concentrates on evaluating the stocks of knowledge-related resources, the dynamic approach to IC focuses on activities (Kianto et al., 2010) that allow knowledge to be created, shared, learnt, enhanced, organized and utilized (Abell and Oxbrow, 2001). As Teece (2007, 2009) points out, the ownership of difficult-to-replicate (knowledge) assets is not enough. Purposive practices which can be harnessed to continuously create, extend, upgrade, protect and keep relevant the enterprise's unique asset base are also needed.

Unlike KM processes (which naturally exist in organizations irrespectively of managerial efforts – Demarest, 1997; Husted and Michailova, 2002; Andreeva and Kianto, 2012), KM practices refer to the aspects of the organization that are manipulable and controllable by conscious and intentional management activities (Andreeva and Kianto, 2012). In the case of this paper, the following KM practices will be considered: strategic KM, knowledge protection, learning mechanisms and IT-based knowledge search, communication, analysis and collection.

Strategic KM involves identifying key knowledge resources to be acquired or developed and establishing the right mechanisms to that end. It also involves knowledge exploitation decisions and other knowledge-related choices. Moreover, Strategic KM requires that company strategy be formulated and updated based on company knowledge and competences (Grant, 2008).

Traditionally, economics and strategy have emphasized the relevance of protecting newly generated knowledge (i.e. innovation) or strategically relevant knowledge in order to maximize the possibilities of capturing the rents derived from it (Schilling, 2011). For that purpose, formal (e.g. patents and copyrights) and informal (e.g. secrecy) mechanisms could be used.

Learning mechanisms differ depending on the nature of the knowledge to be learned (tacit or explicit). When knowledge is personal, context-specific and, therefore, hard to formalize (i.e. tacit knowledge; Nonaka and Takeuchi, 1995), learning mechanisms based on social interaction between individuals are the key. This is often compared to apprentice training. In this case, learning involves self-observation, reflection and immersion in the routines of the master (Von Krogh, 2011). However, when knowledge is transmittable in formal, systematic language (i.e. when it is explicit knowledge; Nonaka and Takeuchi, 1995) it can be easily collected, stored and retrieved. In such situation,

mechanisms based on the collection and diffusion of best practice and lessons learned could be especially relevant.

In this vein, purposive use of IT-based mechanisms for knowledge search, communication, analysis and collection is undoubtedly an important tool managers have at their disposal to increase organizational knowledge stocks. The application of IT can create an infrastructure and environment that contribute to KM by augmenting and supporting a multitude of knowledge processes (Andreeva and Kianto, 2012). Alavi and Leidner (2001) described four major contributions of IT to KM (Andreeva and Kianto, 2012). First, IT supports the creation of new knowledge by combining different sources and by facilitating “just-in-time learning” through decreasing the time delay of knowledge sharing between organizational members. Second, it facilitates the storage and retrieval of organizational memory, as it acts as a platform for valuable knowledge that has been gained by the organization. Third, it assists knowledge sharing by providing more communication channels in the organization. Fourth, IT also supports the usage of knowledge through its integration into organizational routines.

2.3 HRM policies and practices

HRM policies and practices (i.e. policies and practices related to recruiting and selection, training and development, performance evaluation, compensation and job design) constitute important determinants of organizational behaviour and organizational effectiveness (see for instance Becker and Gerhart, 1996; Delaney and Huselid, 1996; Gelade and Ivery, 2003; Bowen and Ostroff, 2004; Robbins et al., 2010). For KM to be promoted such policies and practices should be adapted accordingly.

Recruitment “includes those practices and activities carried out by the organization with the primary purpose of identifying and attracting potential employees” (Breaugh and Starke, 200: 45), while selection refers to “the task of predicting which applicant will be the most successful in meeting the demands of the job, and/or be the best fit with the work group and culture of the organization” (Torrington et al., 2011). Employees who have the required knowledge and skills should be hired (Andreeva and Kianto, 2012), but for KM to be enhanced, special attention to learning and development abilities should be paid, together to collaborative skills.

As Robbins et al., (2010) point out competent employees don’t remain competent for ever. Skills deteriorate and can become obsolete. Thus, new skills need to be learned,

which calls for training and development. Recently there has been a shift from identifying “training needs” to identifying “learning needs” (Torrington et al., 2011) which implies that development is owned by the learner with the need rather than by the trainer seeking to satisfy the need. This move also involves changes in who identifies the needs and how those needs are met. Today it is suggested that needs are best developed by a partnership between the individual and the organization, and that the methods for meeting those needs are not limited only to formal courses, but to a wide range of on-the-job development methods and distance e-learning approaches (Torrington et al., 2011). As a consequence, “self-development” becomes an important issue, which means individuals having ownership of and taking responsibility for their own development.

Performance evaluation could be an extremely relevant mechanism for guiding behaviour. It should be seen as an integrating part of the performance management system of the firm, whose aim is to direct, monitor, motivate and refine employees’ performance (Clark, 2005). For KM processes to be enhanced (i.e. knowledge sharing, knowledge creation and knowledge application) performance criteria related to them should be included.

Compensation policies could also promote KM (Andreeva and Kianto, 2012). Both tangible (e.g. bonuses or one-off rewards) and intangible incentives (e.g. status and recognition) could be used to motivate employees to share, create and apply knowledge (Scarbrough, 2003; Andreeva and Kianto, 2012).

Finally, job design is another element that could foster or on the contrary hinder desired behaviour. It refers to “the process of putting together a range of tasks, duties and responsibilities to create a composite for individuals to undertake in their work and to regard as their own” (Torrington et al., 2011: 85). One of the main contributions to job design was Hackman and Oldham’s (1976) Job Characteristics Model (JCM). This model specifies certain aspects which must be designed into a job in order to ensure the positive outcomes of meaningful work, responsibility and knowledge of the actual results of the work activity (Parker et al., 2001; Torrington et al., 2011). There were five “core job characteristics” identified by Hackman and Oldham in their model: skill variety, task identity, task significance, autonomy and feedback. Later on, with the advent of the knowledge era and the “knowledge worker”, additional extensions to this model have been proposed. Although job autonomy is expected to remain a key issue for knowledge workers (Janz et al., 1997), enabling social contact and knowledge and skill acquisition at

work are seen as two important features to be borne in mind in job design (Parker et al., 2001).

2.3 Hypothesis formulation

According to what has been explained in the previous sections, HRM policies and practices are seen as key drivers of KM, which in turn is considered the foundation for knowledge to be created, shared, learnt, enhanced, organised and utilized (Abell and Oxbrow, 2001). In other words, KM allows the IC stocks of a company to be reinforced and augmented. Thus, considering this cascading set of relationships, the following hypothesis has been formulated:

H1: KM positively mediates the relationship between HRM policies and practices and IC stocks (i.e. the influence of HRM policies and practices on IC stocks takes place mainly through the positive influence they exert on KM).

On the other hand, IC (i.e. the company knowledge base) is the foundation for innovation to occur. As Nonaka and Takeuchi (1995) point out, innovation involves the creation of new knowledge, and new knowledge emerges from the combination of existing knowledge in novel ways (Eisenhardt and Martin, 2000) or from its application to a new context.

According to Fleming and Sorenson (2001, 2004), innovation involves often a “recombinant search”. Thus, innovation comes either from combining technological components (i.e. “any fundamental bits of knowledge or matter that inventors may use to build inventions” – Fleming and Sorenson, 2004: 910) in a novel manner (Gilfillan, 1935; Schumpeter, 1939; Usher, 1954; Nelson and Winter, 1982; Basalla, 1988; Weitzman, 1996) or by reconfiguring existing combinations (Henderson and Clark, 1990). In other words, a recombinant search involves combining specialized, differentiated, yet complementary knowledge (Tell, 2011). Such recombinations may result in completely new products and services, or in the application of existing products to new markets and uses (Fleming and Sorenson, 2004; Ahuja and Novelly, 2011).

Hence, considering this line of thought and the fact that HRM policies and practices and KM have been hypothesized to influence the company’s IC stocks, the following hypothesis has been formulated:

H2: IC stocks positively mediate the relationship between HRM policies and practices and KM on the one hand, and innovation performance on the other hand (i.e. the influence of HRM policies and practices and KM on innovation performance takes place mainly through the influence they exert on IC stocks).

Figure 1 summarizes the research model that emerges from these two research hypotheses.

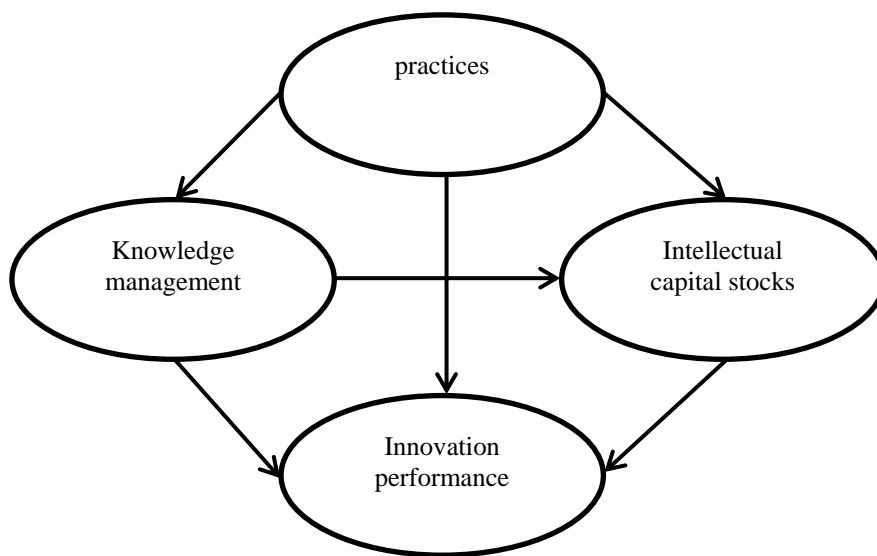


Figure 1 Research model

Although several types of HRM policies and practices will be considered, as well as different types of KM practices and IC stocks, only the results of the aggregated model will be presented (i.e. HRM policies and practices, KM and IC stocks will be modeled as second order molar constructs whose indicators will be the latent variable scores of the first order constructs considered in the research). Nevertheless, the aggregated model will allow the relevance of each first order construct to be tested when it comes to maximizing the amount of variance explained of the endogenous constructs.

3 Research methods

Research reported in this paper is part of an international project on intellectual capital and value creation led by Lappeenranta University of Technology (Finland). A common questionnaire was designed in order to gather information about the variables under study and was administered in each of the countries participating in the research. Here an exploitation of Spanish results is presented.

3.1 Sample and data collection

In the case of Spain (as in the other countries participating in the project), the target population was made up Spanish companies with at least 100 employees. To identify such companies, the SABI database was utilized. 961 firms satisfying the established criteria, together with financial and economic data availability were identified. Due to budget constraints, a junior researcher was appointed to do the data collection. 442 companies were contacted to ask their participation in the research, trying to preserve industry and size proportions in the initial population. Confidentiality was emphasized and a summary of the results was promised to the respondents. Out of the 442 companies contacted 101 responses were obtained, representing a response rate of 22.8 per cent (101/442). The questionnaires were administered through phone interviews, although some companies preferred to receive the questionnaire form by email and send their answers by means of the same mechanism. Most of the respondents held positions such as a HR director or manager (62.4 %), other director or manager (20.8 %), expert or clerical work (7.9%) or managing director (6,9 %), indicating their expertise and key position regarding the issues of intellectual capital and performance.

The sample size obtained is large enough to carry out a statistical study based on the PLS structural equation modeling approach (Chin and Frye, 2003). According to the complexity level of the model to be tested, the minimum sample size required was calculated, and this was made up of 60 firms.

3.2 Measures

The research model is made up of 15 first-order constructs or latent variables. Except innovation performance (the final endogenous construct of the research), the other latent variables are grouped into 3 sets: IC stocks, KM and HRM policies and practices. Human capital, structural capital, internal relational capital, external relational capital,

entrepreneurial capital and renewal capital form IC stocks (i.e. static IC), whereas strategic KM, knowledge protection, learning and IT-based KM form KM practices (i.e. dynamic IC). Finally, recruiting and selection, training and development, performance assessment, compensation and job design form HRM policies and practices.

These three second-order constructs have been modelled as molar constructs, as changes in one of the components making up each of them are not expected to be necessarily followed by changes in the rest of the components of the same construct. However, innovation performance and all first-order constructs except human capital have been modelled as reflective constructs, this meaning that the specific items making up each of them are expected to be highly correlated and be the representation of the same latent phenomenon. In the case of human capital, however, employees' competence and motivation are not necessarily correlated and thus it has been modelled as a formative construct.

Innovation performance measures have been adapted from Weerawardena (2003) and IC stocks have been measured using scales mostly developed for the project. The internal relational capital and human capital scales got inspiration from Yang and Lin (2009) and the scale for entrepreneurial capital is based on work by Hughes and Morgan (2007) on entrepreneurial orientation, adapted here to the specific context of IC.

In the case of KM, strategic management of knowledge has been measured combining indicators from different sources. Indicators 1 and 3 have been adapted from McKeen et al. (2005), whereas indicators 2 and 4 were inspired by Kianto et al. (2013) and indicator 5 was adapted from Boumarafi and Jabnoun (2008). Knowledge protection measures have been inspired by previous work by Levin et al. (1987), Cohen et al. (2000), Hurmelinna-Laukkanen and Puumalainen (2007), Hurmelinna-Laukkanen and Ritala (2012) and Lawson et al. (2012). The learning scale has been specifically developed for the project, with one indicator (the first one) taken from Becerra-Fernández and Sabherwal (2001). Finally, the IT-based KM scale got inspiration from previous work by Handzic (2011) (indicators 1 and 2), Negash (2004) and Pittimäki (2007) (indicators 5 and 6). Indicators 3 and 4 have been specifically developed for the project.

As far as HRM policies and practices are concerned, the indicators used for recruiting and selection have been inspired by Yang and Linb (2009) and by Cabello-Medina et al. (2009), whereas indicators for training and development have been specifically developed for the research. On the other hand, indicators for performance

assessment and compensation got inspiration from previous work by Andreeva and Kianto (2012), whereas the job design scale has been specifically created for the project.

Table 7 in the Appendix provides complete information about specific indicators used in each construct. All the items have been measured by means of 1-to-5 Likert scales.

3.3 Statistical analysis

Descriptive analyses have been first carried out in order to diagnose the IC stocks, KM practices and HRM policies and practices of Spanish companies in the sample. For that purpose, variables synthesizing each of the scales have been created by calculating the average of the items making up each of the constructs. T-tests have been then carried out in order to identify any significant difference of means between large (over 250 employees) and medium-sized (between 100 and 250 employees) companies, and between manufacturing and service companies.

Structural equation modeling (SEM) based on partial least squares (PLS) has been then applied in order to test the hypotheses put forward in the research. PLS is a common methodological approach used in management research (Bontis et al., 2007; Bontis and Serenko, 2007). It works in two stages:

- The assessment of the reliability and validity of the measurement model.
- The assessment of the structural model.

This sequence ensures that the constructs' measures are valid and reliable before attempting to draw conclusions regarding relationships among constructs (Barclay *et al.*, 1995).

As previously outlined, the research model encompasses several mediation relationships. For these to be checked, the following conditions must hold (Baron and Kenny, 1986):

- First, independent variables must have a significant effect on the dependent ones in the absence of mediators.
- Second, independent variables must affect mediating variables significantly.
- Third, in the full model (the one that encompasses all variables), mediators must have a significant effect on the dependent variables. If these conditions all hold in the predicted direction, then the effect of the independent variables on the dependent ones must be less than in the first model (the one in which mediating variables were omitted). Perfect mediation exists where in the final model the

relationship between the independent variables and the dependent ones becomes non-significant, whereas partial mediation applies when these relationships remain still significant, albeit less strong.

In our particular case, two staggered sets of mediation relationships need to be analyzed: the mediating role of KM practices in the relationship between HRM policies and practices and IC stocks, and the mediating role of IC stocks in the relationship between HRM policies and practices and KM vis-à-vis innovation performance. For this to be tested, three models have to be run:

- In the first model (see Figure 2), the relationship between HRM policies and practices and IC stocks will be tested. This will check the first condition of the first mediation relationship.
- In the second model (see Figure 3), the relationship between HRM policies and practices and KM practices vis-à-vis innovation performance will be analyzed. This will check the first condition of the second mediation relationship.
- In the third model (see Figure 1), all mediating variables will be included. This will allow the second and third conditions of each mediation relationship to be verified.

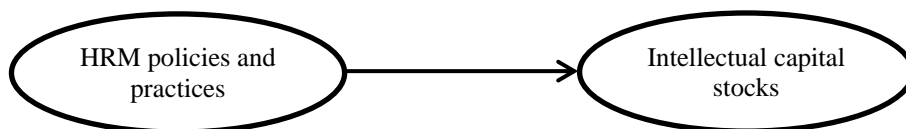


Figure 2 Preliminary research model 1

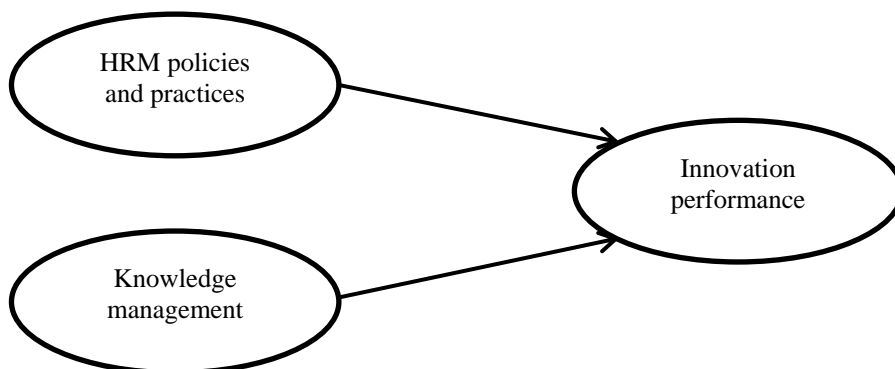


Figure 3 Preliminary research model 2

For these models to be tested, first-order models have to be run first in order to obtain the latent variable scores of the first-order constructs that make up the aggregated latent variables (HRM policies and practices, KM practices and IC stocks). These first-order models also allow us to assess the quality of the scales used in order to represent the first-order latent variables. For all first-order constructs could be included in the same model, a sample size of 160 companies would be required. Our sample being only of 101 companies, we have run three different models (one for HRM policies and practices, another one for KM practices and a last one for IC stocks), connecting each of the first-order constructs with innovation performance. In the case of reflective constructs (all but human capital), this allowed us to check for individual item reliability, construct reliability and convergent validity conveniently. However, for discriminant validity to be tested, correlations between all constructs were calculated by means of SPSS. In the case of formative constructs (i.e. human capital), multicollinearity problems were explored in order to ensure that each indicator represented a truly different characteristic.

4 Research findings

4.1 Descriptive analyses

Tables 1, 2 and 3 summarize the results of the descriptive analyses carried out.

Table 1 Descriptive analysis – IC stocks (static IC)

Constructs	Mean	SD
Human capital	3,51	0,68
Structural capital	3,63	0,72
Internal relational capital	3,59	0,73
External relational capital	3,73	0,62
Entrepreneurial capital	3,10	0,61
Renewal capital	3,44	0,78

Table 2 Descriptive analysis – KM practices (dynamic IC)

Constructs	Mean	SD
Strategic management of knowledge	3,30	0,80
Knowledge protection	3,54	1,01
Learning	3,57	0,85
IT-based knowledge management	3,72	0,81

Table 3 Descriptive analysis – HRM policies and practices

Constructs	Mean	SD
Recruiting and selection	3,79	0,73
Training and development	3,71	0,78
Performance assessment	3,38	0,94
Compensation	3,03	0,95
Job design	3,49	0,74

As far as IC stocks are concerned, the results obtained show that there is clear room for improvement, especially in the case of entrepreneurial (3.10) and renewal (3.44) capital. On the contrary, external relational capital seems to be particularly developed, its average being the highest one among IC stocks (3.73).

Moving on now to KM practices (i.e. dynamic IC), the strategic management of knowledge is the weakest component within this category (3.30), while IT-based KM seems to be fairly developed (3.72).

In the case of HRM policies and practices, although recruiting and selection (3.79) and training and development (3.71) are quite well adapted to support KM, job design (3.49), performance assessment (3.38) and compensation (3.03) are much less adapted to that end.

On the other hand, the t-tests carried out to look for statistically significant differences according to company size (large versus medium-sized firms) and industry (manufacturing versus service companies) show that there is only one aspect in which companies differ significantly: knowledge protection. The latter is significantly more difficult in service companies than in manufacturing firms.

4.2 Measurement model evaluation

Prior to testing research hypotheses, the quality of the measurement model has been assessed, both for the first-order constructs and for the second-order ones. In the case of constructs made up of reflective indicators, individual item reliability, construct reliability, convergent validity, and discriminant validity should be checked, whereas in the case of formative or molar constructs, multicollinearity problems should be explored.

Detailed results for measurement model evaluation in the case of first order constructs are provided in the Appendix (Tables 7 and 8).

Beginning with reflective constructs, and as far as individual item reliability is concerned, a rule of thumb is to accept items with loadings of 0.707 or more, which

implies more shared variance between the construct and its measures than error variance (Barclay et al., 1995; Carmines and Zeller, 1979). As can be seen in Table 7, indicator loadings are greater than 0.707, with a few exceptions: JD1 (0.6992), STRATKM3 (0.6184), STRATKM5 (0.5366), ENTCAP3 (0.6129) and ENTCAP5 (0.6001). According to Barclay et al. (1995), loadings above 0.5 and 0.6 are also acceptable in early stages of scale development as is the case for job design, strategic KM and entrepreneurial capital. Thus, all the indicators proposed have been retained in the research.

Construct reliability or internal consistency refers to the extent to which all the indicators of a specific construct measure the same latent variable. If this were to be true, all the indicators making up the construct should be highly correlated. For this to be tested, composite reliability (ρ_c) has been calculated. According to Nunnally (1978), a value of 0.70 constitutes a benchmark for modest reliability in early stages of research, whereas later on, values higher than 0.80 would be preferable. As can be observed in Table 7, all reflective constructs of the research have a composite reliability over 0.8. Hence, internal consistency is OK.

Convergent validity is assessed by means of the so-called average variance extracted (AVE). This measure was created by Fornell and Larcker in 1981 and it provides the amount of variance that a latent variable captures from its indicators, relative to the amount due to measurement error. It is recommended that AVE should be greater than 0.50, this meaning that 50% or more of the variance of the construct is due to its own indicators. As can be seen in Table 7, this is the case in all reflective constructs of the research.

Finally, discriminant validity indicates the extent to which a given construct is different from other constructs (i.e. the extent to which the constructs making up the research model really measure different things). For this to be true, a construct should share more variance with its measures than it shares with other constructs of the model (Fornell and Larcker, 1981). In other words, AVE should be greater than the variance shared between the construct and other constructs (i.e. the squared correlation between two constructs). Once the correlation matrix obtained, it is easier to calculate the root value of AVE for each construct (this would be the diagonal of the correlation matrix) and to compare it with the correlations obtained. For adequate discriminant validity, the diagonal elements (i.e. the root values of AVE) should be greater than the off-diagonal

elements in the corresponding rows and columns. This is exactly the case in our research (see Table 8).

In the case of the formative construct (human capital), the absence of multicollinearity problems has been checked by means of SPSS software. As has been summarized in Table 7, variance inflation factors (VIF) are lower than 5 in all cases (Kleinbaum et al., 1988) and condition indices (CI) lower than 30 (Belsey, 1991). Hence, multicollinearity problems have been ruled out.

Tables 4 and 5 show the results of measurement model evaluation for the aggregated constructs. In this case, all latent variables except innovation performance (whose reliability and validity have been already checked) are molar constructs (i.e. equivalent to formative constructs in first-order models). Thus, the analysis should concentrate once more on exploring multicollinearity problems.

As can be seen in Table 4, all variance inflation factors are well below 5 and condition indices well below 30. Hence, multicollinearity problems have been discarded.

Table 4 Measurement model (second-order constructs) – Part I

Constructs and measures	Item wording	Assessment parameters
HRM policies and practices (molar)		Highest VIF = 1.763 Highest CI = 2.548
		Weights
REC	Recruitment and selection	0.0991
TD	Training and development	*0.2912
PA	Performance assessment	*0.1894
COMP	Compensation	0.1607
JD	Job design	***0.4867
Knowledge management (molar)		Highest VIF = 1.565 Highest CI = 2.115
		Weights
STRATKM	Strategic management of knowledge	***0.5971
KPROT	Knowledge protection	0.1167
LEARN	Learning	*0.4444
ITKM	IT-based knowledge management	0.0424
IC stocks (molar)		Highest VIF = 1.850 Highest CI = 2.904
		Weights
HC	Human capital	0.1018
STRUTCAP	Structural capital	*0.2793
INTREL	Internal relational capital	0.1508
EXTREL	External relational capital	*0.2385

ENTCAP	Entrepreneurial capital	0.0002
RENCAP	Renewal capital	***0.5631
Innovation performance (reflective)		$\rho_c = 0.906$ AVE = 0.659
	Compared to its competitors, how successfully has your company managed to create innovations / new operating methods in the following areas?	Loadings
INNOPER1	Products and services for customers.	0.8197
INNOPER2	Production methods and processes.	0.8408
INNOPER3	Management practices.	0.8353
INNOPER4	Marketing practices.	0.7852
INNOPER5	Business models.	0.7764

Notes: ρ_c : composite reliability; AVE: average variance extracted; VIF: variance inflation factor; CI: condition index; *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$ (based on t_{499} , one-tailed test).

Table 5 Measurement model (second-order constructs) – Part II

Constructs	1	2	3	4
1. HRM policies and practices	N.A.			
2. Knowledge management	0.792	N.A.		
3. Intellectual capital stocks	0.730	0.796	N.A.	
4. Innovation performance	0.521	0.480	0.591	0.812

Notes: Diagonal elements (values in parentheses) are the square root of the variance shared between the constructs and their measures, relative to the amount due to measurement error (AVE). Off-diagonal elements are the correlations among constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements. N.A.: Not applicable (molar construct).

Table 4 also shows the weights of indicators making up molar constructs. In the case of formative and molar constructs, weights show the relevance of each indicator when it comes to calculating the score of the latent variable so as to maximize the amount of variance explained of dependent variables.

In the case of HRM policies and practices, job design is by far the most relevant element in order to enhance KM, IC stocks and innovation performance, followed at a considerable distance by training and development and by performance assessment (the influence of both elements is still significant, albeit smaller). As far as KM practices are concerned, the strategic management of knowledge and learning constitute the main aspects to work on in order to contribute to the development of IC stocks and innovation. Finally, renewal capital is the most relevant IC component when it comes to enhancing innovation performance, followed at a considerable distance by external relational capital and structural capital.

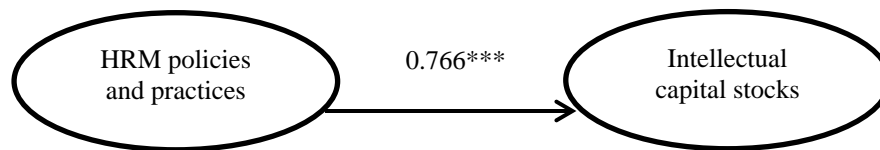
4.3 Structural model evaluation

Once the quality of the measurement model has been guaranteed (both for first- and second-order constructs), the strength of the research hypotheses and the amount of variance explained (R^2) should be assessed. For research hypotheses to be tested, path coefficient levels should be examined, as well as their degree of significance, by means of bootstrapping techniques. Table 6 and Figures 4, 5 and 6 summarize the results obtained.

Table 6 Structural models (second-order constructs)

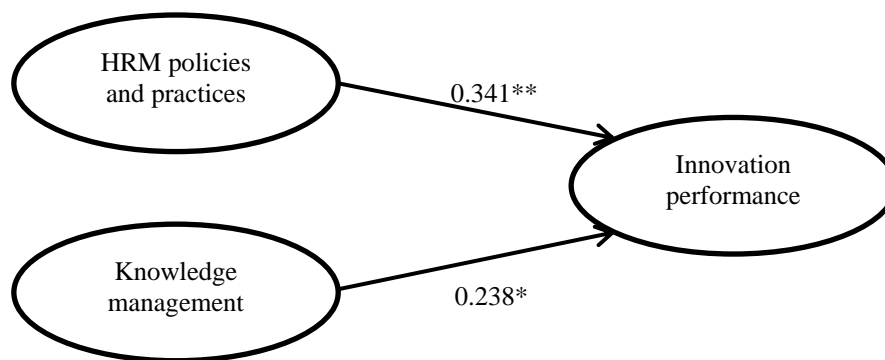
Models	Endogenous constructs	Exogenous constructs			R ²
		HRM	KM	IC stocks	
1	IC stocks	***0.766			58.73%
2	Innovation	**0.341	*0.238		29.65%
3	KM	***0.792			62.79%
	IC stocks	*0.268	***0.583		65.98%
	Innovation	0.242	-0.114	**0.505	37.00%

Notes: ***p<0.001, **p<0.01, *p<0.05 (based on t_{499} , one-tailed test).



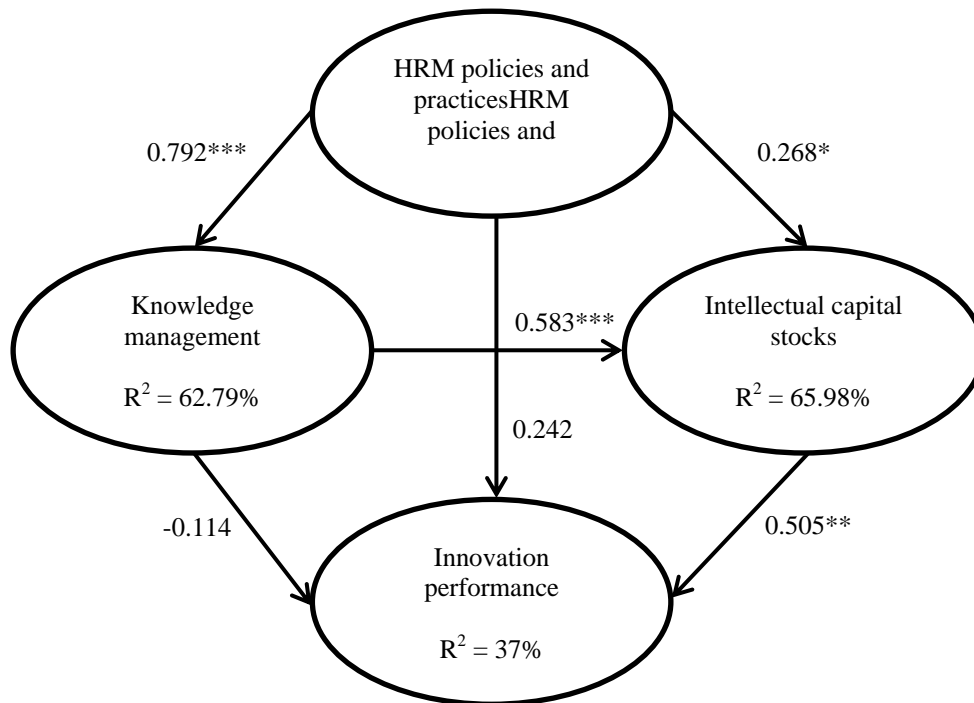
Notes: ***p<0.001 (based on t_{499} , one-tailed test).

Figure 4 Preliminary research model 1 – Structural evaluation



Notes: **p<0.01, *p<0.05 (based on t_{499} , one-tailed test).

Figure 5 Preliminary research model 2 – Structural evaluation



Notes: $***p < 0.001$, $**p < 0.01$, $*p < 0.05$ (based on t_{499} , one-tailed test).

Figure 6 Full research model – Structural evaluation

As can be seen in Table 6 and in Figures 4 and 5, the first condition for mediation to exist is fully satisfied, both for hypothesis H1 and for hypothesis H2. In the absence of KM (i.e. the mediating variable), the relationship between HRM policies and practices and IC stocks is positive and significant (amount of variance explained: 58.73%), while in the absence of IC stocks (i.e. the mediating variable), the relationship between HRM and innovation performance is also positive and significant, the same as the relationship between KM practices and innovation performance (amount of variance explained: 29.65%).

In the full model (i.e. once mediating variables have been introduced, see Figure 6), the relationship between HRM policies and practices and KM is positive and significant (thus the second condition for mediation to exist in the case of hypothesis H1 is fully satisfied), as well as the relationship between HRM policies and practices and KM vis-à-

vis IC stocks (hence, the second condition for mediation to exist in the case of hypothesis H2 is also satisfied: independent variables affect mediating variables significantly).

Moreover, the fact that the relationship between KM and IC stocks is positive and significant fulfils the third condition for the first mediation hypothesis to be accepted, while the fact that the relationship between HRM and IC stocks is still significant (albeit the path coefficient is noticeably lower than in the first model: from 0.766 it has dropped to 0.264) indicates that partial mediation applies (i.e. KM practices partially mediate the relationship between HRM policies and practices and IC stocks). In particular, the introduction of KM practices as a mediating variable has raised the amount of variance explained of IC stocks from 58.73% to 65.98%.

Finally, the fact that the relationship between IC stocks and innovation performance in the full model is positive and statistically significant fulfils the third condition for the second mediation hypothesis to be accepted, while the fact that the relationship between HRM policies and practices and innovation performance and that between KM practices and innovation performance become non-significant indicates that full mediation applies (i.e. IC stocks fully mediate the relationship between HRM policies and practices and innovation, and between KM practices and innovation). In particular, the introduction of IC stocks as a mediating variable has increased the amount of variance explained of innovation performance from 29.65% to 37%.

5 Conclusions

The research carried out contributes significantly both to academic debate and to managerial practice. From an academic perspective, it contributes to disentangle the interplay between IC stocks (i.e. static IC), KM (i.e. dynamic IC) and HRM policies and practices when it comes to enhancing innovation performance. As was noticed in the theory review, this aspect was clearly neglected in previous research, as no study was found that included the three antecedents simultaneously, and only very few studies were identified that analysed the interplay between some of the antecedents (especially between HRM policies and practices and IC stocks).

The results obtained show that KM partially mediates the relationship between HRM policies and practices and IC stocks, while IC stocks fully mediate the relationship between HRM policies and practices and innovation performance, and between KM practices and innovation. Thus, the influence of HRM policies and practices on IC stocks

takes place partly through the positive influence they exert on knowledge management and partly directly (i.e. HRM policies and practices have additional beneficial effects on the development of IC stocks beyond those related to the enhancement of the KM practices included in the research: strategic KM, knowledge protection, learning and IT-based KM). On the contrary, the influence of HRM policies and practices and KM on innovation solely takes place through the influence they exert on the development of IC stocks.

Moreover, the research highlights the specific aspects to work on in order to maximize innovation performance in the case of Spanish companies. As far as HRM policies and practices are concerned, the results obtained reveal that job design constitutes a particularly relevant aspect to consider. Guaranteeing job autonomy, social contact and the opportunity to acquire new knowledge and skills (Parker et al., 2001) should be part of the issues to be considered in work design. In the same vein, promoting training and development, together with the inclusion of assessment criteria related to employee performance in the domain of knowledge processes (i.e. knowledge sharing, knowledge creation and knowledge application), proves to be especially helpful when it comes to enhancing KM and the development of IC. On the contrary, recruitment and compensation did not prove to be relevant elements for KM practices to be encouraged and IC stocks to be enhanced.

In the case of KM practices, strategic KM (i.e. developing an explicit knowledge strategy which is consistent with the company knowledge base, and that is communicated throughout the organization), together with the use of learning mechanisms that take into account both the acquisition of tacit and explicit knowledge, are the two aspects that exert the greatest influence on the development of IC. Conversely, knowledge protection and IT-based KM have not been found to be significant.

Finally, renewal capital, structural capital and external relational capital are the IC components that exert the greatest influence on innovation performance.

Linking these results to the descriptive analysis carried out for Spanish companies, it should be noticed that some of the aspects to work on in order to make the transition from a “brick-based economy” towards a knowledge-based economy are those in which Spanish firms have shown a weaker position. This is actually the case for performance assessment and job design, as well as for strategic KM and renewal capital. Thus, the

research carried out contributes to establish attention priorities for Spanish managers in order to improve the innovation performance of the companies they run.

However, the global picture obtained may hide some relationships between specific components of HRM policies and practices, KM and IC stocks that could provide additional clues for managerial action. For instance, the non-significant role of entrepreneurial capital or human capital may be the consequence of mediation effects between IC components. Thus, further research is needed that contributes to clarify these relationships.

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Appendix

Table 7 Measurement model (first order constructs) – Part I (1 of 5)

Constructs and measures	Item wording	Assessment parameters
Recruiting and selection (reflective)		$\rho_c = 0.810$ AVE = 0.587
		Loadings
REC1	When recruiting, we pay special attention to relevant expertise.	0.7657
REC2	When recruiting, we pay special attention to learning and development ability.	0.8151
REC3	When recruiting, we evaluate the candidates' ability to collaborate and work in various networks.	0.7154
Training and development (reflective)		$\rho_c = 0.910$ AVE = 0.718
		Loadings
TD1	We offer our employees opportunities to deepen and expand their expertise.	0.8325
TD2	We offer training that provides employees with up-to-date knowledge.	0.8606
TD3	Our employees have an opportunity to develop their competence through training tailored to their specific needs.	0.8490
TD4	Competence development needs of employees are discussed with them regularly.	0.8461
Performance assessment (reflective)		$\rho_c = 0.915$ AVE = 0.783
		Loadings
PA1	The sharing of knowledge is one of our criteria for work performance assessment.	0.8871
PA2	The creation of new knowledge is one of our criteria for work performance assessment.	0.9039
PA3	The ability to apply knowledge acquired from others is one of our criteria for work performance assessment.	0.8623

Table 7 Measurement model (first order constructs) – Part I (2 of 5)

Constructs and measures	Item wording	Assessment parameters
Compensation (reflective)		$\rho_c = 0.926$ AVE = 0.806
		Loadings
COMP1	Our company rewards employees for sharing knowledge.	0.8987
COMP2	Our company rewards employees for creating new knowledge.	0.8761
COMP3	Our company rewards employees for applying knowledge.	0.9173
Job design (reflective)		$\rho_c = 0.884$ AVE = 0.563
		Loadings
JD1	Our employees have an opportunity to participate in decision-making in the company.	0.6992
JD2	In our company, work duties are defined in a manner that allows for independent decision-making.	0.6300
JD3	We enable informal interaction between members in our organization.	0.7981
JD4	Our company organizes face-to-face meetings when necessary.	0.7845
JD5	When necessary, we use working groups with members who possess skills and expertise in a variety of fields.	0.8411
JD6	When needed, our company makes use of various expert communities.	0.7280
Strategic KM (reflective)		$\rho_c = 0.860$ AVE = 0.560
		Loadings
STRATKM1	Our company strategy is formulated and updated based on company knowledge and competences.	0.8341
STRATKM2	Our company strategy addresses the development of knowledge and competences.	0.8847
STRATKM3	Our company systematically compares its strategic knowledge and competence to that of competitors.	0.6184
STRATKM4	Our knowledge and competence management strategy is communicated to employees clearly and comprehensively.	0.8077
STRATKM5	In our company, the responsibility for strategic knowledge management has been clearly assigned to a specific person.	0.5366

Table 7 Measurement model (first order constructs) – Part I (3 of 5)

Constructs and measures	Item wording	Assessment parameters
Knowledge protection (reflective)		$\rho_c = 0.881$ AVE = 0.713
		Loadings
KPROT1	Our company's strategic knowledge is protected from those stakeholders to whom it is not intended.	0.7665
KPROT2	If necessary, our company uses patents, agreements, legislation and other formal means to protect its strategic knowledge.	0.8683
KPROT3	If necessary, our company uses confidentiality, employee guidance and other formal means to protect its strategic knowledge.	0.8927
Learning (reflective)		$\rho_c = 0.900$ AVE = 0.753
		Loadings
LEARN1	Our company transfers knowledge from experienced to unexperienced employees through mentoring, apprenticeship and job orientation, for example.	0.7357
LEARN2	Our company systematically collects best practices and lessons learned.	0.9198
LEARN3	Our company makes systematic use of best practices and lessons learned.	0.9333
IT-based knowledge management (reflective)		$\rho_c = 0.935$ AVE = 0.705
		Loadings
ITKM1	Our company uses IT to enable efficient information search and discovery.	0.8072
ITKM2	Our company uses IT in internal communications throughout the organization.	0.8055
ITKM3	Our company uses IT to communicate with external stakeholders.	0.8339
ITKM4	Our company uses IT to analyze knowledge in order to make better decisions.	0.8437
ITKM5	Our company uses IT to collect business knowledge related to its competitors, customers and its operating environment, for example.	0.8731
ITKM6	Our company uses IT to develop new products and services with external stakeholders.	0.8703

Table 7 Measurement model (first order constructs) – Part I (4 of 5)

Constructs and measures	Item wording	Assessment parameters
Human capital (formative)		H. VIF: 1.11 H. CI: 13.47
		Weights
HC1	Our employees are highly skilled at their jobs.	-0.1643
HC2	Our employees are highly motivated in their work.	***1.0393
Structural capital (reflective)		$\rho_c = 0.895$ AVE = 0.680
		Loadings
STRUTCAP1	Our company has efficient and relevant information systems to support business operations.	0.7854
STRUTCAP2	Our company has tools and facilities to support cooperation between employees.	0.8491
STRUTCAP3	Our company has a great deal of useful knowledge in documents and databases.	0.8532
STRUTCAP4	Existing documents and solutions are easily accessible.	0.8092
Internal relational capital (reflective)		$\rho_c = 0.914$ AVE = 0.781
		Loadings
INTREL1	Different units and functions within our company – such as R&D, Marketing and Production – understand each other well.	0.8234
INTREL2	Our employees frequently collaborate to solve problems.	0.9145
INTREL3	Internal cooperation in our company runs smoothly.	0.9106
External relational capital (reflective)		$\rho_c = 0.890$ AVE = 0.730
		Loadings
EXTREL1	Our company and its external stakeholders – such as customers, suppliers and customers – understand each other well.	0.8703
EXTREL2	Our company and its external stakeholders frequently collaborate to solve problems.	0.8119
EXTREL3	Cooperation between our company and its external stakeholders runs smoothly.	0.8799

Table 7 Measurement model (first order constructs) – Part I (5 of 5)

Constructs and measures	Item wording	Assessment parameters
Entrepreneurial capital (reflective)		$\rho_c = 0.867$ AVE = 0.525
		Loadings
ENTCAP1	Risk-taking is regarded as a positive personal quality in our company.	0.7457
ENTCAP2	Our employees take deliberate risks related to new ideas.	0.7924
ENTCAP3	Our employees are excellent at identifying new business opportunities.	0.6129
ENTCAP4	Our employees show initiative.	0.7231
ENTCAP5	The operations of our company are defined by independence and freedom in performing duties.	0.6001
ENTCAP6	Our employees have the courage to make bold and difficult decisions.	0.8393
Renewal capital (reflective)		$\rho_c = 0.912$ AVE = 0.723
		Loadings
RENCAP1	Our company has acquired a great deal of new and important knowledge.	0.8550
RENCAP2	Our employees have acquired a great deal of important skills and abilities.	0.7642
RENCAP3	Our company can be described as a learning organization.	0.9267
RENCAP4	The operations of our company can be described as creative and inventive.	0.8471
Innovation performance (reflective)		$\rho_c = 0.906$ AVE = 0.659
	Compared to its competitors, how successfully has your company managed to create innovations / new operating methods in the following areas over the past year?	Loadings
INNOPER1	Products and services for customers.	0.8204
INNOPER2	Production methods and processes.	0.8377
INNOPER3	Management practices.	0.8340
INNOPER4	Marketing practices.	0.7871
INNOPER5	Business models.	0.7791

Notes: ρ_c : composite reliability; AVE: average variance extracted; H. VIF: highest variance inflation factor; H. CI: highest condition index; *** $p < 0.001$ (based on t_{499} , one-tailed test).

Table 8 Measurement model (first order constructs) – Part II (discriminant validity)

Constructs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Recruiting and selection	0.766															
2. Training and develop.	0.299	0.848														
3. Performance assessment	0.230	0.426	0.885													
4. Compensation	0.264	0.476	0.419	0.898												
5. Job design	0.235	0.561	0.394	0.559	0.750											
6. Strategic KM	0.229	0.628	0.326	0.505	0.583	0.748										
7. Knowledge protection	0.262	0.153	0.253	0.166	0.164	0.220	0.844									
8. Learning	0.257	0.430	0.407	0.429	0.603	0.536	0.146	0.868								
9. IT-based KM	0.240	0.397	0.230	0.182	0.381	0.456	0.172	0.436	0.840							
10. Human capital	0.225	0.223	0.166	0.287	0.475	0.261	0.101	0.543	0.241	N.A.						
11. Structural capital	0.175	0.442	0.256	0.370	0.482	0.626	0.083	0.521	0.553	0.298	0.825					
12. Internal relational cap.	0.228	0.337	0.232	0.322	0.478	0.378	-	0.604	0.320	0.537	0.403	0.883				
13. External relational cap.	0.182	0.311	0.311	0.311	0.396	0.356	0.161	0.413	0.298	0.462	0.347	0.397	0.854			
14. Entrepreneurial capital	0.341	0.525	0.216	0.412	0.552	0.478	0.144	0.481	0.278	0.490	0.395	0.557	0.392	0.725		
15. Renewal capital	0.199	0.509	0.396	0.469	0.475	0.635	0.137	0.520	0.287	0.236	0.549	0.375	0.279	0.499	0.850	
16. Innovation performance	0.235	0.393	0.256	0.302	0.464	0.405	0.109	0.384	0.145	0.278	0.413	0.247	0.370	0.324	0.496	0.812

Notes: Diagonal elements (values in parentheses) are the square root of the variance shared between the constructs and their measures, relative to the amount due to measurement error (AVE). Off-diagonal elements are the correlations among constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements. N.A.: Not applicable (formative construct)

A study of open innovation in facilitating environmental sustainability in road transport innovation networks

Afsaneh Moradi, Emidia Vagnoni *

Department of Economics and Management
University of Ferrara
Via voltapaletto 11, Ferrara, Italy

* *Corresponding author*

Structured Abstract

Open innovation is a new approach in innovation studies emphasize at opening the boundaries of the firm for exchanging the knowledge and R&D achievements with other enterprises, research centres and even competitors. As innovation plays a key role in achieving sustainable development goals and among them environmental sustainability, the effect of open innovation in facilitating the innovation process in transport sector will be discussed in this paper. Three indicators of open innovation have been analysed in order to identify how they can affect the number of firms which could introduce new innovations to the market in European Union countries. These indicators are: cooperation, acquisition of external resources and patents registered for electric and hybrid vehicles. The results of this study showed that while the cooperative and acquisition activities has a significant effect on the number of firms which could introduce new innovation to the market the effect of electric hybrid vehicle patents toward mitigating goals (reducing transport sector GHG emission) can't be judged using the existing data, as this indicator is related to the car manufacturers while some major manufacturing companies located in US and Japan and were outside geographical region of the study.

Purpose the study aimed at discussing how the success of firms in launching innovations to the market is affected by open innovation in road transport sector.

Design/methodology/approach– An explorative study related to the environmental innovations in transport sector has been conducted based on a mixed research approach, The data gathering methods is based on analysing data from OECD database, community innovation survey results (2010) derived from Eurostat database. Statistical analysis includes analysis of variances and regression analysis.

Originality/value – The study allows contributing to fill the gap in literature between open innovation and environmental sustainability in European Union using the network model for identifying the main players of innovative activities,

Practical implications– The results of the study shows the extent to what European firms are willing to share their innovation and how open innovation variables can affect the firm's ability in launching new innovations to the market.

Keywords –environmental innovations, transport, open innovation, R&D, sustainability

Paper type – Academic Research Paper

1 Introduction

Open innovation is relatively a new paradigm in innovation studies lying on the main idea that firms should exchange knowledge and innovation with the surrounding environment.

Traditionally, most industrial firms focused on internally developing new technologies and applying them in their own products (March, 1991; Calantone and Stanko, 2007). Since the 1990s, the frequency of various technology transactions has increased significantly due to the development of markets for technologies (Arora et al., 2001). This has led to the fact that companies have started to use external technologies and knowledge in their R&D processes to an increased extent (Granstrand et al., 1992).

Mainly large firms relied on internal R&D to create new products. In many industries, large internal R&D labs were a strategic asset and represented a considerable entry barrier for potential rivals. Extending R&D capabilities in large firms result in a gap between large firms and smaller rivals (Chesbrough, 2003). In this situation small and medium size enterprises try to increase the efficiency and reducing the costs and risks of R&D activities by sharing their knowledge and innovations. Thus, to compete, firms should share their R&D achievements and gain from the other firm achievements. Furthermore, as competitiveness increased, and the sustainable development issue started to permeate the businesses and firms strategy, the environmental sustainability has become an other perspective to challenge the firms' strategic dimension.

Ensuring environmental sustainability is the seventh goal of Millennium Development Goals (MDG) mentioned by United Nation as the issues which need to be considered urgently (UNDP, 2010). Climate change mitigation is an important goal of any environmental sustainability program, since neglecting it could result in a real threat in the near future.

Among the industrial sector, the transport sector is one of the main contributors of the GHG emissions, EU commission report (2012) states that “transport sector is responsible for the major part of CO₂ emission because it is highly depended on fossil fuels”, Transport sector has not achieved its CO₂ reduction goals yet, and the increasing demand for passenger and freight movements generates an increase of the number of road vehicles. As a consequence, it can be argued that reducing vehicle’s emissions is a key issue for economic development policies and vehicle manufacturers' business. However,

the reduction of vehicles' emission is highly depended on both the innovations in the car manufacturing industry and the public policies. While innovations in the car industry is often costly and needs a strong background of research and development, the approach of open innovation in sharing R&D achievements could be useful in progressing innovations in this sector.

This paper aims at investigating the effects of open innovation on the number of innovations introduced to the market in the transport sector. The literature analysis allowed at defining the open innovation indicators; then corresponding variables have been identified considering the data from Community Innovation Survey (2010) for 27 EU countries. Data analysis based on descriptive statistics and regressions has been conducted. The results showed that although not all variables directly affect the innovation output, the resultant indicator could predict the innovation success to a good extent. Except for patenting electric hybrid vehicles indicator that didn't show considerable effect, the indicators for cooperation and external acquisition of knowledge and R&D strongly affect the innovation output.

The paper is organized as follow: next section is related to a literature analysis about open innovation and the role of R&D to that end; the third section analyse the environmental sustainability, even with regard to the transport sector. The forth section explains the main determinants of open innovation and the correspondent measures. The fifth section describes the methodology and methods used for the study.

2 Open innovation

2.1 Defining open innovation

Chesbrough (2003) described an innovation paradigm shift from a closed to an open innovation model (which emphasize on sharing knowledge and innovation)Based on close observation of a small number of companies. He argued that firms should use external ideas as well as internal ideas, and internal and external paths to market, as they are looking to advance their technology (Chesbrough, 2003). Von Hippel (2010) comments that the open innovation which is defined by Chesbrough should be distinguished from the meaning of open in open source software as in Chesbrough's sense, the word open refers to organization permeability and is the "openness" of an organizations to the acquisition of new ideas, patents, products, etc., from outside – which

is often through licensing protected intellectual property while in open source software the word open refers to information commons that are free from intellectual property constraints and so open to all (Von Hippel, 2010).

In the context of open innovation, firms share their R&D achievements and gain from the other firm innovations. The central idea behind open innovation is that, companies cannot rely entirely on their own research, and they should gain from other firms R&D achievements by the ways such as by buying or licensing processes or inventions (i.e. patents) from other companies. In addition, internal inventions not being used in a firm's business should be taken outside the company (Chesbrough, William 2003). As Chesbrough confess, the open innovation paradigm is 'the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and to expand the markets for external use of innovation, respectively' (Chesbrough et al., 2006, p.1).

West and Gallagher (2006) argue that open innovation shouldn't be considered as just using external sources of innovation such as customers, rival companies, and academic institutions, but it is also a change in using, managing, and employing of intellectual property as it is in the technical and research driven generation of intellectual property. The above mentioned authors define open innovation as the systematic encouragement and exploration of a wide range of internal and external sources for innovative opportunities, the integration of this exploration with firm capabilities and resources, and the exploitation of these opportunities through multiple channels (West, J.; Gallagher, S., 2006).

Open innovation generates benefits both from the firm and market perspective. Wallin and Von Krogh (2010) believe that open innovation can help firms by reducing the cost of product development and process improvement, accelerating time to market for new products, improving product quality, and accessing customer and supplier expertise outside the organization. Thus, open innovation paradigm would contribute to increase the level of competitiveness of the firm.

2.2 Process and activities

Chesbrough's model described the process of open innovation as inbound and outbound innovation activities or strategies. When a firm explores or commercializes external knowledge and ideas it called inbound activity; in this situation the flow of innovation is from the environment and actors which are outside the firm into the firm

boundaries. In this case firms or enterprises have the absorbent role. The other situation is when a firm out-licence or spin off internal knowledge and ideas outside organizational boundaries, the flow of knowledge and innovation in this case is from firm toward the outside environment or actors (Chesbrough, 2003a and 2003b). Enkel, Gassmann and Chesbrough (2009) added a third process to this model after analysis of in-depth case studies: the coupled process that combines the two directions. In the literature related to the management of open innovation, two main streams can be discerned: the firm perspective, and the interface between the firm and the innovation actor (Ollila and Elmquist, 2011).

Nowadays, the open innovation research is conducted through a great number of methods and tools. However, there is yet no agreement on what method is more suitable for the study of the open innovation phenomenon.

2.3 The role of R&D in open innovation models

Dahlander& Gann (2010) made an extensive literature review on open innovation and found some evidence to the concept currently used. According to their study, although in reality, not many firms followed a fully closed innovation approach; a multitude of developments within and outside the innovation arena made it necessary to make innovation processes more open. They believe that open innovation entails both exploration of external knowledge and ideas, referred to as inbound activities, as well as exploitation of internal knowledge outside organizational boundaries, referred to as outbound activities (Dahlander& Gann, 2010).

According to Vanhaverbeke, Van de Vrande and Chesbrough (2008), Chesbrough and other scholars claim that the internally oriented, centralized approach to R&D is going to be abolished in many industries. Useful knowledge is widely distributed and ideas must be used, in other case they should be sold to other organizations. R&D is going to be more costly and shorter product life cycles which is the result of increasing competition in product markets cause the reduction of R&D returns.

In the review of Chesbrough's¹ book, Faems (2008) wrote that in a closed innovation model, firms internalize their firm-specific R&D activities, and commercialize them through internal development, manufacturing and distribution processes. In contrast, an open innovation model is characterized by the use of purposive inflows and outflows of

¹ "Open innovation: researching a New paradigm", Oxford University Press, Oxford.

knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. While the closed innovation model considers R&D as an inherent part of a vertically integrated system within firms, the open innovation model treats R&D as an open system in which external ideas and external paths to market are placed on the same level of importance as that reserved for internal ideas and paths to market. Recently, numerous companies (e.g., IBM, Intel, P&G) have started to adopt the concept of open innovation. Nowadays, some managers even argue that open innovation is no longer a source of competitive advantage, but it has become a competitive necessity (Faems, 2008).

3 Environmental sustainability

Scholars have different definitions for environmental sustainability. Among them, Sutton (2004) defined environmental sustainability as the ability to maintain the qualities that are valued in the physical environment. Stead (2008) indicated that environmental sustainability “means maintaining the integrity, productivity, and resilience of biological and physical systems and preserving access to a healthy environment”, and Voet, Guine’e, and Udo de Haes (2000) believe that environmental sustainability “is guaranteed when environmental interventions are kept within the limits of the environmental carrying capacity”.

But one of the first and most reliable, comprehensive definition was provided by Goodland (1995). He defines environmental sustainability as “the maintenance of natural capital” and as a concept apart from, but connected to, both social sustainability and economic sustainability. He states that environmental sustainability is a source of constraints on the four major activities regulating the scale of human economic subsystem: the use of renewable and non-renewable resources on the source side, and pollution and waste assimilation on the sink side.

Environmental managers have identified environmental sustainability as a concept that has “a professional meaning for them” (Morelli and Lockwood, 2011).

Morelli (2011) believes that sustainability can be considered as a three-legged table consisting of the environment, the economy and society, while the leg for environmental sustainability is much more important than the two others; he argues that without a sustainably productive environment to provide a resource foundation, it would be difficult or impossible to imagine having a sustainable society. Similarly, a sustainable economy

depends upon a sustainable flow of material, energy, and environmental resources. A lack of achievement of sustainable goals would bring economic systems to failure. However, a sustainable environment need not be dependent on the existence of either society or economy and, as evidenced in the wild, can stand alone as a sustainable system.

According to Sutton (2004) sustainability issues arise wherever there is a risk of difficult or irreversible loss of the things or qualities of the environment that people value. Whenever there are such risks, there is a degree of urgency to take action. Greenhouse gas emission which is the main reason of climate change is an example of these issues.

Environmental sustainability is a key pillar of sustainable development and an integral component for the achievement of all other Millennium Development Goals.

3.1 Environmental sustainability in transport sector

Ensuring environmental sustainability is the seventh goal of Millennium Development Goals (MDG) mentioned by United Nation as those issues which need to be considered urgently. Under MDG 7, four global targets and ten global indicators provide a basis for monitoring progress towards environmental sustainability. The total amount of CO₂ emission per capita and per \$1 GDP (PPP) is one of these indicators (UNDG¹, 2010)

Reducing the amount of CO₂ emission is the collision point of environmental sustainability targets with transport sector. As from Szeto et al. (2012), vehicle emissions and noises damage the environment and have adverse effects on human health. It is, therefore, important to take their effect into account when designing and managing road networks (Szeto et al., 2012).

This paper focuses on the road transport vehicles' manufacturers as a main actor in transport sector. This industry is considered "the economic sector most emblematic of modern times and of the polluting consequences of modernity" (Orssatto and Clegg 1999: 264).

The international car industry is the archetypal example of an industry sector dominated by multinational corporation and is truly global in its structure and operations. It manufactures and distributes its products on an integrated global scale and today it is often taken as the paradigm case of a globalised industry (Paterson 2000: 264).

¹ United Nation Development Group (UNDG).

Vehicle production is the largest manufacturing sector in the world. In OECD countries, four to eight percent of GDP, and two to four percent of the labour force, are accounted for by the transport vehicle sector (UNEP and ACEA 2002).

Furthermore, according to Mikler (2004) environmental problems are usually characterised as cases of market failure due to environmental externalities. Environmental externalities cause market failure because the environment is often ignored by markets, so the price of goods and services does not reflect environmental aspects related to their production. This is because actors lack property rights over the environment, meaning that they can ignore the negative environmental effects of their actions (Mikler, 2004).

Ghafele and O'Brien (2012) believe that open innovation has received relatively limited attention in discussions about promoting 'green' innovation. They mention that other than Nike, only one other company – Best Buy – has agreed to place its IP assets on the green exchange, and the vast majority of the posted IP cannot be used in the creation of commercial products. Thus, the recent literature put in the research agenda the call for bridging the ability of open innovation to promote 'green innovation'.

3.2 Environmental innovation networks in transport sector

Innovation is a process. Presenting models for this process is one of the interesting topics in innovation management studies. Innovation modelling trends evolved over the years. At first, R&D was the main driver of innovation because it was the first step of technological development in technology push linear model. Then the market needs determined the direction of innovation, and after a while a combination of these two factors was proposed as the driver of innovative activities.

Since the beginning of the 21st century, the network modelling approach based on innovation systems theory emerged for defining innovation process (Pycaand Koppers, 2002; Hsu, 2005; Calia et al., 2007).

In innovation network models, innovation and technology development are results of a complex set of relationships among actors in the system. These actors are the main players of innovative activities and involve enterprises, universities and government research institutes, etc. According to European policy brief research observation (European commission, 2011), the growing intensity of innovation networks shows that firms are relying more and more on external sources of knowledge to generate innovations (Hagedoorn and Duysters, 2002; Chesbrough 2003).

Based on literature review this paper considers four groups of actors in transport sector innovation networks from the perspective of vehicle production industry. However, innovation networks can show many more relations and further actors. These groups can be introduced as:

1. **Industry partners and enterprises:** include other vehicle manufacturers and competitors or alliances in car manufacturing industry.
2. **Suppliers and distributors:** this group of actors are the partner enterprises which are completely in the industry; they may be the selling agents or may produce some parts of vehicles like seats, filters, etc.
3. **Universities, consultants and private R&D institutes:** they help manufacturers to improve their final products.
4. **Customers and end users:** they final part of a value chain who gain the innovations.

4. Measuring open innovation

4.1 Building the indicators

Many scholars tried to define indicators for measuring the openness degree of innovation in different industries. Based on the dependent variables which the effects of open innovation on it needs to be analysed, different variables and indicators could be selected. Lichtenthaler (2009) examined the effects of outbound open innovation on firm performance and showed that some factors such as high degrees of technological turbulence, transaction rate, and competitive intensity have a positive effect on firm performance. Chien (2011) declares that the open innovation performance indicators are: “the percentage of successful cross-departmental staff participation in new product development”, “the degree of incentive/reward system implementation for innovation”, and “the degree of innovation sharing among employees”.

In a report for the European Commission, Ebersberger et al. (2011) studied open innovation drivers and barriers in European countries, and described indicators for open innovation based on community innovation surveys (CIS). In that report, open innovation has been measured through: collaboration activities, searching activities, and legal protection activities, while searching activities is broken in two separate category:

searching with academic and science partners, and searching with industry and value chain partners (Ebersberger, 2011).

Another report which has been recently published by Lappeenranta University of Technology (ENPI, 2013), summarizes the indicators and variables used for measuring open innovation, after analysing a set of 507 conceptual, quantitative and qualitative papers. In this report a comprehensive set of indicators is introduced based on the reviewed papers and the data sources. Table 1 show a summary of the measures which have been introduced by Lappeenranta (2013) study.

Table 1: Indicators for measuring open innovation (adaptation from ENPI, 2013)

Author	INDEPENDENT	DEPENDENT
Czarnitzki and Thorwarth(2012)	Design activities	1) Innovation output (sales-new to market; imitation)
Ebersberger et al. (2012)	1) external sourcing 2) search (breadth and depth) 3)collaboration (breadth and depth) 4) protection (breadth) overall: open innovation (breadth/depth)	Innovation success: 1) Share of sales with market novelties 2) Share of sales with firm novelties
Köhler et al. (2012)	knowledge search: 1) science-driven knowledge search 2) supplier-driven knowledge search 3) market-driven knowledge search	Innovation success: 1) Share of sales with marketnovelties 2) Share of sales with firmnovelties
Laursen and Salter (2006)	1) external search breadth 2) external search depth (the extent to which firms draw intensively from different search channels or sources of innovative ideas) 3) Innovation collaboration	innovative performance (3 proxies): 1) radical innovation 2) incremental innovation:
Sofka and Grimpe (2010)	search strategies 2) Share of R&D expenditure of sales 3)Continuous R&D activities 4) Share of employees with college education 5) GERD as a percentage of GDP	innovation performance (the share of turnover achieved with new products (new for market, not just for the firm)
Spithoven (2013)	1) Incoming knowledge spill overs 2) Research cooperation 3) Appropriability4) Complexity of knowledge	1) research intensity (Natural log of the ratio of intramural R&D expenditure over turnover) 2) innovative sales (Natural log of the % of new or significantly improved products (goods and services) in sales)
Temel et al. (2013)	1) Cooperation-type of partner 3) Internal R&D occasional	1) Innovation

	4) Internal R&D continuous	
Tether and Abdelouahid (2008)	1) Breadth of openness 2) Commitment to R&D 3) proportion of science and engineering graduates in the workforce 4) proportion of 'other graduates' in the workforce 5) Financial commitment to 6) Radical innovations 7) External innovations	LINK SKP-links between firms and Specialist Knowledge Providers
Berchicci (2012)	1) External R&D 2) R&D capacity	Share of innovative sales
Kafouros and Forsans (2012)	1) In-house R&D 2) External scientific knowledge and technologies	firm profitability (profits before tax)
Nunez-Sanchez et al. (2012)	1) Relational assets individual level 2) Relational assets firm-level 3) Financial motives 4) Technical motives 5) Commitment of firms 6) Commitment of PRC 7) intellectual property 8) coordination in project management 9) Communication	1) Scientific impact 2) Economic impact 3) Objective impact 4) Subjective impact 5) Scientific impact - publications 6) Scientific impact-position 7) Patents 8) Technical impact
Sandulli et al.(2012)	1) Size 2) Technology 3) Leadership 4) Life-cycle 5) Concentration 6) Intensity	Open (Does the firm collaborate in product innovation with other firms or organizations? Binary variable (yes/no))
Teirlinck and Spithoven (2013)	1) research_managers (total#) 2) R&D_experts (total #) 3) PhD_holders (share) 4) R&D_training (dummy)	1) research cooperation (dummy) 2) R&D outsourcing (dummy)
Visnjic and Van Looy (2013)	1) product 2) service sales 3) Customer proximity	1) Total profit margin
Wagner (2013)	1) Innovation source (1) the use of the potential partner as a source of knowledge or information for innovation; 2) the involvement of the firm in Inter-organizational collaborations with the partners in innovation projects)	Innovation performance-new and improved services (the percentage of the firms' annual sales pertaining to services improved and services new to the firm
Waguespack and Fleming (2009)	1) Published standards 2) Working group chairs 3) Publishing attempts 4) Conference attendance	liquidity event
Wang et al. (2013)	1) licensee (dummy) 2) reference scope 3) reference time lag (average time lag for the backward citations) 4) science-based references (dummy)	innovation outcome (patent counts)

Wang et al. (2013a)	1) SLT (The total number of licences) 2) Ratio of foreign licences 3) NLT (technology newness) 4) NTS (number of different licensors used)	1) Innovative performance (patent counts) 2) Technological diversity (number of new classes in a firm's patent portfolio within five years of its in-licensing experience compared with the five years preceding the licensing year as an indicator of technological diversity)
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Following the above literature analysis of open innovation' measurement, this study's approach is based on the following three categories of indicators with regard to open innovation:

- A. Cooperation indicators: this set of measures is related to the cooperation with network actors and its effect on innovation process output.
- B. Intellectual property indicator: it includes patents registered for climate change mitigation and hybrid-electric vehicle patent, and measures the effects of patenting trends and activities on innovation process output.
- C. External innovation acquisition: this category of indicators shows the effect of acquisition external R&D, machinery and equipment, and acquisition other external knowledge in innovation process output.

5. Methodology

Based on a mixed research approach, an explorative study related to the transport sector environmental innovation networks has been conducted in order to analyze the effect of open innovation on firm innovation.

The data gathering methods is based on analysing data from OECD database community innovation survey results (2010) derived from Eurostat database, the statistical analysis include analysis of variances to see if the dependent variable changes with the independent variables or not? Then the regression analysis used for estimating the relationships among variables and the best fitting chart obtained from regression analysis.

5.1 Research propositions

Considering the literature review, enhancing open innovation affects the number of firms which introduced new product to market. Thus, the following research propositions have been formulated:

1. Does cooperation with other network actors have a reliable effect on the number of firms which introduced innovations to the market?
2. Does protecting intellectual property rights has a reliable effect on the number of firms introduced innovations to the market?
3. Does external innovation acquisition have a reliable effect on the number of firms introduced innovations to the market?

5.2 The variables

Based on the above literature review, table2 summarizes the variables which have been considered in order to measure open innovation and innovation output.

Table 2: Measures for open innovation and innovation output

Parameter	Indicator	Independent Variable	Dependent variable
Open innovation	Cooperation	with industry partners	The number of firms which introduced new innovations to the market
		with suppliers	
		with clients and customers	
		with consultants & private R&D institutes	
	IP protection	Electric and Hybrid vehicle patents	GHG emissions
			Revealed technology advantages in environmental related technologies
External acquisition		machinery, software and equipment	The number of firms which introduced new innovations to the market
		external R&D	
		other external knowledge	

5.3 Sample and data

The study steams from data related to the above indicators and environmental economic derived from different sources such as OECD¹-MSTI, CIS 2010² results from

¹ Organization for Economic Co-Operation and Development

² Community innovation survey, 2010

Eurostat (European commission) database and WIPO¹. Data related to the year 2010 was considered.

The data for 27 European Union countries obtained from the community innovation surveys, WIPO patenting data and OECD data base, although in patenting data there were some missing cases that indicated no patent registered or at least the latest updated were not available.

Secondary data sources and statistical data analysis were conducted using SPSS 18.0 software for analysing the effects of open innovation indicators on innovation output.

6. Results and discussions

6.1 Analysis of cooperation indicator

Analysing the first category of indicators, related to cooperation, the results show that the 96.8 % of the variance in innovations which are new to the market can be predicted from the variables related to cooperating activities (Table 3). Also the regression analysis coefficients showed that cooperation within enterprise group or industry and the cooperation with clients and customers have a significant effect on the introduction of innovations which are new to the market (Table 4). While the two other variables (cooperation with suppliers and with consultant and private R&D institutes), didn't show a statistically significant relation with the market new innovations. This indicates that firms preferred to cooperate with the other enterprises in their group and also with clients rather than consulting firms or suppliers,

Model summary				
	Multiple R	R Square	Adjusted R Square	Apparent Prediction Error
Standardized Data	.984	.968	.960	.032

Table 3: The model summary for cooperation indicator

¹ World Intellectual Property Organization

coefficients

	Standardized Coefficients		df	F	Sig.
	Beta	Bootstrap (1000) Estimate of Std. Error			
Coop within enterprises' group	-.385	.171	1	5.054	.037
Coop with clients and customers	.914	.331	1	7.610	.013
Coop with suppliers	.007	.446	1	.000	.988
Coop with consultants and private R&D institutions	-.280	.331	1	.715	.409
All cooperation	.712	.256	1	7.715	.012

Table 4: The regression coefficients for the variables of cooperation indicator

As a dependent variable, the number of firms which introduced new innovations to the market can be predicted from the level of cooperation with network actors. It means that increasing the level of cooperation will intensely increase the innovations introduced to the market. Chart1 indicates that the best equation that can describe the effects of all cooperation variables on introducing new innovations to the market is a quadratic equation.

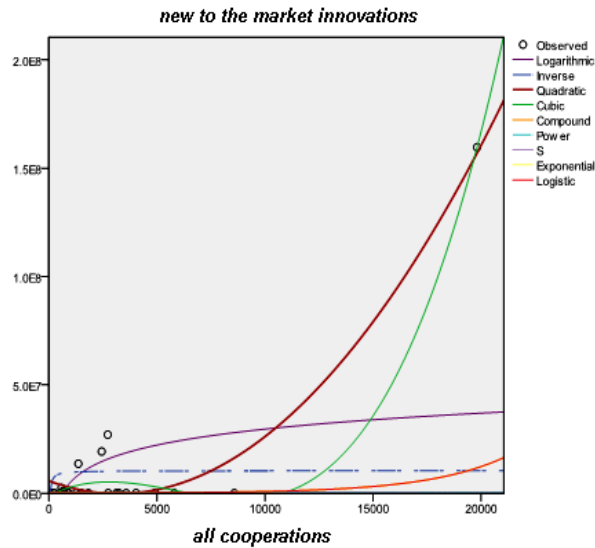


Chart1: Quadratic equation predicting the effect of all cooperation on the number of firms which have innovations new to the market

6.2 Analysis of intellectual property indicator

Although the results of covariance analysis showed a relation between the numbers of electric hybrid vehicles and transport sector greenhouse gas emissions (equivalent to tones of emitted CO₂), as in Table 5, the coefficients couldn't be computed from regression analysis. This limit resulted from a lack of availability of data with regard to some countries and from the focus of the production in a defined geographical area. Most of world automobiles are produced in the 'triad' of the US, Germany and Japan as Dicken (1998) argued. And considering the European focus of this study, it can be predicted that the 'intellectual property indicator' couldn't be a good scale for measuring open innovation, or at least it requires a wider population of car manufacturers to be investigated.

Table 5: the relation between electric hybrid vehicle patents and GHG emissions

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Regression	5.726	1	5.726	7.123	.015
Residual	15.274	19	.804		
Total	21.000	20			

Dependent Variable: GHG emission transport
 Predictor: electric & hybrid vehicle patents

6.3 Analysis of external acquisition activities

Based on the CIS surveys the effects of the number of firms engaged in different levels of external acquisition activities on the number of firms introduced innovations which were new to the market have been investigated. The following activities considered as the predicting variables have been considered:

- o Acquisition of machinery, equipment and software
- o Acquisition of external R&D
- o Acquisition of other external knowledge

The results showed that the set of considered variables can predict the dependent variable (number of firms that introduced new innovations to the market), with a good precision (R²=99.1 %, Error=0.9%), (Table 6).

Table 6: The relation between acquisition activities and introduction of new innovations to the market

Model Summary				
	Multiple R	R Square	Adjusted R Square	Apparent Prediction Error
Standardized Data	.996	.991	.990	.009

Analysing the effect of each variable shows that the variable for other external knowledge didn't have a statistically significant effect on the number of firms that introduced new innovations to the market (Table7). It can be argued that the number of firms which introduced new innovations to the market is highly depended on the firm's ability in acquisition of machinery, equipment, software and external R&D. Also, in order to formulate the effect of acquisition activities on the number of firms that introduced new innovations to the market, the regression chart shows the best fitting curve for the coefficients of the cubic curve (Chart2), indicating that the innovation output is the third cubic function of acquisition activities.

Table 7: The regression coefficients for the variables of acquisition activity indicator

	Standardized Coefficients		df	F	Sig.
	Beta	Bootstrap (1000) Estimate of Std. Error			
RRDEX	.372	.148	1	6.311	.021
Acquisition of machinery	.541	.114	1	22.304	.000
ROEK	.131	.127	1	1.051	.318

Dependent Variable: number of firms introduced new innovations to the market (RMAR)

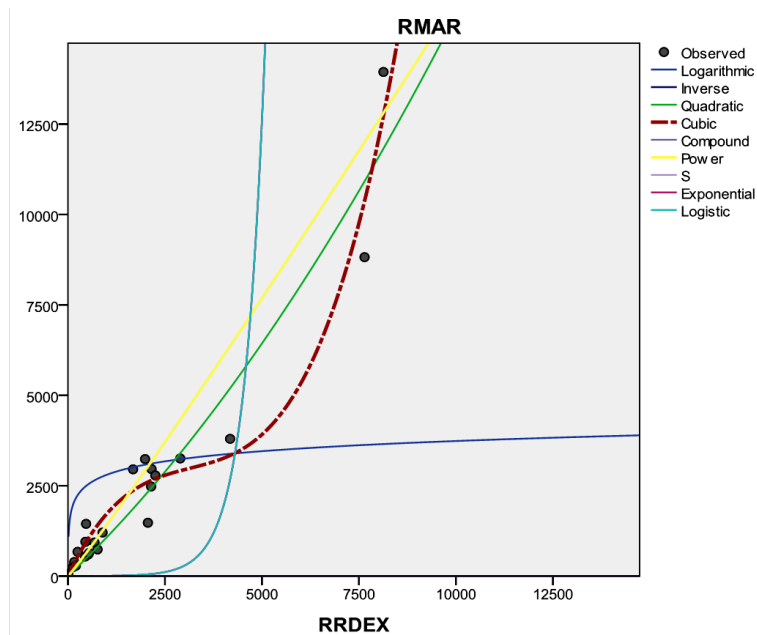


Chart1: Cubic equation can be the best predictions the best predictor f for the effect of acquisition activities on the number of firms which have introduced new innovations to the market

7 Conclusions

The research aimed at discussing the effect of selected open innovation indicators on the innovation output (the number of firms which can introduce new innovations to the market). Open innovation has been measured through selected indicators: cooperating with innovation network actors, intellectual property indicator for innovation related to climate change in vehicle manufacturing industry (the number of hybrid and electric vehicle patents), and the acquisition activities which shows the firm's ability in gaining from surrounding environment. Data analysis showed that the innovation output is highly depended on the firm's ability in acquisition of resources and external R&D, and also the level of cooperation with customers and industry groups. It can be concluded that if the variables that showed a weak performance would be strengthened through appropriate strategies and policies, the number of firms which can introduce new innovations to the market could increase. This could motivate the adoption of corporate strategies and public policies, such as strengthening the link between industry and private R&D institutes and consultants. Although the study clearly pointed out that the external R&D acquisition is the most effective factor on the ability of firm in launching new innovation to the market,

the lack of information about single country profile in innovation success limited the study to the European Union countries, while country base analysis could be possible in case of update and completed database

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Using a user centered methodology to drive open data initiatives. Lessons learned from the U-Home Case

Guillaume Pérocheau

ICI LAB, ISEN Toulon
Maison des Technologies
Place Georges Pompidou
83400 Toulon

Structured Abstract

Purpose – The open data movement is a global trend for the opening of governmental data and the delivery of these data onto connected internet servers. The main argument for open data is that it will enhance the governmental transparency, and will promote the creation of new services for citizens by third parts. Despite its global success, open data initiatives utilizability for end users is often questionable and limits its social impact. This paper relates the case of an open data initiative designed around a user centered methodology, and proposes operational recommendations for further open data projects.

Design/methodology/approach – During the U-Home project we used a participative design methodology, that could be described as *opened* or *participative* (Chesbrough, vanhaverbeke, West, 2006), more *horizontal* (Von Hippel, 2005) or even an *ascending* process (Cardon, 2005). The aim of this method is to imply all the stakeholders (users, partners, developers, etc.) during the innovation project to maximize the social utility and acceptability of the result.

Originality/value – This methodology is an alternative to most of the former open data initiatives, consisting in creating open data portals, and inciting independent innovators to develop third services. In this classical case, the Open Data initiative relies onto the energy and the power of entrepreneurs/developers, willing to create business from a newly appeared resource (Data).

Practical implications – Our work proposes to public agencies to play a new role in open data initiatives. They are not only data providers, but also partners that can facilitate and cooperate with data projects. Our work also insiste on the role of human sciences to imply end users at every stage of the project.

Keywords – data, end-user, innovation, process, methodology

Paper type – Practical Paper

1 Introduction

Since 2006, the opening of Open Data has become a global trend. Hundred of countries, regions or urban areas have created data portals and allow any stakeholder to re-use these data to create activities, reports, applications, etc. But, despite all its promises, the open data movement has not yet produced the awaited growth, economic activity and democratic transparency (Point 2 of this article).

An explanation often proposed by analysts and observers of this trend, is that open data initiatives do not pay a sufficient attention to the utilizability of data portals and of open data applications. For this reason, applying user centered methods to open data initiatives, could be a good solution to ensure an increasing social impact of this movement (Point 3).

Empirically, we present the case study of U-Home, a digital service, based on data sets from the urban area of Toulon in France. This project has been designed following a user centered methodology at every step of the process, implying many stakeholders. During this project, the team of scientists from ISEN used an ethnographic study, organized co-design workshops, and end users Focus Groups, and proceed to utilizability tests (with video and face to face interviews). We briefly relate this experience and try to present some preliminary results (Point 4).

From this empirical experience, we propose some recommendations for further Open Data initiatives. We insist on the complex role to be played by the public authorities, which should be only data providers, but also partners and facilitators for open data projects (Conclusion).

2 The Open Data movement, promises and critiques

2.1 Origins of the Open Data Movement

The idea that Public Data should be considered as a common good was really asserted in 2006 in Sebastopol, in the North of San Francisco, during a meeting between activists of the Internet and philosophers. For this group, governments and public authorities should promote the diffusion of open contents, defined as follow : “*A piece of data or content is open if anyone is free to use, reuse, and redistribute it – subject only, at most, to the requirement to attribute and/or share*” (Open Knowledge Foundation, 2006). This definition is highly inspired by the Open Source vision of the knowledge. Concretely

speaking, when applied to Public Data, the Open Data movement states that the public data should be available onto connected internet servers, into a re-usable and comprehensive format, with specific licences allowing the free use of those data (Berners-Lee, 2006).

2.2 The global success of Open Date Initiatives

Since then, this trend has encountered an exponential success around the world, and the concept of Open Data has inspired major governmental policies (Peugeot 2010, Chignard 2013, Davies et Al 2013). In the US, President Obama launched an initiative for “Open Government” in 2010 which led to the creation of a data portal (<https://www.data.gov/>). This portal currently proposes more than 90 000 government data sets delivered into open formats. In the UK, a comparable initiative followed quickly, with the opening of another data portal (data.gov.uk). The same year, the World Bank opened its own portal, supporting the creation of comparable initiatives in countries like Kenya, Moldova, Ghana or Chile. Open Data is not only a trend at the National level. It also concerns the opening of public data at regional level, or even at urban area level. If we take the example of France, the first Open Data initiative has been launched by the city of Rennes as soon as 2010, with the creation of a Data Portal and the launching of a competition for granting the best applications based on the re-use of this data.

2.3 The Open Date Promises

In the field, the craze for the opening of public data is clear. How can we explain this success ? Arguments for open data are numerous and have been often documented (Kitchin, 2013, Gurstein, 2011, Huijboom and Van den Broeck, 2011, Longo, 2011, Sifry, 2010). They can be categorized in three main promises. The first promise is that open data increases the accountability and the transparency of public bodies. A comparative study of recent Open data Programmes shows that the creation of government data portals often followed reports or public declarations concerning the necessity for transparency and “smarter governments” (like in UK, Australia or US.). In this case, Open Data is seen as a leverage for more participation and more democratic control, each citizen becoming *eyes and ears* for public action. The second promise is that open data will allow third parties to develop public services for citizens. In this case,

public administration will find partners / stake holders willing to extend public services through an innovative re-use of the data. For instance, in some urban areas, the opening of transportation data resulted in the creation of many applications or mobile services by third parts developers to help travellers during their trips in city. In this case, it can be seen as a free enhancement of the public services for travellers. The third promise, is that the opening of open data will create economic activity, and will enhance growth, innovation and job creation. In this case, open data is seen as a resource that can be freely used by economic agents. This resource can be used to increase efficiency of current businesses, or it can be re-used as a based for start-ups, creating apps or digital services.

2.3 Critiques to Open Data : what about the user ?

But have all those promises been fulfilled ? For Rob Kitchin (2013), despite all its promises, and obvious successes, Open Data initiatives deserve some main critiques. At first, the funding and sustainability of Open Data portals is questionable. Producing, curating, and distributing data onto connected web servers has a cost. And maintaining those servers (updates, softwares, power supply, web access, IT staff, etc.) may also be costly in years to come. But most of the time, the future of these portals is questionable, and there is no specific revenues for governments, public agencies or regional authorities freely delivering data (Pollock 2009). Another critique is that due to its complexity and its nature, Open Public data empowers the empowered. Understanding and interpreting a data requires a specific literacy. In this way, Open Data meets the famous digital divide question, and remind us that not all the citizens have the skills, knowledge and even equipments to make an effective use of the newly available data (Gurstein, 2011). But for us, **the main critique is made about the *Utility and Usability of the Open Data initiatives***. Some recent reports studying dozens of data projects (Helbig et al., 2012) point out the fact that these initiatives are often mainly driven by technological concerns, and results into collections of links pointing to structured files. In the same report, authors insist on the fact that the Open Data based services should take into account the context of use of the Data. For instance, a piece of information concerning crime rates in a city does not have the same meaning for a policeman, a neighbor, a tourist or a home seller. It can not be presented the same way. More over, most of the time, this information needs to be

enriched and mixed with other data to build a more specific signification. And finally, it will have to be presented into a readable and comprehensive way for specific users of the data. This is the meaning of this main critique about the *Open Data Usability*.

3 Open Data initiatives should be seen as an innovation process where the user has a major role

3.1 Open Data, Social Innovation and Social relevance of innovation

To better understand open data initiatives, we propose to analyze open data projects as innovation processes. Open Data initiatives are often portrayed as a Digital Social Innovations (DSI). It was even at the core of recent European Conferences dedicated to this Topic, like the Open Knowledge Conference (OKON) in September 2013 in Geneva. But the fact that Open Data - a technologically based innovation, potentially creating business innovation - may be a Social Innovation may be questionable. We believe that this is due to the difficulty to define Social Innovation, that often tends to be a buzz word, with multiple definitions, and approaches from multiple fields (Pol and Ville, 2009, Howaldt and Schwarz, 2010). Following these authors, we can remind that most of the technological and business innovations may also have social impact, whereas many current social innovations (like car sharing, crowd funding or home swapping) are based onto strong technological innovations (such as data bases, internet and mobile devices). As such, “*open data can be seen as forming the infrastructure of an Information Society, and enabling the development of social innovations*” (Poikola et Al. 2011). Finally, Howaldt and Schwarz (2010) propose to temporally close this debate, by focusing onto the social relevance of innovations.

3.2 Limits of a Schumpeterian view

Public policies to open public data often follows a three steps scenario. At first, a public agency gathers data sets from various public services into a structured format. Then (second step) this data is published with a specific license onto a public web service. Third step often consists in the launching of competitions to reward the best application based onto the re-use of these data. This scenario has often been described in recent reviews (Davies and Al., 2013, Peugeot 2010). And unfortunately, after a first and rapid emergence of concepts and proposals, it does not lead to sustainable open data solutions.

In this scenario, the main innovation driver is the entrepreneur, just like in Schumpeter theories (Hagedoorn, 1996). In this case, the Open Data initiative relies onto the energy and the power of entrepreneurs/developers, willing to create business from a newly appeared resource (Data). But, as reminded by Kitchin (2013), the entrepreneurs having the skills to understand complex sets of data are not always able to design applications for citizens, taking into account utilizability matters. And finally, the results are often technical applications offering poor user experiences.

3.3 Open Data, like any innovation, is a social process

As seen above, Open Data initiatives are innovative in many ways. And as such, they should be seen as a *social process*, as any other innovation. Open Data initiatives are *processual*, because they correspond with a phenomena where *time matters* (Abbott, 1990), where sequences of action unfold in time. And Open Data initiative are *social*, because during this innovative process, a multiplicity of actors is going to take part into action (Callon, 2003). Finally, we can remind this definition from Ven de Ven (1986) who already stated that “*innovation is defined as de development and implementation of new ideas by people who over time engage in transactions with others within an institutional order*”. With this definition of Open Data initiatives, *described as a social process where a multiplicity of actors are going to create innovative use of public data during a succession of sequences of action in time*, we can build a more complex vision of these projects.

Many various previous works have been proposed those past 20 years in the field of innovation studies in social sciences. And the good new is that the user is now having all its place during this process. We emphasis some key points of these works here under.

3.4 Innovation process : the growing role of the user (and other stake holders !)

In a traditional model, the users's only role is to have needs to be addressed by an innovative company, an innovative entrepreneur. But some recent works, based on rich empirical studies, show that many users (from 10 to 40%) are engaged into developing or modifying products (Von Hippel 2006). This point had also been underlined by works on the Open Innovation paradigm, where users are presented as key partners for innovation

processes (Chesbrough, Vanhaverbeke, West, 2006). In some areas, the users can even create communities and engage themselves into industrial projects (see the famous examples of Open Source softwares), or into controversies with scientific communities. Their role becomes so prevalent, that we some authors describe it as an ascendant innovation process (Cardon, 2005), reversing the descendant logic of innovation going from industry to customers.

3.5 Applying user centered methods to Open Data Initiatives ?

Since early 2000's, many governments or public agencies have implemented specific policies to promote the user commitment into innovation process. We usually speak of Living Labs to describe those institutional settings (Salter and White, 2013). The originality of Living Labs is to propose an extensive implication of the users, at various steps of innovation projects (ideation, design, development, tests, etc.), using scientists from Human and Social Sciences as facilitators between users, communities, SMEs, companies and research centers. Traditionally, Living Labs have been used to develop new products and services. But recent works have shown that user centered methods could also be used when designing Social Innovation (Brown and Wyatt, 2010), and that in this case, the role of social sciences could be central (Mallard, 2011, Labarthe, 2014).

By considering Open Data Initiatives as socio-technical innovation processes, and remembering that one of the main critique made to these initiatives is the lack of attention payed to final users (see previous part), it seems obvious that we should try to apply user centered methodologies to such projects. *That is why we chose to address, in this article, the following question : how can we apply a user centric methodology to open data initiatives ?*

4 The U-Home case, an open data application in Toulon urban area

4.1 An open data initiative into the Living Lab context

Provence Alpes Côte d'Azur (PACA) is a region located in the South of France. It comprises cities like Marseille, Nice or Toulon. Since 2008, PACA as launched a specific tool to support digital initiatives having an impact onto the territory. Since its origin, PACA labs is aiming at promoting user centered methodologies, by granting collaborative innovation projects melting industrials, territories, designers, users and

human sciences laboratories. U-Home project is one of these projects, supported by PACA Region. U-Home consortium is made of :

- Centr@IWeb, an IT services company, willing to develop a new application based onto public data
- ISEN Toulon, a technological graduate school, and especially its Human Sciences team, who brought the user centric methodology to drive this project.
- Toulon Provence Méditerranée (TPM), the urban area of Toulon, who provided data sets and facilitated the access to data facilities

The U-Home application concept is the following : when a person (it could be an individual or a company) wants to migrate to Toulon area or inside the urban area, he has to choose the best place for him depending on his life style : does he have children ? Is there a school nearby ? Or a doctor ? Is he far from a Judo club ? Can he park his car easily ? Potentially, all these pieces of information are disposable into various public data sets... But browsing all these data bases is a nightmare. The solution would be an interactive map of the urban area, highlighting various zones of TPM by processing a mash-up of the useful data.

The purpose of the U-Home project was double :

- 1) Centr@IWeb wanted to design a user friendly solution, by collaborating with potential end-users at each step of the project.
- 2) The TPM IT team wanted to explore the open data problematic before deciding to open (or not) its public data.

4.2 The user centered Methodology used during the project

We had the opportunity to use various tools issued from human and social sciences at each step of this project.

- From 02/2012 to 08/2012, a first team of Sociologists¹ performed a qualitative study to better understand what is the mobility process of individuals. This work was based onto ethnographic works, comprising 10 face to face interviews and on site observations.

¹ *This Ethnographic Study was performed by Voilmy D., coordinator of the ActivAgeing Living Lab of Troyes, and Karine Lan Hing Ting, Postdoctoral Researcher at Université de Technologie de Troyes, and will be documented into further articles.*

- In the same time (March 2012), we animated a Co-design workshop, joining together technical staff from TPM, developers from CentralWeb, and some professionals of property from the urban area (9 persons).
- Relying on those first works, a first version of the U-Home service was developed from 09/2012 to 02/2013. We tested this version during a Focus Group dedicated to the service utility, where 12 potential users could bring their insights concerning the current version of the project.
- A second version of the U-Home site was then developed and tested. We organized utilizability tests from 02/2013 to 06/2013 with 12 users, whose browsing sessions were recorded for further analysis².
- We finally produced new recommendations for the development of the project final version, delivered in the end of 2013.

The meta analysis of all these data is currently ongoing, and more complete results will soon be published.

4.3 First analysis of the projet results

In this article, we do not propose a complete analysis of this project research that ended just a few months ago. But we remind here the main results obtained during U-Home, regarding our initial goals. This analysis is also based onto a *post mortem* project review, organized with the various project leaders in February 2014.

- During this project, centr@lweb developed new technological skills (use of Open Street Maps, Open Data Mash Ups, etc.), but mainly discovered the importance of utilizability tests. It is now a common tool for the company project managers.
- The U-Home Web site is on line, and its technology will soon be embedded into a new portail dedicated to property market.
- TPM has decided NOT to create a data portal, as many other urban areas did before. The idea of TPM is to propose collaborations with third parts, willing to use the city data sets.
- The data sets specifically used during this project will be delivered to the PACA Regional open data portal.

² *The utilizability tests have been organized and analyzed by Alena Sjarheyeva, Researcher at ISEN Toulon.*

This first result may seem rather ambiguous : despite a succesful open data initiative, the TPM IT team decides to no create an open data portal. This shows that TPM team has clearly understood the complexity of data, and the relative inefficiency of a policies only based onto the delivery of raw material. Instead, the TMP IT managers have acquired a more complex approach of their data, and understood that opening data for third parts should imply a strong collaboration with those stake-holders.

5 Conclusion

As a Conclusion, and relying on those first empirical results, we could make some operational recommendations (R) to increase the sustainability and social impact of further open data initiatives :

- R1) Public agencies are not only data providers, but also data experts with analysis capabilities that could be useful for third parts project leaders.

In tis prospect, creating open data portals is often no more than a political gesture, but has few direct impact onto growth and welfare.

- R2) The meaning of data sets for end users often has to be explored and designed directly with users of spokespersons representing these users.

During U-Home project, we had passionating discussions concerning data representing noise. Noise at 9 PM has not the same meaning for a senior or for a student, while it is a neutral information in data. Sense making was a key result of our focus groups.

- R3) The definition of end users is a tricky question for the project designers, and should be a central task for Open Data Initiatives.

At the beguining of U-Home, we had a clear (end simplistic) vision of our service end-user. But during the project, we discovered that end users were plural, and may have very different needs and visions.

- R4) Open Data initiatives should work closely with lead users and /or user communities.

Open Data initiatives will lack appropriation as long as they will be developed only between data experts, coming from state agencies and start ups. Implication of users brings a contextual vision of problems to be solved and is a creativity resource for entrepreneurs.

By analyzing our data, we also should be able to make some theoretical proposals concerning user centric methodologies, and to better understand what may be the role of human and social sciences during social innovation processes.

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Research on ecoinnovation

Pawel Bartoszczuk *

Enterprise Institute, Warsaw School of Economics
Al. Niepodleglosci 162
02-554 Warsaw , Poland

Marek Michalski

UNEMI (Public University of Milagro) in Ecuador
and Rey Juan Carlos University in Madrid (Spain).
Cda. Universitaria Km. 1 1/2 via Km.26
Milagro; prov Guayas, Ecuador

** Corresponding author*

Structured Abstract

Purpose – The goal of this paper is to present eco-innovation implementation in some European countries. Both current and expected government regulation is particularly important for pushing firms to reduce air and water pollution, decrease hazardous substances and increase recyclability of products. Cost savings are an important main incentive for reducing energy and material use, pointing to the role of energy and raw materials prices, as well as taxation as drivers for eco-innovation. Customer requirements are very important source for eco-innovations, particularly with regard to products with improved environmental performance and process innovations that increase material efficiency, reduce energy consumption and waste .

Design/methodology/approach – We propose an approach theoretical approach: to investigate available data concerning ecoinnovation implementation in the EU countries and case study. We review literature and analyse how different stakeholders can contribute to building a green economy through eco-innovation. Moreover, we analyze incentives and barriers of ecoinnovation development in European countries. Many companies implement eco-innovation, but the majority either still do not eco-innovate or the material savings gained due to innovation are not important. Nevertheless, there exists solid, often unrealized potential for eco-innovation in the EU. Around one fourth of innovating companies in the EU-27 countries have reported introducing eco-innovation to reduce material use between 2006 and 2008, according to the Community Innovation Survey/CIS/.

Originality/value –This methodology puts in evidence that ecoinnovations are important tool in building modern economy. It is confirmed by presented in this paper case studies.

Practical implications –The outcomes of the ecoinnovation are very important to the decision makers. Traditional environmental policies and measures focus on dealing with specific problems. Generally, this approach has been quite successful. However, since traditional problem solving begins after recognising a problem's existence, such policies

are not preventive in a general. Solving individual problems only by specialised environmental technologies can even worsen other problems, in particular those as yet undiscovered. Today, more than 95% of the resources lifted from nature are wasted before the finished goods reach the market. And many industrial products - such as cars - demand additional natural resources while being used. Sufficiently decoupling production and consumption from nature requires new systems, goods, services, processes, and procedures for meeting human needs.

Keywords – ecoinnovation, sustainable development, environment.

Paper type – Academic Research Paper

1 Introduction

Globalisation, technological progress, life cycles ever shorter, increasing pollution, and fast changing of customers demand have involved that company's competitiveness is more related to the ability to ecoinnovate. We have to underline that no fully agreed definition of eco-innovation (environmental innovation) has been emerged to date (Wozniak, 2010). Eco-innovation concept appeared in economics very late -in the 90's of XX century as response to continuously deteriorating environment and increasing interest in innovations, which contribute to the competitive growth of firms and economic development. First definition was given by Fussler and James (1996), who described them as beneficial both to producers and consumers, and simultaneously decreasing negative impact on environment. In the last years the concept is becoming more welcomed among researchers, entrepreneurs and administration. Definition of eco-innovation is continuously modified with increasing knowledge about relationships between innovation and environment.

The reason underlying is that this category is very wide and difficult to define, requiring both theoretical and practical research. In this study, we used the EIO (2010) definition of Eco-innovation. "Eco-innovation is the introduction of any new or significantly improved product (good or service), process, organizational change or marketing solution that reduces the natural resources use (including materials, energy, water and land) and decreases the release of harmful substances across the whole life-cycle". An environmental innovation creates environmental benefits compared to alternatives. The environmental benefits can be the primary objective of the innovation or the result of other objectives. This benefits can occur during the production of a good or service, or during the after sales use of a good or service by the end user." What follows is a list of environmental benefits that an environmental innovation could have produced

either with the firm or from the after sales use of a product by the user for which surveyed firms should state whether this benefit has in reality occurred or not.

Contemplated, in addition to the process of innovation is the ability to generate and absorb; eco-innovation ability is believed as one of the important attributes of the region's economy. The prefix 'eco' added to the term "innovation" enriches the positive expression. One of the main expected results of eco-innovation is the increase of environmental effectiveness, meaning reduction of energy consumption, and in this way increasing business competition (Wozniak, 2010). Still, the preparation and implementation of the eco-innovation is undertaken in order to build a sustainable competitive advantage. Another result will be in relation to the innovation perception, comprehend as the sum of the innovation capacity and synergy mechanism caused by innovation effects dispersing in the given region. The increasing efficiency of small medium enterprises enhanced thanks to those eco-innovation activity, will significantly contribute to the eco-efficiency of the region's economy.

In most conducted econometric studies to date, environmental innovations were widely analyzed while only a few papers distinguished between end - of - pipe - innovations and cleaner production ones. In the literature, there is an agreement that eco-innovations are regulation driven though significant number of studies emphasizes also cost - savings. It is especially true for cleaner production technologies, where of cost reduction is important driver of eco-innovation (Horbach, 2008; Frondel et al., 2007). However, due to deficiency of more differentiated data availability, the literature on driving forces of eco-innovations to date has ignored to analyze different areas of environmental impacts of eco-innovations such as recycling, low carbon technologies or innovations for water management (Kammerer, 2009). Kammerer also emphasizes the function of customer benefits as an important determinant for eco-innovations. Important findings were given by Popp (2006) who suggested that innovation in companies were driven rather by internal country's regulation, not by foreign regulation. Other researchers demonstrated further incentives to be very essential. Del Rio Gonzalez (2005) conducted a survey in the Spanish pulp and paper industry. He found regulation pressure and corporate image as the main drivers of cleaner technology adopting. Frondel et al. (2007) find that generally policy stringency is an increasingly important driving force for environmental innovations rather than single policy instruments. Other researchers, like Arimura et al. (2007) found similar result for the effect of regulation on green R&D.

Facilities facing very stringent environmental regulation are more likely to conduct environmental R&D. Frondel et al. (2007) point to the fact that the effects of regulation may vary with regard to different environmental technology fields.

Eco-innovation can be developed not only by firms but also by non-profit organizations. They can be traded on different kinds of innovations: “ technological, organizational, social and institutional (Rennings, 2000). There is a common agreement that eco-innovation is great chance for business. By this innovation we are able to introduce: new processes and products and changing business models to increase competitiveness in new and changing markets. We have mounting evidence that eco-innovation in companies have positive economics effect since it leads to reduced costs, improves capacity to capture new growth opportunities as well as strengthens company image in the customers view (EIO, 2012). We argue that eco-innovation in European companies is key to the constant transformation needed toward sustainable development and to meet the EU’s vision of a green economy. This transition does not have to be a burden for business, but rather a great opportunity for strategic investment. It asks how business and policy can reduce risk to ensure these opportunities are met.

Other interesting definition of eco-innovation was demonstrated by Kemp and Pearson (2008). An environmental innovation, according to them, has been defined as “a new or significantly improved product (good or service), process, organizational method or marketing method that creates environmental benefits compared to alternatives. The environmental benefits can be the primary objective of the innovation or the result of other innovation objectives. The environmental benefits of an innovation can occur during the production of a good or service, or during the after sales use of a good or service by the end user” (Kemp and Pearson, 2008). In what follows is a catalog of environmental benefits that an eco-innovation could have produced either with the firm or from the after sales use of a product by the user for which surveyed firms should say whether this benefit has occurred or not. Concerning environmental product innovations, ZEW (Zentrum für Europäische Wirtschaftsforschung -Centre for European Research) econometric results show that present regulations are only effective for reductions of air, water, soil and noise emissions but not suitable for energy consumption and recycling (Horbach, 2009). The firms expect a growing importance of future regulations for all product innovations. In all considered environmental innovation areas future regulations already trigger eco- innovations.

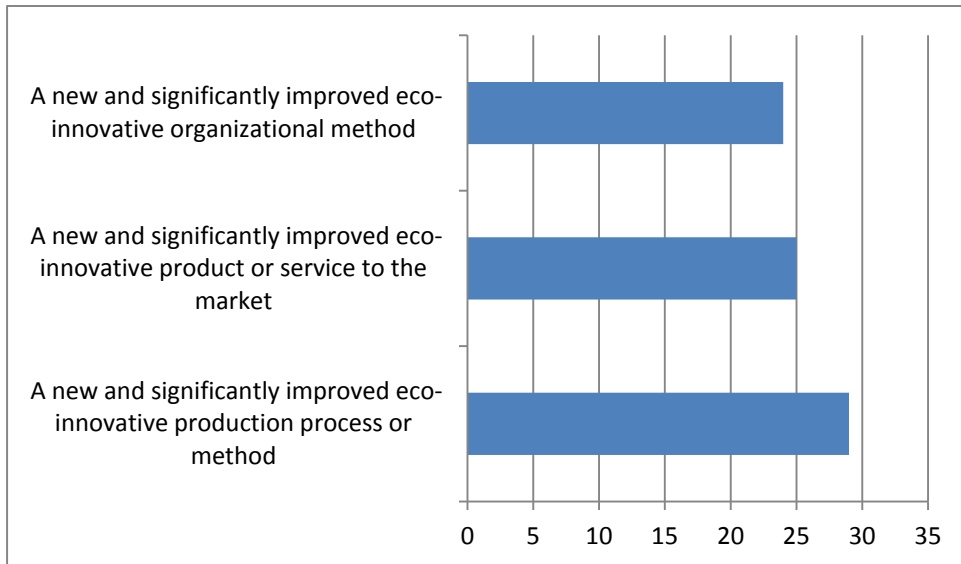
Environmental regulation and individual environmental policy instruments (specially, soft regulation) are important drivers particularly for eco-product innovations (Cleff and Rennings, 1999, Horbach, 2008 and Rehfeld et al., 2007). Other researchers like Green et al. (1994) imply that firms implement environmental product innovation to obey with existing and anticipated legal requirements. Horbach (2008) finds a significant positive influence of subsidies on environmental product innovation. Kammerer (2009) demonstrate that a high level of regulatory stringency incentivises companies to implement environmental product innovations which are quite novel to the firm, but this result cannot be corroborated when these innovations are new to the market. Finally, Horbach et al. (2012) confirm a high importance of expected future regulations for all environmental product innovations.

The paper consist of 4 chapters, including introduction. In second chapter we present results of ecoinnovation development in Europe, the third present case study: Poland and Spain, and forth presents conclusion.

2 Result of ecoinnovation development in Europe

Many European companies implement eco-innovation, nevertheless the majority either still do not introduce that type of innovation or the material savings gained due to innovation are insignificant. Nevertheless, there is solid, often unrealized potential for eco-innovation in the EU (EIO 2011). Around 25% innovating companies in the EU-27 have reported introducing eco-innovation to reduce material use between 2006 and 2008, according to the Community Innovation Survey/CIS/ (Eurostat, 2010). Up to 45% of EU companies in the manufacturing, construction, agriculture, water supply and food services sector reported implementing eco-innovation in the period 2009-2011. Eurobarometer survey (Flash EB No 315, 2011) showed that the majority of them achieving incremental type improvements in resource efficiency of 4. While these are positive events-seeming to indicate a greater push for material efficiency in companies—there is still a large gap between the great potential for eco-innovation and the state of eco-innovation in the EU countries (Attitudes of European entrepreneurs towards eco-innovation Summary Fieldwork, op cit.). Roughly 3 in 10 (29%) companies in the EU had introduced a new or significantly improved eco-innovative production process or method in the past two years, while roughly a quarter (24%) had introduced a new or significantly improved eco-innovative organizational method. A similar proportion (25%) had introduced a new or

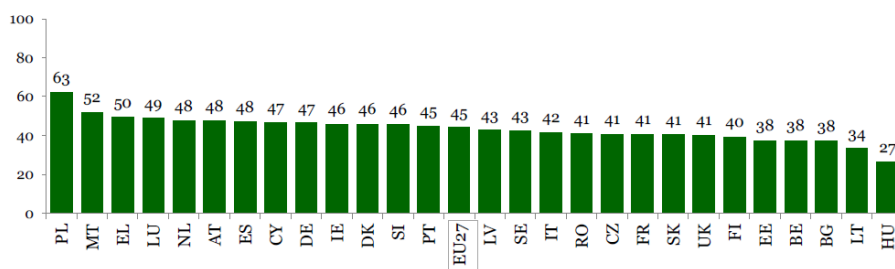
significantly improved eco-innovative product or service on the market (Figure 2) (Flash EB No 315, 2011).



Source: Attitudes of European entrepreneurs towards eco-innovation Summary Fieldwork: January 2011, Publication: March 2011

Figure 1: Introduction of various eco-innovations in past 2 years

More than 4 in 10 companies in the EU reported having introduced at least one eco-innovation in the past two years (2009-2011). Surprisingly, companies in Poland were the most likely to have introduced a new or significantly improved eco-innovative product or service, production process or organizational method in the two years (63%); companies in Hungary were the least likely to have done so (27%) (Figure 2).

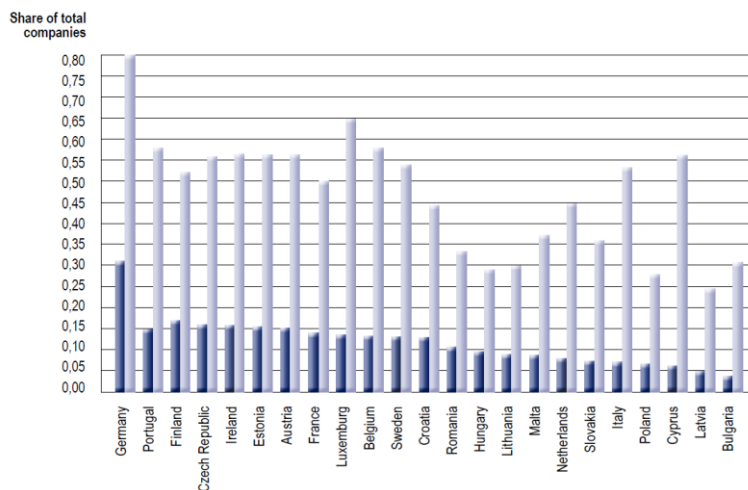


Source: Attitudes of European entrepreneurs towards eco-innovation Summary Fieldwork: January 2011

Figure 2: Companies that introduced at least one eco-innovation in past two years.

Medium-sized companies, companies with an annual turnover €10 -50 million and those that that increased turnover in the past two years were more likely to have introduced the types of eco-innovation listed in the Eurobarometer survey. For example, 32% of medium-sized companies had introduced a new or significantly improved eco-innovative organizational method in the past two years and 41% said the same for a new or significantly improved production method or process; the corresponding figures for small companies were 22% and 26%, respectively.

There is a large gap both in the scale of eco-innovative activities, with large differences between countries, sectors, and sizes of companies as well as a gap in the scope of eco- innovation changes, with a tendency towards more incremental rather than radical changes introduced to the market. The gap between innovators and eco-innovators is significant across the EU. In Germany around 39% of innovators are eco-innovating (Eco-innovation observatory, 2011), while only 10% in Cyprus and Bulgaria (see Figure 3). If one looked at the share of eco-innovators in total companies, only around 15% of companies across the EU have reported eco-innovative activity focused on material efficiency. In Poland there is little innovation (located on the penultimate place in the CIS ranking). Eco-innovators are about 22% of the total innovators in Poland .



Source: Eurostat (CIS)

Note: Not all countries provided data in the Community Innovation Survey on eco-innovation: data is missing for the UK, Denmark, Greece Slovenia and Spain.

Figure 3: Share of European companies implementing ecoinnovation

We argue that this share is unsatisfactory. Especially, innovative companies already have capacity to capture benefits from improved resource efficiency. Closing the

gap in the performance between countries may also add up to greater savings at the macro level. As regards the gap between incremental and radical eco-innovation, still little we know. In the past many firms have become increasingly alert of overarching environmental challenges and have begun preparing their products and services to meet the wave of “green consumption” that has swept across Europe (The Eco-Innovation observatory, 2012). While there is a general tendency towards ‘eco-friendly’ products, particularly evident in the proliferation of eco-labels over the past 5 years, the trend toward increasing consumption of natural resources in the EU has continued. This indicates that the intensity of changes have not been sufficient to counteract the overall trend (Eco Innovation Observatory, 2012, 2012). Economic growth has continued to require less additional final energy consumption within the EU-25 economy. However, this improvement has not been sufficient to prevent total final energy consumption from rising. Decoupling was most successful in the industry sector as a result of technical improvements and structural changes, while private households consumed more energy per capita due to larger and more dwellings and more electrical appliances. While energy intensity continues to decline at a faster rate in the new EU-10 Member States, it remains much higher than in the EU-15. There is not, yet, evidence of systemic change, which actually contributes to an absolute decrease of environmental pressures and impacts. This report aims to provide information about the scope of economic benefits for companies to encourage companies to grasp these opportunities and close the eco-innovation gap (Tab.1).

Table 1: Reasons of introduction of environmental innovations (eco innovations)

Environmental innovations that were introduced in response to	Yes	No	Number of firms
	In % of all firms with at least weak environmental impacts		
Existing regulations	31.5	68.5	3733
Expected regulations	27.0	73.0	3730
Financial support by governments	9.9	90.1	3733
Demand from customers	27.4	72.6	3733
Voluntary codes and industry agreements	28.0	72	3727
*only firm with environmental innovations			

Source: In SYSTEMATIC Eco-Innovation Report 2008, p. 36

The European Eco-innovation Action Plan states that European environmental legislation has been one of the most important drivers for eco-innovation. Moreover, the Plan paid attention to some aspects that should be considered in the design, revising or implementation of environmental regulation. One of these is the innovation as an

opportunity to improve the environment through flexibility in technological standards. This aspect is directly linked to IPPC Directive, also because the pollution prevention schema could be considered as organisational eco-innovation (Eco Innovation Observatory, 2012).

Just over a third of European companies reported that less than 10% of their innovation investments in the past five years were related to eco-innovation and a quarter estimated that this share was between 10% and 29% (Flash EB No 315, 2011). In just six countries, more than a fifth of respondents estimated that 30% of their innovation investments were eco-related: Sweden (21%), Greece (22%), Austria (23%), Cyprus and Luxembourg (both 24%) and Poland (30%). Companies that had made the largest share of eco-innovation investments were more likely to be found in the water supply and waste management, and agriculture sectors. Roughly 3 in 10 companies in the EU had introduced a new or significantly improved ecoinnovative production process or method in the past two years, while roughly a quarter had introduced a new or significantly improved eco-innovative organisational method. A similar proportion (25%) had introduced a new or significantly improved eco-innovative product or service on the market.

Medium-sized companies, companies with an annual turnover between €10 and €50 million and those that had grown in terms of turnover in the past two years were more likely to have introduced these types of eco-innovation. (Flash EB No 315, 2011). Among companies that had introduced at least one type of eco-innovation in the past two years, the largest share (42%) said that such eco-innovation had led to a reduction in material use of between 5% and 19% per unit of output, while roughly a third estimated that the reduction in material use had been less than 5% per unit of output.

The results also show that the attitudes of European entrepreneurs towards current high material prices have the expected impact in eco-process innovations (a positive correlation), which is consistent with previous empirical studies (Frondel et al., 2007 and Horbach, 2008). Giving importance to cost-related factors is also correlated with the implementation of EOP and cleaner production technologies. On the other hand, the variable that reflects the importance given to the maintaining or increasing market share is not statistically significant, in line with Cleff and Rennings (1999). However, similarly to what was found for environmental product innovations, giving importance to the increasing market demand for green products has also a strong positive effect on

environmental process innovation. Most probably, product eco-innovators are able to develop process eco-innovations.

2 Case study: ecoinnovation development in Poland

Poland, since its accession to the EU in 2004, enabled to utilize EU funds, reduce the backlogs in transportation infrastructure and environmental protection and at the same time build a strong and stable economy (Kassenberg et. al, 2011). The state of the natural environment has significantly improved, while the resources productivity and energy intensity unfortunately have increased. Despite that, Polish productivity indexes per Gross Domestic Product still remain below average of the EU countries (Kassenberg et. al, 2011). During the last 20 years, energy consumption remained stable in spite of significant Gross Domestic Product (GDP) growth, due to energy efficiency improvement and changing the structure of economy. Nevertheless, the energy intensity index is still 2-3 times lower than the EU-27 average. In Poland, almost half (47%) of the companies surveyed by **Eurobarometer** stated that material costs represented 50% or more of their total production value (Flash EB No 315,2011). Companies in Poland were the most likely to have introduced a new or significantly improved eco-innovative product or service, production process or organisational method in the past two years (63%); companies in Hungary were the least likely to have done so (27%). Regardless of the fact that the country policy in the area of eco-innovation misses synergy, the eco-innovations have been addressed via national policy strategies on environmental protection, product policy, energy efficiency in buildings, etc. The interest of Small Medium Enterprises (SME) in eco-innovation is slowly growing, especially in relation to cost reduction possibilities, due to notably reduction of energy consumption and decreasing expenditures related to pollutant emissions (Kassenberg et. al, 2011).

The country also has outstanding examples of eco-innovations in energy and water management, hazardous waste treatment, solar energy, green banking and coke industry and a number of eco-innovation related programs and initiatives within various clusters. On the other hand, eco-innovation does not constitute a driving force for new business opportunities in Poland. Development of eco-innovations in Poland is significantly hindered by numerous barriers. The most important is underestimation of the innovative potential as a growth driver. This innovative potential is understood here as an ability to create new technological and organizational solutions, increase labor productivity and

improve resource efficiency with relation to work, capital, energy and materials. Eco-innovations in particular, remain outside the interest of decision makers policies which determine Poland's expectations towards the EU and future Structural Fund allocations for development objectives. As a consequence, Polish policies focus on clearing infrastructural backlog and accelerating extensive economic growth, ignoring future changes in the significance of the respective sectors and the barriers that limit the current growth model, which is based strongly on price, rather than quality, competition.

Another barrier is too big focus on EU funds availability and their fast utilization. The approach that money should be utilized fast, considerably limits the debate on how to optimize EU funds absorption. Poland needs stable mechanisms (similar to Finnish solutions) that will instigate the development of new, competitive structures of the Polish economy. There should be more focus on the quality of implemented ideas, their better selection and support for truly innovative economic initiatives.

The EU funds provide new possibilities for financing various initiatives at universities and colleges. Unfortunately, due to excessive formalization, more and more often the true aim of these activities is lost, while bureaucracy is increasing. A lot of attention is provided to the accounting side of projects, although it should be focused on how to fulfill the planned objectives and ensure durable benefits.

Lack of well-qualified and skilful specialist constitutes another large barrier to development of eco-innovations in Poland. This is result of, first and foremost, from a poor and ineffective system of education. Graduates of technological studies are in minority and staff available to work on eco-innovations is limited. There is a large difference between the business sphere, which is very innovative but still on a basic, everyday level, and administration and science. Due to insufficient information, access to eco-innovative solutions developed by the academic and science sector is limited. Providing adequate support for innovations, or eco-innovations in particular, constitutes a challenge. Poland has a serious problem with innovativeness as such, in its broad meaning.

Positive, albeit slow, changes are observed in Poland in the area of eco-innovations. They do not immediately lead to a significant increase in the value of the eco-innovativeness scoreboard index. The Eco-Innovation Scoreboard (Eco-IS) is the first tool to assess and illustrate eco-innovation performance across the 27 EU Member States. The scoreboard aims at capturing the different aspects of eco-innovation by applying 16

indicators grouped into five thematic areas: eco-innovation inputs, eco-innovation activities, eco-innovation outputs, environmental outcomes and socio-economic outcomes. It thereby shows how well individual Member States perform in different dimensions of eco-innovation compared to the EU average and presents their strengths and weaknesses. The Eco-IS complements other measurement approaches of innovativeness of EU countries and aims to promote a holistic view on economic, environmental and social performance. Compared with 2011 Poland rank moved from the last place to the 25th position. The increase occurred in the area of eco-innovation output. (Eco-innovation in Poland: 2012 update)

There exist several examples of eco-innovation examples in Poland:

- Successful continuation of the program GreenEvo (Green Technologies Accelerator). This initiative of the Ministry of Environment supports Polish eco-innovators, mostly small and medium enterprises (SMEs) transferring technologies all around the world. In 2011 alone, Green Evo participants revenues increased by 31% on average, and their export revenues soared by 58%. What is more 86% of companies made a trade offer to foreign customers, and 50% of them have signed distribution agreements with foreign partners (Kassenberg et. al 2011).
- Establishing a number of eco-innovation oriented clusters e.g. Silesian Cluster of Environmental Technologies, Baltic Eco-energy cluster and Clean Energy Cluster of Małopolska and Podkarpackie (Eco-innovation in Poland: 2012 update).
- Participation of Poland in the Environmental Technologies Verification (ETV) Pilot Program of the European Union – a scheme supporting market uptake of eco-innovative technologies ((Kassenberg et. al, 2011)).

Despite these positive trends, development of eco-innovations in Poland is still hindered by a number of barriers. Eco-innovations still are giving the impression as “end of pipe, environmental protection technologies” rather than a cross-cutting innovations (Eco-innovation observatory 2012). Transition to a low-carbon economy is perceived as a threat in companies and SMEs. Implementation of stringent environmental regulations is seen solely as a cost and not as an opportunity for building an innovative and competitive economy. Awareness on the benefits resulting from implementation of eco-innovative technologies among entrepreneurs and consumers in general is relatively low. Entrepreneurs tend to invest in cheapest technologies allowing them to achieve the

commercial goal or meet the minimum legislative requirement. Many entrepreneurs and research organization fail to see benefits from cooperation.

Lack of well-qualified and experienced labor force constitutes another large barrier to development of eco-innovations in Poland. This stems, first and foremost, from a not effective system of education. Excessive number of humanists, lawyers or sociologist graduate from Polish universities each year, but there are too little engineers, biologists, etc. Staff available to work on eco-innovations is limited. There is a large difference between the business sphere, which is very innovative but still on a basic, everyday level, and administration and science. Due to insufficient information, access to eco-innovative solutions developed by the academic and science sector is limited. Providing adequate support for innovations, or eco-innovations in particular, constitutes a challenge. Poland has a serious problem with overall innovativeness as such, in its broad meaning.

The main barrier for Polish companies is lack of sufficient capital to invent and implement eco-innovation. Additionally, financial institutions face a significant risk connected with involvement in eco-innovative projects. This risk is related more to technological issues, i.e. the possibility to achieve expected parameters, than to financial ones. There are no sufficient funds to verify proposed solutions, be it in a semi-technical form or as a pilot solution. This relates especially to a project finance situation, where a company is established only to implement a particular investment. If a project has undergone preliminary verification, banks or other financial institutions are more likely to provide a loan, as such verification reduces their risk. Venture capital funds are also lacking. Establishment of the National Centre for Research and Development and development of clusters should improve that situation.

Eco-innovation needs and challenges in Spain are associated with the economic crisis. Primary energy intensity and greenhouse gas emissions (GHG) have declined in Spain since 1999, reflecting the decoupling of economic growth from primary energy consumption (Sorli M.,2011). Many enterprises and technology providers are emerging in the sector of renewable energy. However, a large potential rests in the eco-innovations involving low energy consuming in industry and housing, ICT solutions, etc., (Sorli M.,2011).. One of the limits is a high imported of fossil fuels from non-EU countries, in particular natural gas. Construction is the most energy consuming sector in Spain, and therefore eco-innovation is of the utmost importance in the introduction of renewable energy sources and energy saving materials in buildings. There is a challenge for eco-

innovations that will enable transform the Spanish building sector towards less materially intensive practices (EIO Country Brief: Spain 2011). Spain faces a number of serious environmental problems that would need addressing through eco-innovative solutions. Despite water efficiency progress the country still faces ever increasing water shortage which poses the must in water efficiency innovations. There are emerging problem with solid wastes, while the resource efficiency and consumption needs improvements towards sustainable patterns; the growing number of cars in fact, cancelled out the improved energy and environmental efficiency achieved in other sectors. Industries and agriculture sector are increasingly contributing to the nation's water pollution problem (EIO Country Brief: Spain 2011). In comparison to 2010, the Spain country's eco-innovation performance has changed significantly. In 2010, Spain's overall eco-innovation performance was even 5% above the EU average and it lay within a group of countries with a medium-high eco-innovation performance. The 2011 Eco-Innovation Scoreboard places Spain high in the EU27 ranking of eco-innovative countries (fifth). It is positioned particularly well in eco-innovation inputs (due to its strong performance for environmental and energy R&D appropriations and outlays), eco-innovation activities (due to its high number 14001 registered organizations) and eco-innovation outputs (due to its strong performance in eco-innovation related media coverage) ((Sorli M.,2011). The country's leading areas are water efficiency, sustainable construction and waste treatment. Many initiatives have been taken in reuse of water, proper management of water resources, water collecting and purification systems, water quality control, etc.), waste management (energetic waste recovery) and sustainable construction¹

Current strengths of Spain in the promotion of eco-innovation include the high number of EMAS (Eco-Management and Audit Scheme) certificated organizations. Spain has 1,235 Eco-Management and Audit Scheme certified workplaces, which means the country is one of the leaders in Europe. Most of the certificates are issued in the service and hospitality sectors, and in the Autonomous Communities of Catalonia and Madrid. In addition to this, Spain has the sixth highest number of certified eco-labeled products (51) in the EU. Furthermore, Spain is for the fourth consecutive year, the third country in the world and first in Europe in number of Environmental Management Systems certified ISO 14001, 16,443 certificates (Eco-innovation observatory, Country profile Spain, 2011).

¹ <http://www.eco-innovation.eu/>

Current weaknesses of the country can be found in the limited participation of the private sector in the funding of environmental R&D. This is despite the substantial outlays effort of recent years and a reduction in Spain's "environmental deficit" thanks to the application of environmental regulations and the progressive compliance with objectives (Sorli M., 2011). Another weakness is the lack of organization at an institutional level. This involves many entities, organizations, programs and funds over a wide geographical area (European, Spanish, and Regional) for eco-Innovation and Environmental Technologies. The lack of collaboration between research centers and companies in Spain makes technology transfer and RTD difficult (Eco-innovation observatory, Country profile Spain, 2011 op.cit.).

One of the main causes revolves around limited knowledge and lack of assessment from technology transfer offices. In addition, RTD (Research and Technical Development) from universities and public research centers is not oriented to corporate technological needs. These agents are not used to applying for patents and setting up companies. Spain has an excessive dependence on grants and subsidies. The public sector through its grants and subsidies is another important financial source (Eco-innovation observatory, Country profile Spain, op cit.). Moreover, poor consumer awareness regarding eco-innovation advantages exists. Market prices do not reflect the ecological advantages and so there is a very low demand for eco-innovation both among consumers and businesses exists. Although the Future Sustainable study shows that 43% of consumers are aware of the environment and consider environmental aspects to be important, they do not understand eco-innovation and what type of measures are available to help the environment (Sorli M., 2011).

7 Conclusions

There are considerable concerns related to the development of eco-innovativeness in some European countries including Poland and Spain. First, politicians do not recognize the significance of eco-innovations, or more generally speaking – innovations. There is a strong lobby supporting obsolete industries and it is not interested in development of eco-innovations. On the one hand, there is no pressure on research in new eco-innovative solutions. On the other, academic and R&D centers are unable to satisfy the demands of the industry. It is of key importance that eco-innovations are perceived as the driving factor of the third transformation in Poland and other EU members (following system

transformation and the EU accession). The state should play the key role in this process – on the one hand it should inspire the demand for eco-innovations and on the other it should assure conditions for increasing interest in such solutions. Despite significant progress, the Polish economy has low productivity and high GHG emission intensity. Poland still has a lot to do to become an economy of high material and energy efficiency. This includes development of a necessary legal and institutional background. Such a transformation also requires fundamental changes in education and the behavioral patterns of citizens and companies so that we become a society of sustainable material consumption and move toward a green economy, where development is decoupled from material and energy use (Szpor, Sniegocki, 2012).

Cooperation between research institution and companies is not satisfactory in some European countries. Poland and Spain indicate stringent environmental regulation as main driver of eco-innovation. Those countries experience limited interest, lack of collaboration between business and research institutions, and limited budget for research at this area.

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A critical review of Program and Project Evaluation Models

Roberto Linzalone *

Dipartimento di Matematica, Informatica ed Economia, DIMIE
Università degli Studi della Basilicata
Via dell'Ateneo Lucano, 10 – 85100 Potenza, Italia
Institute of Knowledge Asset Management
IKAM Centro Studi&Ricerche
Via D. Schiavone, 1 – 75100 Matera, Italia

Giovanni Schiuma

Dipartimento di Matematica, Informatica ed Economia, DIMIE
Università degli Studi della Basilicata
Via dell'Ateneo Lucano, 10 – 85100 Potenza, Italia
Innovation Insights Hub
University of the Arts London
Central Saint Martins
Granary Building, 1 Granary Square, London N1C 4AA
United Kingdom

Structured Abstract

Purpose – The Project Management body of studies has represented a catalyst of research, contributing to the development of effective theories and models, enabling to manage project's results achievement. From another point of view, instead, it appears necessary, and still lacking, an higher attention towards theories and models that support the management of stakeholders' value achievement. Of a fundamental importance in order to support the management of a program/project with the aim of value matching, is evaluation activity.

A variety of evaluation approaches and models exist. Existent literature suggests that no one approach is best for all situations. Rather, the best approach varies according to many different factors. This paper collects, classifies and compares several project/program evaluation models, addressing insights on the selection of the proper evaluation model.

Design/methodology/approach – Through a literature review several models addressing a program or project evaluation have been selected. They have been analysed in terms of characteristics, approach (qualitative vs. quantitative), field of application, pros and cons. A summative critical analysis compares the models and suggests implementation insights, depending on the evaluation scope and/or project's field.

Originality/value – The research contributes in the defining of a holistic framework of project/program evaluation models, that overcomes existent limitations: overall collection and comparison of evaluation models, critical analysis for an effective selection of the model.

Practical implications – Evaluation of results and impacts of programs and projects is even more fundamental in turbulent and high competitive environments. The assessment and selection of the evaluation model is a crucial activity for many different purpose: finance of a project, assessment of a project's efficacy, improvement of a program's performance. Any project's/program's stakeholder should consider evaluation models characteristics, as a rationale for an effective and efficient evaluation process.

Keywords – Program, Project, Planning and Evaluation, Evaluation models.

Paper type – Research Paper

1 Introduction

In the last decades there has been a wide diffusion of Project Management (PM) approach in all the fields of human life. The scientific community is paying attention to the research and the studies focusing on PM; companies and public administrations works even more by projects applying PM's models and techniques.

The PM approach implies planning the achievement of a given objective, on the base of project's activities planning. According to this approach the management by activities secure an effective management of the whole project, with respect of expected time and cost.

The PM approach, indeed, recognizes as driver for customers' value creation, the respect of planned time, cost, quality of delivered product/service. It is not comprised, among the management drivers, the stakeholders' value, that is all the benefits that arise in the mid and long term because of the project's results.

In today's economic, political, social context the measurement of the value generated in the mid term (effects) and in the long term (impacts) by projects and programs is not circumventable in order to actually boost companies, public administrations, politics, third sector, a whole country.

If on one hand PM has represented a catalyst for research, largely contributing to the development of effective theories and models enabling the management of projects, on the other hand an higher attention needs to be addressed to theories and models enabling

the management of the value that spin-off from the project or program. The management perspective changes from PM: the project/program is not the goal, but the mean to impact on stakeholder's value.

A step in order to support the management of project's and program's impacts, in the perspective of stakeholder's value creation, is the modelling of relations between project/program and created (or induced) changes on stakeholders in the mid and long term.

This paper aims to identify and frame the models that play a role in the measurement and analysis of effects/impacts produced by projects and programs. These models are identified as evaluation models. The terms project and program are used interchangeably.

The paper is organized as follows. Section 2 provides the background of the research, section 3 reports the research results, section 4 outlines the conclusions.

2 Program and Project evaluation: definitions and concepts.

Notably higher than the past is the variety of projects and programs that the manager faces today: local development programs, social innovation projects, poverty reduction programs, politic programs, cooperation projects, research projects, are just few of the wide range of today's project typologies.

Global dimension, intangible nature of the objectives, wideness of target beneficiaries, are just few of new emerging characteristics of a program. They call to a re-examination of the models of project management, according to new management drivers, like mid and long term impacts, stakeholders' value.

Those last critical drivers of a project have been adopted by the European Community under the European planning programs, with the name of Project Cycle Management (PCM) (European Commission, 1993). The management approach focuses on wider effects and impacts of a project or program, and becomes critical for many reasons: the funding, the management, the communication.

A different approach to planning, distinguishes the traditional PM from the management of impacts: management of impacts is based on the "planning by objectives", while PM is based on "planning by activities". In the "planning by objectives" it is first identified the ultimate objective of project, that is the impact, then afterward the sub-objectives, that are the effects, necessary preconditions to generate impacts.

Project evaluation, that means exactly measurement of the created value, allows to evaluate the actual impact produced on a project's stakeholders, to assess ex-ante the coherence of a project, to provide feedbacks to managers and policy makers against the quality of management process, to improve/innovate the management.

Any framework designed to promote an understanding of evaluation should include a common conception of what evaluation is (Saskatchewan Minister's Advisory Committee on Evaluation and Monitoring, 1989).

Evaluation concepts are understood in very different ways. For this reason it is important to define them so everyone will attach the same meaning to them, or know what the differences are, thereby improving communication. Most definitions refer to program evaluation; some refer to project or policy evaluation. Some definitions use one term to refer to all types of evaluation, for example including policy and program evaluation under the umbrella label of 'policy evaluation'.

The concept of evaluation is wide and requires a focus against the context, the field of study. In management and economics evaluation is the assessment and the analysis of the effectiveness and the route of an activity, it involves the formulation of judgements about the impact and progress. "Evaluation is the comparison of the actual effects of a project, against the agreed planned ones. Evaluation looks to what is planned to do, what has been achieved, how it has been achieved" (Shapiro J., 1996; Archibald R., 2012).

Many different definitions of Evaluation can be found in the management literature. Evaluation is often as an activity that judges worth. Valutazione è spesso definita come l'attività che giudica il valore. For example, evaluation is "...the determination of merit, worth, or significance..." (Scriven, 2007), or "a course of action used to assess the value or worth of a program" (Farell et al., 2002). Policy evaluation is a family of research methods that are used to systematically investigate the effectiveness of policies, programs, projects and other types of social intervention, with the aim of achieving improvement in the social, economic and everyday conditions of people's lives (Government Social Research Unit, 2007).

This last definition highlights the need of measuring the change produced by a project, and not just limit to the output. The change should be measured in terms of improvement (value creation) or worsening (value destruction). The produced change takes different forms and dimensions, not always measurable and comparable.

Program and project evaluation models are approaches and techniques aimed at evaluate and/or measure one or more dimensions of change, like social, economic, cultural, technological, determined by actions taken in one or more contexts.

Most of the definitions of evaluation are linked to concept of improvement. As Kahan e Goodstadt (2005) argue, evaluation is a set of research questions and methods properly articulated to review processes, activities and strategies, with the aim of improve and achieve better results.

The strategic importance of evaluation for the project management is given by the need of do it so along the whole project life cycle. So according to this need, it can be effectively divided into ex-ante, interim, ex-post evaluation. The first applies in order to compare, select, finance alternative projects. The second one applies along the project development in order to improve the strategy, or the processes. The third applies to completed projects, in order to take lessons, insights, judgement and awareness about taken decisions and projects.

The real purpose of an evaluation is not just to find out what happened, but to use the information to make the project better. Different project evaluation 'process models' can be found in the management literature. Darabi (2002) proposes a systemic model of 5 phases:

1. program analysis and evaluability assessment
2. evaluation design
3. evaluation methodology development
4. implementation and administration
5. communication of evaluation findings

The statement that many programs and projects for social and economic development have not determined tangible and durable changes to target of stakeholders, induced the main international organizations for development (United Nations, World Bank, European Union) to give themselves frameworks and tools able to secure higher project efficacy, overall improvement of program management .

As the motto '*you cannot manage what you cannot measure*' sounds appropriate to stress the importance of the performance measurement and management in companies, the one '*you cannot change what you cannot evaluate*' appears equally appropriate to stress the importance of evaluation in the management of project and programs. A fundamental role in performing evaluations play the evaluation models.

3 Program and Project Evaluation Models: a literature review.

3.1 A collection from the literature

Many evaluation approaches and models exist. The literature suggests that no one approach is best for all situations. Rather, the best approach varies according to factors such as fit with basic values, the intent of the evaluation, the nature of key stakeholders, and available resources. In addition, it is not necessary to stick strictly to one approach: evaluations “might quite reasonably combine elements of different approaches or adapt to local conditions.” (Rogers and Fraser 2003) . A variety of approaches exists (Kahan, 2008): goal based, goal free, theory based (logic model), utilization, collaborative, balanced scorecard, appreciative inquiry, external, CIPP. The Logical Framework Approach (LFA) is probably the widely used to support planning, evaluation and management of a project (Practical Concepts Incorporated per US Agency of International Development, USAID, 1969).

Typology	Framework/model	Source	Nature
Peer Review (p.r.)	A. Direct p.r.	Various authors from scientific literature (most dated source: Royal Society of Edinburgh, 1731)	Qualitative
	B. Modified direct p.r.		
	C. Ancillary p.r.		
	D. Traditional p.r.		
	E. Indirect p.r.		
	F. Pre-emptive p.r.		
Case study	A. Prospective c.s.	Le Play F., 1829	Quali-Quantitative
	B. Retrospective c.s.		
Technological forecasting	Scenario Planning	Kahn H., 1950	Qualitative
	Cross-impact matrices (or Inter-dependency matrices)	Gordon T., Hayward H., 1968	Quali-quantitative
	Morphological analysis	Zwicky F., 1967	Qualitative
Financial methods	Internal Rate of Return (IRR), Net Present Value (NPV), Pay Back Period (PBP)	Value-based management literature	Quantitative/Financial
	A. Binomial Option Pricing Model B. Trinomial Option Pricing Model	Cox, Ross and Rubinstein (1979)	Quantitative
Economic-based methods	Cost-benefit/Cost-effectiveness Analysis (CBA)	Economic Literature (most dated source: Dupuit J., 1844)	Quantitative/Financial
	Social Accounting Matrix (SAM)	Stone and Brown, 1962	Quantitative
	A. Experimental economics B. Data C. Instrumental variables D. Computational methods	Economic literature	Quantitative

E. Structural econometrics			
Technological-based methods	A. Technology Assessment B. Technology Dynamics C. Technology Forecasting	Technology management literature	Ex-ante, quantitative
Narrative methods	Storytelling	Social sciences	Qualitative
	Impact narratives	Social Literature	Qualitative
Ethnographic methods	Ethnographic Evaluation	Social sciences	Qualitative
Scoring methods	Analytic Hierarchy Process	Saaty T.L., '70s	Quantitative
	Earned Value Analysis/Management (EVA/M)	United States Department of Defense, 1960's	Quantitative
	Program Assessment Rating Tool (PART)	United States Office of Management, 2002	Quantitative
	Key Performance Indicators, KPI	Management Literature	Quantitative
Scorecard methods	Balanced Scorecard	Kaplan and Norton, 1992	Quali-quantitative
	Performance Prism	Neely et al., 2002	Quali-quantitative
Bibliometric methods	Main Science and Technology Indicators (MSTI)	OECD (2013) World Bank (undated)	Quantitative
Pathways analysis	Participatory impact pathways analysis (PIPA)	Challenge Program on Water and Food (CPWF)	Qualitative
	CPM/PERT <i>Critical Path Method/Program Evaluation and Review Technique</i>	Catalytic Construction Company, 1957/Booz, Allen & Hamilton, Inc., 1958	Quantitative
Logic model/ framework	Logical Framework Approach (LFA)	Rosenberg L. J., 1969	Qualitative
	Kellogg's Logic Model	Quigley M., for W. k. Kellogg Foundation, 1998	Quali-Quantitative
	CIPP Evaluation Framework	D. Stufflebeam et al. 1960	Qualitative
	Weaver's Triangle	Weaver P., undated	Qualitative
TQM Approach	Malcom Baldrige Award/ Model	Malcolm Baldrige National Quality Improvement	Quali-Quantitative
	EFQM Excellence Model	European Foundation for Quality Management (EFQM)	Quali-quantitative
Strategic	SWOT Analysis	Humphrey A., 1967	Qualitative
	Strategy Map	Kaplan R.S., Norton D.P., 1996	Qualitative
	Critical Success Factor	D. Ronald Daniel (McKinsey & Company), 1961/	Qualitative

Breakdown/Tree Structures	Work Breakdown structure	United States Department of Defense, 1957	Qualitative
	Cost Breakdown Structure	Management literature	Quantitative
	Problem tree analysis	System analysis literature	Qualitative
Statistical	Six Sigma	Motorola, 1981	Quali-Quantitative
Multicriteria analysis	Multicriteria decision analysis (MCDA)	Early 1960s	Quantitative

Tab. 1 - Summary table of Program/Project Evaluation models literature review.

Approaches vary on the basis of what is evaluated, who participates in the evaluation, evaluation purpose, and how the evaluation is conducted. In practice, approaches are often combined.

Despite the large number of evaluation models, their heterogeneity in nature, field of application, phase of application, make the selection of the suited model(s) a strategic decision for the evaluation. In order to decide which model/approach best suites, a literature collection of evaluation models has been carried out. The collection results in 41 frameworks and/or models, some of them have common subjects, context/field of application, evaluation or measure approach. These commonalities allows to group in typologies. Besides they have been labelled by 'source' and 'nature' (qualitative vs. quantitative).

4 Conclusions

The collection of models/approaches for program and project evaluation purposes, represents the first step of a research project aimed to define a wider, prescriptive framework addressing support for the models selection. A suitable characterization should take into account some program's variables like phase and field/context, and some evaluation's variables like purpose.

The research contribute also to understand how important is the adoption of evaluation's model, in the management of impacts of programs and projects, in the perspective of stakeholders' value creation. Particularly important is the selection of the approaches and techniques in order to support ex-ante, ad interim, ex-post program evaluation. Useful implications arises as spin-off from the research, for practitioners such

as managers, policy-makers, public decision makers, that have to perform project and programs in ages of even higher expectations and needs coming from stakeholders.

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A management model for sustainable SMEs marketing networks: it's all about knowledge

Lara Agostini *

Department of Management and Engineering (DTG)
University of Padua
Stradella San Nicola, 3 - 36100 Vicenza (Italy)

Structured Abstract

Purpose – This paper has two main aims: the first is to explore the development process of marketing networks, which are much less studied than R&D networks; the second is to identify those organizational and managerial factors that are supposed to have an influence on the success of a SMEs marketing network, given that the phenomenon has attracted much attention, but a high percentage of networks still fail. This allows to design a model for the sustainability of SMEs marketing networks.

Design/methodology/approach – To address the aim of the paper, a qualitative approach based on multiple case studies was used. Four SMEs marketing networks having a different level of success were selected so as to have a base of comparison. The analysis of cases is based on a framework of analysis developed on the grounds of the literature review, which represents the guide for the within- and cross-case analysis and the basis for the design of the final management model.

Originality/value – The study makes a noteworthy academic contribution to theory concerning marketing networks, since it allows to design a management model representing the development process of SME marketing networks, encompassing organizational and managerial factors involved in the process, as well as elements of contingency. Moreover, this study lays the grounds for future research in this field and gives rise to a new stream of research considering the specific role played by knowledge in networks.

Practical implications – This study provides managers with a model for the development and management of SMEs marketing networks and a series of guidelines for success. The most relevant recommendation is that an network needs to be managed, and to this purpose specific network-related skills and know-how are required. Moreover, the paper contains insights relevant also for public policy. Indeed, high investment in order to foster collaboration need to be sustained by strong campaign of awareness of these topics.

Keywords – Management model, Marketing network, Knowledge, SME

Paper type – Academic Research Paper

1 Introduction

The theme of inter-organizational relationships (IORs) draws the attention of both representatives of the economic life, because IORs may provide firms with significant benefits they would not reach by their own (O'Dwyer *et al.*, 2011), and the academic world, since networks are addressed by different disciplinary specializations (Dennis, 2000).

By now, literature has much more focused on networks established with the aim of cooperating in upstream value chain activities, such as R&D, engineering and manufacturing, with respect to downstream value chain activities, such as marketing, sales, distribution, and customer service (Teng and Das, 2008). Actually, given that recent IORs have developed with internationalization and market competitiveness enhancement as their main drivers (Yu *et al.*, 2011), this aspect is worth considering. IORs, despite being potentially relevant for all types of firm, seem to be particularly suited for small- and medium-sized enterprises (SMEs) which may need to look outside of their boundaries in order to overcome constraints related to their lack of all the required resources and competences needed to enhance their competitiveness (Colombo *et al.*, 2012). Therefore, if a SME is not obliged to grow dimensionally in order to survive, its survival cannot leave its development inclination, regarded as its ability to offer suitable strategic answers to the quali-quantitative changes of the socio-economic context it belongs to, out of consideration (Gianfelici, 2012).

Furthermore, the literature about this topic presents two main shortcomings: the first refers to the lack of a comprehensive analysis of the development process and management of networks; the second regards the issue related to network success, since previous research noted the high failure rate of networks (Hyder and Eriksson, 2005), as well as a lack of studies describing how success (or failure) has been achieved specifically (Reid *et al.*, 2008).

On these grounds, the purpose of this paper is to explore the development process of marketing networks and the organizational and managerial factors that are supposed to have an influence on the success of SME marketing networks, which allows to design a management model for the sustainability of SME marketing networks.

To reach this aim, a qualitative approach based on multiple case studies was selected since it proved to be particularly useful for network dynamics (Halinen and Törnroos, 2005).

The main contributions of the paper consist of a comprehensive framework representing the development process of marketing networks which has been designed on the basis of the literature and then tested through the case analysis, as well as a series of guidelines for firms willing to undertake a marketing network, which rises the issue of the importance of knowledge within the context of the development process of networks. In particular, results demonstrate that most of the critical factors leading to the successful formation and development of a marketing network are related to knowledge.

The setting of this study is the Italian context which is characterized by a high presence of SMEs which are at the backbone of the Italian economy. While on the one hand, their structure allows flexibility (Schumacher, 1973), on the other hand the limits related to their dimension constrain their ability to internationalize and face competitive and environmental pressures. For this reason, from the beginning of 1960s, different forms of collaboration, initiated by the phenomenon of the industrial districts, started to gain pace in many areas of Italy. More recently, the most relevant action is represented by the draft of the Network Contract Law in 2009, the first European law which aimed to formalize and regulate the issue related to collaborations; however, this is only one of the recent government actions, both national or regional, favoring firm collaboration. Therefore, within this context, this paper assumes a high relevance.

The remainder of the paper is organized as follows: firstly, a literature overview about marketing networks is outlined, before entering into the details of the design of the theoretical model of the marketing network development process; secondly, the methodology is described in deep details; thirdly, data analysis and results are illustrated; lastly, results are discussed in order to draw the conclusions, identify the theoretical and practical contributions of the paper and open new paths for future research.

2 Theoretical background

2.1 Literature overview about marketing networks

Marketing networks may be defined as formalized collaborative arrangements between two or more organizations focused on downstream value chain activities (Swaminathan and Moorman, 2009). The literature about marketing networks is not very broad, indeed few and sporadic publications in this area appeared before 2003 and most contributions date back to the period between 2007 and 2010 when the body of literature started to grow. The first papers (e.g. Eyuboglu and Buja, 2007; Mouzas et al., 2007) are mainly theoretical and have a broad scope aimed to describe the emerging phenomenon, as well as to identify the theories on which basis this new topic has developed (i.e. transactional cost economics theory, resource based theory, real options theory). Then, authors have started to restrict the scope of analysis, focusing on precise aspects related to marketing networks, such as drivers to network formation (Palmer and Bejou, 1995), governance (Bucklin and Sengupta, 1993), partner selection (Spekman *et al.*, 1996; Pansiri, 2005) and social elements like trust (Mehta *et al.*, 2005, Mouzas, 2007), commitment (Mehta *et al.*, 2005). Most of these studies are quantitative and aim to determine whether these factors may have an impact on network success or firm performance. Within this context, the main shortcoming concerns the development process of marketing networks, taking a process perspective and thus investigating the sequence of events leading to an outcome. Indeed, most papers adopt a cross-sectional approach and even those papers carrying out a longitudinal analysis, which would be supposed to adopt a dynamic perspective, investigate the relationship among the independent and dependent variables considering what is in between these variables as a black box. There is only one theoretical paper (Wang and Xiang, 2007) which aims at designing a theoretical framework meant to explain an observed sequence of events in terms of some underlying generative mechanisms or laws, particular circumstances or contingencies (Van de Ven and Huber, 1990) and it focuses on a service industry, as most papers do. Moreover, previous research also noted the high failure rate of networks (Hyder and Eriksson, 2005), as well as a lack of studies describing how success (or failure) has been achieved specifically (Reid *et al.*, 2008). In this regard, the extant research has tended to focus on networks and their success or failure rates, but has not looked at them in comparative terms (Ring, 2000). Regarding firm size, the literature has dealt both with SMEs and large firms. However, the SME context was preferred because

SMEs are at the backbone of the Italian economy, as anticipated, and networks are thought to be a concrete possibility SMEs have in order to overcome resource constraints in order to enhance their competitiveness (e.g., Colombo et al., 2012).

On these basis, the present paper aims to answer to the following questions: *how is the development process of SMEs marketing networks carried out?*, and *how do the organizational and managerial factors involved in the development process of successful SMEs marketing networks differentiate from those involved in the development process of unsuccessful ones?*.

2.2 The design of the theoretical framework

In order to design a theoretical model for the development process of networks, previous papers containing a model of network development process were identified and analysed in order to integrate different models within this stream of research. Organizational and managerial factors included in all papers were organized in order to categorize and include them in the model.

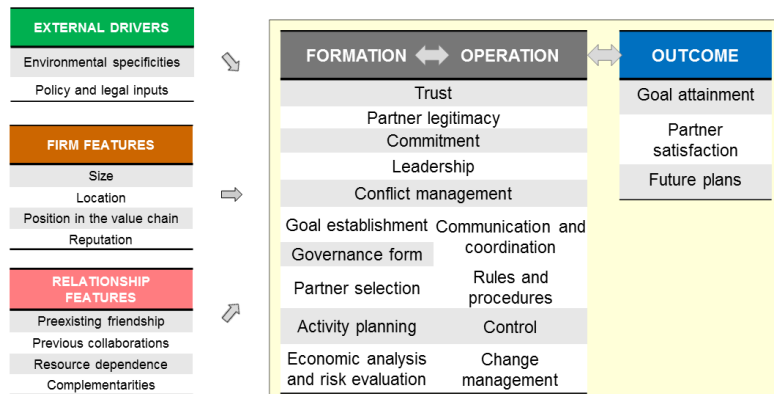
Most papers (e.g., Das and Teng, 2002; Batonda and Perry, 2003) describe the process of network development in terms of stages or phases. Even if different authors call them with different names, most of them agree on the main phases of network development. In particular, the process appears to be made up of three main moments: when the network starts to arise and partners decide how to integrate, which has been called network design (e.g., Doz, 1996); when the network begins operating and conducting its activity at full, which has been called network operation (e.g., Das and Teng, 2002); and when at a certain point partners need to evaluate the activity of the network, its costs and benefits, and decide what to do with the network, whether to continue, making some changes or not, or terminate, which has been called network evaluation (e.g., Wohlstetter *et al.*, 2005). Each of these phases includes different organizational and managerial factors. There are some factors which seem to influence both the design and operation phases and they are mostly “social” aspects related to trust (Hyder and Eriksson, 2005; Todeva and Knoke, 2005), commitment (Das and Kumar, 2011; Gebert-Persson *et al.*, 2011), legitimacy (Das and Kumar, 2011), leadership (Wohlstetter *et al.*, 2005) and conflicts (Todeva and Knoke, 2005; Wohlstetter *et al.*, 2005), which may take different connotations but are relevant throughout the whole process of network development. Instead, some factors interest only the formation phase and others only the operation

phase. In the design phase there are those factors which are needed to establish the network, that are goal establishment (e.g. Batonda and Perry, 2003; Hyder and Eriksson, 2005), partner selection (Doz *et al.*, 2000; Reid *et al.*, 2001), governance (Pansiri, 2005; Konsti-Laako *et al.*, 2012), activity planning (Gebert-Persson *et al.*, 2011) and economic and risk evaluation (Spekman *et al.*, 1998). Instead in the operation phase there are those factors meant to maintain the network, that are communication and coordination mechanisms (Wohlstetter *et al.*, 2005; Wigley and Provelengiou, 2011), rules and procedures (Larson, 1992; Reid *et al.*, 2001), control (Spekman *et al.*, 1998; Das and Kumar, 2011) and change management (Halinen *et al.*, 1999; Batonda and Perry, 2003). It could be argued that in the design phase there are more organizational factors, while in the operation phase more managerial factors, which reflect the type of decisions which are taken in the two phases respectively. In the outcome phase, managerial factors and decisions are present, as the evaluation of performance and impacts (Hyder and Eriksson, 2005; Todeva and Knoke, 2005), possible improvements (Wohlstetter *et al.*, 2005; Konsti-Laako *et al.*, 2012), and the decision whether to continue or terminate the network (Das and Teng, 2002; Das and Kumar, 2011).

The process of network development is not a stand-alone process, in the sense that there are a number of affecting factors. There are a few authors (Das and Teng, 2002; Pansiri, 2005) explicitly dealing with these factors; instead, many authors cite them without giving them a precise positioning within the context of network development. After analyzing papers in deep details, three main categories could be identified: external drivers which include those socio-economic conditions and specific policies or regulation that can push the development process of an network (Ring, 2000; Lapiedra *et al.*, 2004; Pansiri, 2005); firm features which refer to the distinctive characteristics of a partner, such as size, location, position along the value chain and reputation (Das and Teng, 2002; Pansiri, 2005); and relationship features which is not explicitly dealt with in the literature, but items like preexisting friendship of partners or complementarities are frequently cite and seem to have an influence on the development process (Das and Teng, 2002; Todeva and Knoke, 2005).

Figure 1 depicts the framework designed taking the macro-stages theory (Batonda and Perry, 2003) as a reference point, but considering also possible dynamic changes, which implies a not strictly sequence of stages and, thus the possibility to go back to a previous stage in order to make some changes.

Figure 1: The theoretical model for the development process of networks



3 Methodology

A qualitative methodology based on multiple case studies has been selected for three main motives (Yin, 2009): firstly, “why” and “how” questions are likely to favor the use of case studies, experiments or histories; secondly, the case study is preferred in examining recent or contemporary events, but when the relevant behaviors cannot be manipulated, as in the case of networks; lastly the case study method should be used when the researcher wants to understand a real-life phenomenon in depth, but such understanding encompasses important contextual conditions because they are highly pertinent the phenomenon of study. Along this vein, cases are analysed combining a retrospective and real time temporal orientation. Furthermore, Halinen and Thoroos (2005) explicitly assert that “it is obvious that case strategy is more suitable for the study of business networks”.

3.1 Case selection

This study analyses four cases of marketing networks among partners from different Italian industries. Several factors were considered in selecting the cases. First, the study is limited to manufacturing networks not only to bridge a gap in the literature, as previously explained, but also to minimize extraneous variation (Eisenhardt, 1989) that might be derived from differences between the service and manufacturing sectors (Yan and Gray, 1994). Second, since the issue related to success is worth investigating, two successful (S&S and RAB) and two unsuccessful (CDP and CEV) marketing networks were

selected. In this study, the level of success reflects the level of goal attainment (Arino, 2003). In so doing, also the maximum variation sampling principle (Patton, 2005) is respected. Lastly, case studies are particularly useful when investigating recent or contemporary events (Eisenhardt, 1989), hence we opted for choosing recent networks.

Table 1 summarizes the major characteristics of the selected networks. The companies and individuals are disguised to ensure confidentiality.

Table 1: Summary of major characteristics of selected cases and data collection

<i>Network pseudonym</i>	<i>Industry</i>	<i>Year of foundation</i>	<i>N° of partners</i>	<i>Aim</i>	<i>N° of interviewees/ interviews</i>
S&S	Ho.Re.Ca.	2006	9	Participate to trade fairs together, get information about potential clients and markets, provide clients with complete solutions	4 interviewees 8 interviews
CDP	Shoe	2009	4	Clients' fidelity through the collection of unsold goods to be sold directly through outlets	3 interviewees 6 interviews
RAB	Automotive	2009	12	Participate to trade fairs, candidate to large clients, provide them with finished products and services	4 interviewees 7 interviews
CEV	Construction	2010	16	Participate to public offerings, provide clients with full solutions	4 interviewees 7 interviews

Table 2 contains comparative data instances for each case relative to each of the key constructs in the theoretical framework that are developed in this article.

3.2 Data collection

Data for this study were collected from both interviews and secondary sources, such as company briefings, press releases and internal reports, such as to provide data

triangulation (Patton, 2002). Interviews were carried out following a semi-structured protocol which was developed on the basis of the literature review and our research questions and then shared with key informants during some preliminary interviews before applying it to a pilot case. This helped identify the most significant aspects, those aspects that, indeed, were not so relevant and those that needed to be investigated in further detail. Moreover, the pilot data provided considerable insights into the basic issues being studied, so that the final research design was informed both by prevailing theories and by a set of empirical observations.

Based on the data collection protocol, 28 in-depth interviews with actors involved in the selected networks (i.e. network partners CEO, consultants and external brokers) have been carried out. Since the unit of analysis is the network, respondents were summoned to answer in name of the network and keeping in mind that the object of study is the network and not themselves. More than one informant for each network was interviewed (see Table 1), so as to respect investigator triangulation (Patton, 2002). Furthermore, some informants were interviewed more than once, with a period of time passing between the two sittings, so as to capture aspects related to network dynamics over time. To this regard, apart from scheduled interviews, I had regular contact with informants over a period of two and a half years, which allowed me to track the development of each marketing network over time. The duration of each interview was between thirty minutes and two hours, according to the time the interviewee had available, and all interviews were recorded. All the interviews were conducted during the period between March 2011 and November 2013. A complete database containing all required information about all cases was created, which is recommended in order to allow personal inspection and following examination (Yin, 2009).

3.3 Data analysis and coding

We structured our methodology according to established procedures for theory-building inductive research (Miles and Huberman, 1994; Voss, 2002), working recursively between our multiple cases (Eisenhardt, 1989; Yin, 2009) and the theory we were developing. Following Eisenhardt (1989), I carried out data analysis in two macro-steps: the within-case analysis, in which each single case is treated as a stand-alone entity, and the cross-case analysis, whose main aim is to examine these cases comparatively using different techniques.

In this research study, due to the fact that this is not a totally unexplored field, the coding process is mainly “theory-driven” (Ryan and Bernard, 2000) since many categories already existed in previous literature as explained in the framework of analysis. However, also new categories have been identified following the classical open coding technique (Corbin and Strauss, 1990). Data were coded manually, including as many potential themes as possible, coding extracts of data inclusively, so as not to lose the context (Bryman, 2001). In so doing, it was possible to build the book of codes for the present study. The subsequent step consisted in the axial coding (Corbin and Strauss, 1990) which aims to make connections between categories, thus identifying a set of relationships using visual representation, as for example schemes and tables (Miles and Huberman, 1994), which facilitates the identification of patterns.

While documenting patterns in the data and constructing tentative theoretical explanations, data were used to challenge and extend our theory (Strauss and Corbin, 1998). During the repeated process of interrogating the data, revising the theory, and returning to the data, the themes presented in this paper eventually emerged. In the presentation of the results, the use of a combination of tables describing the data from which inferences were drawn (Miles and Huberman, 1994) proved useful.

4 Results

In this study, there are two key themes which make reference to the two research questions: the development process of marketing networks and the organizational and managerial factors that are supposed to have an influence on the success of a marketing network. The output of the former is the management model for the development process of marketing network; instead, the output of the latter contains a series of propositions dealing with those organizational and managerial aspects influencing the success of the development process of marketing networks. Next paragraphs deal with them separately. In the presentation of the results, I make use of a combination of illustrative examples and tables describing the data, as well as interviewees’ quotes from which inferences were drawn (Miles and Huberman, 1994). Moreover, here cases are dealt with one by one and in comparative terms, thus expanding on data presented in Tables 1 and 2.

Table 2: Comparative data from case studies

GENERAL ASPECTS				
Case study	S&S	CDP	RAB	CEV
Drivers	Acquire new clients, increase their marketing activities, take advantage of a chance offered by Unindustria (both internal and external drivers)	Enhance competitiveness, improve client fidelity	Overcome the crisis of the sector and reach new clients; take advantage of a chance offered by the Union of Industrials	Crisis of the industry, lack of orders, need to create synergies and gain contracts otherwise unattainable singularly
Responsible of the network business idea	Union of Industrials of the province, helped by a partner CEO	A partner CEO, supported by the shoe trade association	A partner CEO, helped by the Union of Industrials of the province	Union of Small Firms of the province
Criteria for partner selection	Companies belonging to the same industry and territory, manufacturing complementary products, potentially interested in the project; later on, no competitors are accepted	Shoe makers belonging to the district realizing complementary product, not competitors	Firms of the same industry, with process complementarities (not competitors), willing to invest some money in projects	Firms of the same industry, mainly associated to Apindustria, willing to take part to the project, not competitors
Partner entering/exiting	Two competitors and another firm exit	One firm exited and a bank entered	One partner exited and two entered	Some entered and some exited
Partner core business	Appliances producers (e.g., kitchens, ovens, food processing equipment, laundry solutions)	Shoe makers (assemblers)	Components production and assembling	Different specialization in the construction industry (e.g. hydraulic, architecture)
Partner business model	Firms selling products with their brand in the B2B industry	Shoe makers selling with company brand, only one is also a subcontractor (B2C)	Firms selling products without brand (suppliers) in the B2B	Firms selling in Italy, only one also abroad
Market position of partners	In the same market segment, at the same level of the value chain	In the same market segment, at the same level of the value chain	In the same market segment, at different levels of the value chain	In different market segments, at different levels of the value chain
Partner reputation	Same level of reputation	Almost same reputation	Different level of reputation	Different level of reputation
Previous knowledge of partners	Yes	Yes	Almost all	Almost all
Previous collaborations together	No	No	Yes, some of them	No
Other previous collaborative projects	Not partners, but the Union of Industrials	No	Yes, they are used to collaboration, even if not formalized	No

ORGANIZATIONAL AND MANAGERIAL FACTORS								
	Design	Operatio n	Design	Operatio n	Design	Operatio n	Design	Operatio n
Business plan	Activity planning, not economic analysis	Activity planning	The minimum required by the contract, not economic analysis	Totally informal activity planning	The minimum required by the contract, not economic analysis	Activity planning	Not really	
Governance form	Consortium		Network contract	Consortium (selling product with the NC was a problem)	Network contract		Consortium	
President and/or bodies	President: Union of Industrial s		President: a partner CEO Bodies: internal board		President: a partner firm Bodies: internal board		President: external manager Bodies: internal board	
Communication, coordination and decisional process	Periodical meetings	Periodical meetings	Periodical meetings	Informal meetings	Periodical meetings	Periodical meetings	Periodical meetings	Periodical meetings
Existence of shared norms and rules	Yes	Yes	Yes	Informal rules	Yes	Specific rules to manage orders	Yes	nr
Control of activities	Periodicaly by the Union of Industrial s	Periodicaly by the Union of Industrial s	No	Sales through the shop (planned)	Periodicaly	Periodicaly	No	Informal
Conflicts	Among two competitors	No	Not with partners, but with external entities	Not with partners, but with external entities	No	No	No	No
Change management	Regarding criteria for partner selection	Evolution of goals	Regarding governanc e (network form) and goals		No	Evolution of goals		The president is going to change
Commitment to the network	Same level by all partners		One partner is more committed	Not relevant difference among partners	Three firms are more committed	Some firms are more committed	Low level of commitment, equal among partners	Low level of commitment, equal among partners

Level of trust	Good level of trust	Good level of trust	High level of trust	High level of trust	High level of trust	Very high level of trust	Good level of trust	Decrease in the level of trust
EVALUATION								
Partner satisfaction	Medium-high		Low		High		Very low	
Main difficulties	Relationships, trust building; some of them overcome some not		Bureaucracy, not able to solve them, they are the real obstacles		A company which did not want to invest some money (then it exited); not equal benefits		Partners with different size and thus with different facilities and inclination to investment; aptitude towards collaboration; lack of planning	
Plans for the future	Terminate		Continue		Continue		Uncertain	
Aspects to be modified or re-evaluated	nr		Yes, common brand, other outlets		None		Yes the planning phase which is now absent but required	

* nr = not relevant

4.1 The development process of marketing networks

The analysis of cases shows that marketing networks develop through a process made up of four phases pushed by an initial input which consists of an idea of business involving different actors. At the beginning, this input is just a concept which can be used for commercial purposes prior to its transformation into a viable business. For this reason, the input to the process has been called *network business idea*. Secondly, the first activity carried out after the network business idea is always partner selection which happens before any other plan is made or decision is taken, so as a stand-alone phase. To support this evidence, a representative of the association supporting CEV pointed out:

“Without partners, any decision can be taken and any activity can be started. Thus, this is the first step to be carried out.”

This is quite logical, since an network implies more partners working together, so the first decision to be taken is to whom collaborating with. This step may be carried out by a firm in first person, more probably when one of its members is responsible for the network business idea, as in the case of CDP, by a firm helped by an external association, as in the case of RAB and S&S, which are supported by Union of Industrials of their province during the start-up of the network, or totally by an external association, when it is responsible for the network business idea, as in the case CEV which is created by the Union of Small Firms of the province.

When partner selection has been carried out, since partners are not familiar with the project and they do not figure out how precisely it could develop, they are used to meet all together in different sessions in order to design the network. To this regard, the association supporting S&S asserted:

“The network needs to be ideated and shaped, therefore all partners should start collaborating since the beginning in order to make the network start.”

This phase may include various activities, but the three points that are always dealt with are the governance form of the marketing network, goal establishment, and activity planning which allows to reach objectives. The governance includes the designation of the president and internal committees or bodies, or any other requirement of the contract which is always present in the analyzed cases, either being a network contract, as in the case of CDP and RAB, or a consortium, as in the case of S&S and CEV. These preliminary decisions, in particular activity planning, may be more or less formalized, at the point that they can be developed in the context of a real business plan or only drafted, also depending on what the contract requires. In particular, firms signing a network contract (i.e. CDP and RAB) are obliged to write in the contract the network program. Another factor which assumes particular relevance in all investigated cases is the choice of the network brand. Actually, on the one hand, marketing networks are supposed to be directly visible by clients and, on the other hand, since their aim is mainly to increase competitiveness, even though in different forms and with different specific objectives, the intangible component related to emotions and suggestion created by a brand is highly important (He and Balmer, 2006).

In those networks where the activities in the development process are carried out in a more formal way, partners also establish specific rules and procedures for the going on of activities. They more often regard how to deal with orders and involve different partners in different requests from clients; otherwise, they may also concern what partners can or cannot do in name of the network. For example, in the case of RAB, firms which are positioned at different levels of the value chain, partners agreed on designating the final assembler to maintain the relationship with clients, since it is the closest to the market. Then, for each order, partners realizing the requested products or manufacturing phase are selected. Instead, in the case of S&S, rules and procedures were established regarding the selection of trade fairs where to participate jointly and the sharing of information about markets gathered during these fairs and other specific actions.

The operation phase starts when the network begins to function and some activities are effectively put in practice. Owing to many partners and activities being involved in the network, the communication and coordination process seems to be unavoidable. It often consists of periodical meetings where partners talk about what to do and take decisions. Face-to-face meetings and verbal communication are preferred in all cases. Meetings may also represent a moment of control of activities by partners or by external entities which play a role in the network, as well as a situation when discussing possible conflicts emerged among partners. As the literature indicates (Batonda and Perry, 2003; Todeva and Knoke, 2005), conflicts are functional when more people work together, so they are not always negative; however, it is important that they are treated as any other issue regarding the network and that they are dedicated the attention they deserve. For example, in the case of S&S there were some conflicts inside the network due to the presence of three competitor partners which were not able to find their way through collaboration. Instead, in the case of CDP, conflicts rose with external entities. In any case, as the CEO of one of RAB partners asserted:

“Conflicts are ordinary events when collaborating, overall at the beginning, hence they need to be treated as any other shortcoming in the development process.”

On the contrary, in the case of RAB and CEV, no conflicts emerged, hence this activity has not been carried out. Since cases proved that conflicts may arise in any step of the network development process, this activity has a cross-sectional dimension.

Another relevant matter which needs to be taken into account is change. Due to an infinite number of circumstances, every aspect of the network may change with the passing of time, so change management represents something partners face day by day. This last element makes us understand that there may be a return to previous phases which leads to a change of initial settings. The most relevant change happened in CDP which had to change their governance form since the network contract did not result the appropriate tool for partners' specific activities and goals. Hence, they reconsidered the whole project and established a consortium supporting the network contract. Other relevant changes regard the reconsideration or evolution of goals, as in the cases of S&S and RAB which, once reached the first goals, started setting new ones, which obviously caused the need to re-plan activities.

In the design phase, the economic evaluation, which was present in the framework of analysis based on the literature review, is never mentioned in the case analysis. Actually, this element is never carried out, despite its potential importance was highlighted during two interviews. To this regard, the CEO of one of RAB partners asserted:

“Realizing a complete and accurate business plan including a detailed economic analysis would be useful for partners who may have a concrete description of all the aspects related to the project they are participating in.”

As a consequence, it has been included in the final framework (see Figure 2), since the fact that the economic evaluation is not carried out seems to be a shortcoming of the analyzed cases, rather than an aspect which is not worth considering.

Other than all these practical and tangible factors, there are other aspects which deserve to be considered due to their high level of importance for marketing networks. Since many people are involved in an network, it is impossible to overlook those intangible elements regarding personal relationships and attitudes. Indeed, during the design and operation phase of the development process, three main elements intervene throughout the development process of all cases, that are trust, commitment and leadership. Due to their nature, they do not take place in a precise moment, instead they go hand in hand with the going on of activities and are shaped during the process. They need to be taken into account in the development process of marketing networks since they may influence and be influenced by all the above mentioned elements.

The last phase of the process is the evaluation. After the network has operated for a certain period, it arrives a moment when partners take stock of what they have done and the results they have obtained. They mainly evaluate whether goals have been attained or not, if partners are satisfied with their participation to the network and think about future plans, in case they decide to continue with the marketing network. This is the case of RAB whose partners have reached predetermined goals and are going to continue their network. Also CDP partners have decided to go on with the network, despite they have not reached their objectives yet, but feel confident that they can improve the network success. Of course, this may also represent the moment in which partners decide to interrupt the network both because they have reached their goals or because they realize it is not worth doing. This happened in the case of S&S partners which have reached their goals, but then decided to interrupt the network. Due to the standstill, CEV partners are still evaluating whether to continue or not. The fact that at this point partners may think

about future plans implies that there might be the need to go back to the design phase to establish new goals or plan different types of activities, as anticipated. This confirms the fact that the development process of marketing networks is not strictly sequential, but it encompasses the possibility of passing from one phase to the subsequent one and then again to the previous ones.

As far as elements of contingency are concerned, many different elements emerging from each single case have been taken into consideration, so as to provide a picture as complete as possible. Furthermore, cases proved that contingency factors related to external factors are more likely to make the development process of marketing network start up, while firm and relationship features intervene later on during the partner selection phase. Next paragraph expands on this issue.

Evidences emerging from cases are in line with the framework of analysis presented in paragraph 2.2, with the exception of some elements that has been modified or added. More specifically, for first, the partner selection phase has been isolated as a stand-alone phase; second, leadership and conflict management have assumed a cross-sectional dimension throughout the design and operation phases.

The factors that has been added concern the network business idea, branding and previous experience of partners in other collaborative projects, not necessarily with the same partners. To this regard, a key informant asserted:

“Having participated to previous collaborative projects makes each partner more prepared towards the new network, hence this aspect may play a significant role in its development process.”

Being related only to each firm, it has been included in elements of contingency related to firm feature.

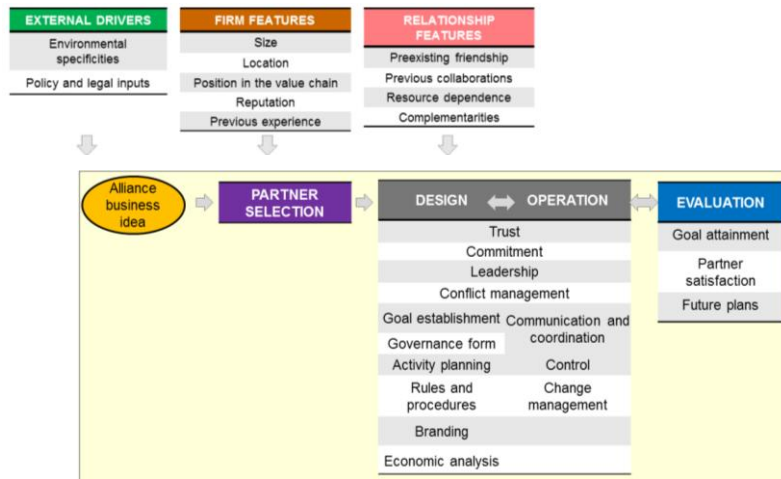
Figure 2 summarizes the proposed version of the management model for the development process of SME marketing networks.

4.2 Organizational and managerial factors and marketing network success

This paragraph is intended to shed light on the second research question investigating the organizational and managerial factors that may have an influence on the successful development process of marketing networks. Organizational and managerial factors, taking into account also contingency factors, are analyzed and compared among cases so

as to identify patterns leading to the discovery of key success factors for the development process of marketing networks.

Figure 2: Model for the development process of SME marketing networks



Partner selection presents similarities among all cases, indeed the same criteria for partner selection are used. SMEs seem to privilege collaborations with partners located in the same industry and geographical area, because this entails partners share the same problems and values. A partner CEO asserts:

“Belonging to the same industry, we already know the environment we operate in and we share difficulties; as a consequence it is easier to communicate and look for collaborative solutions.”

Another partner CEO gives another point of view:

“I prefer to make affairs with someone who I know shares my ideas and values, and I can be aware of this only if it is quite close to me.”

This last quote introduces another important element for partner selection, that is previous knowledge of partners. Indeed, SMEs tend to search for partners among people they already know, which reflects a precautionary attitude of Italian entrepreneurs. Proven that, in general, they have difficulties in collaborating with other entrepreneurs, if they manage to do so, at least they do it with someone they already know, which gives them a higher sense of confidence.

Secondly, product complementarity seems to be essential for collaboration. In particular, SMEs willing to be part of a marketing network look for partners offering products or services they cannot provide singularly, thus becoming more attractive to clients. This is in line with previous literature asserting that one of the main drivers to collaboration for SMEs is to overcome resource constraints (Lorenzoni, 1990). Related to this issue is the fact that SMEs do not want any competitor to be part of the same marketing network. Whilst in some R&D networks collaboration among competitors may happen (Gnyawali and Park, 2009), in marketing networks they seem absolutely undesired. Indeed, in CDP, RAB and CEV no competitors were accepted during the partner selection phase. Indeed, in the case of S&S at the beginning there were two or three competitors in the marketing network, but this caused conflicts leading to competitors exit from the network. As a consequence, also in the case where this was not a selection criterion since the beginning, it became later on. This may be due to the fact that clients have a direct visibility on marketing networks, so balancing the dichotomy cooperation-competition becomes much more demanding. Based on these evidences, the first proposition is shaped.

P1: When firms are close one another, in terms of location, production and culture, already know each other and realize complementary products, they are more likely to undertake and maintain a marketing network.

The suggestion from cases is that these criteria are supposed to increase the level of initial trust among partners. To this regard, the association supporting S&S asserted:

“Italian entrepreneurs, who are distrustful in nature, feel more relaxed if they know other managers they collaborate with. [...] We also realized that suspicion increases sharply if competitors are involved in the same network, overall in case of marketing networks which have a direct visibility towards clients.”

Always referring to competitiveness inside the network, the CEO of one of RAB partners explicitly confirmed:

“I felt comfortable and confident because no competitors were involved in the project.”

The CEO of one of CDP partners completed the picture by stating:

“I prefer to choose partners in my district since I know they share my values and my problems, which increases the initial level of trust towards them.”

These evidences lead to the second proposition exposed below.

P2: In SMEs marketing networks, selecting not competitor known partners which manufacture complementary products and with a high level of proximity increases the level of initial trust among partners.

Always talking about partner selection, the initiator of RAB explicitly asserted:

“When selecting partners, it is fundamental that they are willing to invest some money in the network; for this reason, doing a due diligence before starting the marketing network could be a useful practice.”

Indeed, not only in RAB, but also in CDP, those firms which were not inclined to investments, despite modest, ended in exiting the network. Accordingly, the following proposition has been developed.

P3: In SMEs marketing networks, selecting partners prepared to invest money in the network decreases the probability that those partners exit the network.

Focusing on goal establishment, we can notice that the main difference emerging from cases concerns the way they are established, that is whether the macro-objective is set and then separated into more detailed sub-objectives, so as to reach the macro-objective step-by-step, or the macro-objective remains the only established goal without any intermediate step. In the two cases of success (i.e. S&S and RAB) the macro-objective is divided into more concrete and simpler sub-objectives before going on with more challenging goals. Before S&S partners started to realize finished solutions, they participated to trade fairs together, gathered information about potential interesting markets and clients. Similarly, RAB partners, before approaching large clients, went to trade fairs in order to promote their network brand and acquire some smaller clients. Instead in the two unsuccessful cases, partners start with a very ambitious goal since the beginning, as Table 3 shows.

Table 3: Goal establishment and previous experience

<i>Level of success</i>	<i>Cases</i>	<i>Goal establishment</i>	<i>Previous experience</i>
High	S&S	Start with few and concrete goals	High
	RAB	Go on with more ambitious goals	High
Medium-low	CDP	Start with ambitious goals	Low
	CEV		None

In particular, CDP goal was to collect unsold products from their clients, which represents a very complex and ambitious goal, as well as CEV goal whose partners aimed to realize complete solutions for clients. They did not think about any way to make their network gain consensus and visibility, nor any intermediate goal so as to make trust and commitment among partners increase.

Since we guessed one possible explanation could be the level of experience of collaborative projects of actors involved in the network, we checked this element of contingency and find interesting evidences. Indeed, in the two cases of success, there are at least one actor that has a high level of experience of collaborative projects. In S&S, the external entity, which supported the network throughout the whole network development process, is a body of the Union of Industrials which was born with this precise mission; hence, it had already supported the design and operation of other networks before S&S. To this regard, the responsible of the Union of industrials asserted:

“We noticed that proceeding step-by-step enhances the chance the network is successful, firstly because it entails a more precise activity planning and control, secondly because in so doing partners are more likely to perceive they are reaching established goals, hence the level of trust and commitment increase.”

Instead, in the case of RAB, partners are already used to collaboration, in the sense that they previously collaborated either with some of the same partners or with other firms. This different attitude with respect to partners of other networks seems to be related to the location of partners. Actually, the Emilia Romagna region is particularly active in promoting collaborative projects, even before the establishment of the network contract. The CEO of a partner affirmed:

“Having experienced other collaboration projects, we know it is better to set minor objectives and then go on with more ambitious ones. In this way, the macro objective has more chances to be reached.”

Based on these evidences, the following two propositions are presented.

P4: If involved actors have a high previous experience of collaboration, they are likely to follow a step-by-step approach in goal establishment.

P5: Having a step-by-step approach in goal establishment increases the probability of a successful SME marketing network.

The issue related to governance deserves particular attention. Among the four selected cases, S&S and CEV are consortia, while CDP and RAB are network contracts. While in the case of the two consortia, the governance form does not play a significant role in determining the success of the network, in the two cases of network contract, the governance is partially responsible for the failure. Indeed, since the network contract does not establish a new legal entity, partners can't sell products through the network contract, so they have to establish specific rules and procedure to deal with this issue, otherwise potential conflicts or barriers may arise. This aspect is particularly delicate in the case of horizontal marketing networks where all partners are positioned at the same level of the value chain and, potentially, any partner could be the head of the network and have direct contacts with clients, as in the case of CDP (see Table 4). Indeed, CDP partners were not able to establish specific procedures so as to overcome this "problem", so they had to establish also a consortium which could act as a separate legal entity in name of the network partners. Instead in the case of a mixed network, like RAB, it is easier that the head is naturally selected (i.e. the one closest to the client which is used to maintain the relationship with it). As a consequence, a mixed position of partners along the value chain facilitates the positive impact of rules and procedures on network success.

Table 4: Rules and procedures and position along the value chain in network contracts

<i>Level of success</i>	<i>Cases</i>	<i>Governance form</i>	<i>Rules and procedures</i>	<i>Position of partners in the value chain</i>
High	RAB	Network contract	Well established	Mixed (vertical + horizontal)
Medium-low	CDP	Network contract	Informal	Horizontal

As a consequence, the following two propositions are outlined.

P6: The presence of well-established rules and procedures has a greater impact on the success of a SMEs marketing network governed by the network contract, than on the success of an SMEs marketing network governed by the consortium.

P7: In SMEs marketing networks governed by the network contract, a mixed position of firms along the value chain moderates the impact of rules and procedures on network success.

Always referring to the network contract, being a new and specific tool, also the presence of someone who is familiar with the principles of the network contract is fundamental for the successful starting up of a marketing network governed by the network contract. Indeed, the sustenance of the Union of Industrials of its region during the draft of the contract and the initial settings of RAB was essential since the law had just been approved and it was one of the first network contracts to be signed. Some people in the Union of Industrials had studied the network contract law in details, so it had a good knowledge of this new tool. On the contrary, in the case of CDP, which is also one of the first network contracts, the shoe trade association supported the network at the very beginning, but since it was not so skilled in matter of network contracts, it asked for an accountant's assistance; however, he had never heard about the network contract hence he had any knowledge of the network contract (see Table 5).

Table 5: Level of knowledge of the network contract of involved actors

<i>Level of success</i>	<i>Cases</i>	<i>Governance form</i>	<i>Network contract experts</i>	<i>Knowledge of the network contract</i>
High	RAB	Network contract	Unindustria	Medium-high
Medium-low	CDP	Network contract	Accountant, Acrib	Low

As a consequence, we hypothesize that the presence of an actor having a good knowledge of the network contract is relevant for the successful starting up of a marketing network.

P8: In SMEs marketing networks governed by the network contract, being supported by an entity with a good knowledge of the network contract is fundamental for the success of the starting up of the network.

Different actors involved in the network development process have been mentioned. One having a main role is the network manager who is responsible of the going on of activities, their coordination and control, and who maintains the leadership of the network. The network manager can be both internal to the network or external. In the case of CDP and RAB the network manager is the CEO of one of the partners of the network; instead, in the case of S&S the network manager is the responsible of the body of the Union of Industrials. The case of CEV is atypical since the trade association supporting the network formally nominated an external person as the president of the network, hence the tasks of the network manager are deployed by both actors. What emerges from the cases is that in the case of S&S and CEV, that are the two successful cases, there is a network manager with both network-related skills and a strong leadership. On the contrary, in the case of CEV there is not a strong referential figure, the management of the network is in the hand of one formal president, who limits to head meetings, and the trade association whose representatives do not possess neither leadership characteristics or specific skills in matter of networks. Instead, the case of CDP is in the middle of the other cases because the network manager is a moral leader, despite not possessing all necessary skills and know-how required to manage a marketing network. These evidences suggest that it seems not important whether the network manager are inside or outside the network, the relevant issue for success is that he has certain features. On these ground, the following hypothesis is formulated.

P9: The higher the leadership attitude and the network-related skills of the network manager, the higher the probability that a SME marketing network is successful.

Cases show that different organizational and managerial activities may be carried out in a more or less formalized way. In particular, activity planning may consist of a detailed medium-term plan including different activities and actions the network partners arrange to carry out with a precise scheduling, including also a moment of control over the

established scheduling, as in the case of S&S and RAB where there is a proactive attitude. Oppositely, activities may be planned day-by-day with a short-term orientation, as in the case of CDP and CEV which have a reactive approach. Following the same vein, communication and coordination processes can follow a regular pattern of meetings to which all partners participate and tasks are divided among members so as to know who does what, as in the case of S&S and RAB; otherwise they can be managed informally, as in the case of CDP and CEV in which informal communication is preferred and there is not a precise coordination of partners and activities. These opposed situations suggest that on the one hand there may be a context in which everything is formally planned and controlled, and partners follow specific rules and established procedures, while on the other hand a context in which there is not a comprehensive vision and control of the whole network and everything result less formalized. On these grounds, the following proposition is articulated.

P10: A higher degree of formalization of activity planning and control, communication and coordination mechanisms leads to a successful SMEs marketing network.

The last issue is related to the network brand. In three of the analyzed cases, this topic is given particular attention, in the sense that partners of these marketing networks demonstrated high consideration of this theme. The CEO of one of S&S partners asserted:

“For our network, we wanted a brand recalling our specific activity which also highlighted our Italian character. Hence, we opted for S&S since the steel is the main material we work with and one of the main feature associated with the made in Italy is style. Moreover, at the same time, we opted for an English brand in order to be more internationally oriented.”

Also RAB partners chose an English brand:

“A marketing network needs to have a short and effective brand evoking internationalization.”

Instead, partners of CDP relied on different arguments:

“CDP is the name of the confraternity of shoe producers which was born in 1268. It seemed to us an appropriate name for our network contract since it evokes our origins.”

Both successful cases have a short brand, easy to remember because somehow related to the products realized by partners, and very effective. Instead, CDP and CEV opted for a long network brand which is the result of a reasoning favoring the roots of the network and no particular consideration towards this element, respectively. This evidence inspired the last proposition.

P11: A short, effective and easy to remember brand contributes to the success of a marketing network.

5 Discussion and conclusions

The study examined the development process of marketing networks, with a particular focus on organizational and managerial factors involved in the process and having an influence over marketing network success. Investigating these aspects related to marketing networks provides an important contribution as on the one hand prior studies have tended to disregard them, dedicating much more attention to R&D networks (i.e. Hagedoorn, 1993; Belderbos *et al.*, 2003), and on the other hand, despite the high failure rate of networks (Hyder and Eriksson, 2005), the extant research has not looked at successful and unsuccessful in comparative terms (Ring, 2000). Moreover, Italy represents a fertile field for research in this field since the first European law dealing with the topic of formal collaborations has been approved in 2009, which is the most relevant but also one of the policy actions favoring firm collaboration.

The first main finding consists of a scheme representing the development process of marketing networks. It includes the phases of the process, that are the network business idea, partner selection, the network design, operation and evaluation, all pushed by the initial network business idea. The concept of the network business idea is new in the literature about marketing network, but actually it is the element which makes the process start, thus its characteristics, meaning its clarity, its feasibility, the person who is the creator, may shape how the process is then carried out. Also the fact of moving partner selection out of the design phase is a novelty, indeed previous literature consider this element inside of the formation process (e.g. Reid *et al.*, 2001). Instead, we guess it comes before any other phase, since it is a prerequisite for networks. In the network design, operation and evaluation all relevant organizational and managerial factors are highlighted. They represent the link between the first and the second research questions.

Indeed, the second finding deals with those organizational and managerial factors having an influence on network success. Previous paragraphs have dealt with each of them in deep detail, hence here the discussion aims to provide an interpretation of the above-discussed results. Table 6 provides an overview of the most significant findings, highlighting those aspects that have some relationship with knowledge in its broader meaning. Cases prove that the partner selection phase is mainly based on previous knowledge, in the sense that Italian managers, characterized by a skeptical attitude towards collaboration, prefer to collaborate with someone they already know, someone who is next to them, and of course who is not a direct competitor. Hence interpersonal knowledge makes manager be more confident about the collaboration and trustful of their partners, which enhances the probability of a successful marketing network. During the network design and operation, more technical elements seem to play the main role, that are previous experience of collaboration, which entails that involved actors have developed network-related know-how, knowledge of the possible contractual forms, including the regulations of the recent network contract, and the skills of the network manager. These elements may be categorized as network-related know-how and skills.

Table 6: Interpretation of results assuming a knowledge perspective

<i>Phase</i>	<i>Relevant factor</i>	<i>Knowledge perspective</i>
Partner selection	Previous knowledge of partners Proximity Non competitors	Interpersonal knowledge
Network design	Previous experience of collaboration Knowledge of the network contract Formalization	Network-related know-how and skills
Network operation	Leadership and know-how of the network manager Formalization	Network-related know-how and skills

5.1 Theoretical and practical implications

The study makes a noteworthy academic contribution through the development of theory concerning marketing networks. Generally speaking, being completely dedicated to marketing networks, it enriches and enlarges the knowledge about this topic which has

been under-investigated until now. In this context, this research addresses one specific issue, that is the development process, which are supposed to contribute significantly to the literature. Previous contributions have been integrate in a systematic way, which makes it possible to design a comprehensive framework representing the development process of marketing networks, which encompasses organizational and managerial factors involved in the process, as well as elements of contingency. This framework responds to the call for a deeper understanding of how marketing networks are formed and what are the dynamics that bring to their creation and development (Veilleux et al., 2012). This aspect has not been given much attention in previous literature not only about marketing networks, but also about networks in general. As a consequence, it could represent a good basis for the development of theory concerning the development process of different types of network. With respect to previous literature investigating aspects related to marketing network development process (e.g. Batonda and Perry, 2003; Hyder and Eriksson, 2005; Wang and Xiang, 2007), this framework maintains the approach based on phases (Das and Teng, 2002), despite highlighting that those phases are not strictly sequential. On the contrary, it provides a more focused, even though detailed and comprehensive, picture of the process, rationalizing and giving an order to previous contributions coming from different areas of research. Moreover, it adds an analysis of elements of contingencies which may influence the development process. Moreover, this study proposes a number of factors which seem to impact on network success, hence providing the basis for the identification of key success factors for marketing networks. This study could also represent a starting point for the comparative analysis of different types of networks which are supposed to have different peculiarities and thus different dynamics leading to success. With respect to previous literature, all relevant organizational and managerial factors are considered, as well as their potential interrelations. Beyond the scope of networks, considering the touching point with the theme of knowledge, in some of its different facets, the present research may also contribute to the theory of knowledge management within the context of networks.

This study has a relevant managerial component, since marketing networks are a very practical subject which has immediate implications for managers. Indeed, evidences emerging from cases suggest a series of recommendations which may reveal convenient for those firms involved in or willing to undertake a marketing network. In particular, they need to take into account that managing an network is not like managing a firm,

meaning that specific skills and know-how are required, which becomes even more important when dealing with the network contract.

Furthermore, this study contains insights relevant also for public policy. Indeed, governments throughout the world, primarily in Italy, are investing more and more funds for the creation of networks and the signing of network contracts. Therefore, it is important to assess the efficiency and returns of these millionaire investments of public money and to provide assistance to firms willing to start a collaborative project. Actually, a fundamental prerequisite is a strong campaign of awareness of these topics. All analyzed cases show that Italian entrepreneurs and managers are still skeptics about collaborating with other firms, due to their individualist aptitude. There are some Italian regions where firms have a greater inclination towards collaborations, as for example Emilia Romagna, than others, as Veneto. Indeed, none partner belonging to the marketing networks in the Veneto region has previous experience of collaboration, whilst partners belonging to the case in Emilia Romagna were more familiar and, thus, more comfortable with collaboration. Indeed, in this region, there have been many public and private measures laying the foundations for the development of collaborations, resulting in a high number of projects involving many firms, far before the draft of the network contract law. As a consequence, following the steps of these pioneer regions is of great importance, because if firms are not educated in matter of collaboration, it is more difficult that they succeed. In his case, educating means illustrating the different forms of collaborations, because the network contract is only one of the different possibilities to govern an network, but it is not suitable for all necessities. It also means presenting potential benefits, but also the commitment, responsibilities and technical skills and know-how an network requires. To this purpose, it is important to accept an external support in case partners do not possess all necessary skills and know-how.

As far as the network contract is concerned, legal issues should be integrated with managerial requirements. Moreover, a good base on knowledge should include the awareness that the main driver for signing a network contract should not be fiscal subsidies. The president of Retimpresa asserted:

“If a group of firms want to sign a network contract with the main purpose of receiving some subsidies, then it is better for them not to do it.”

5.2 Limitations and future research

Despite the above-discussed implications, this paper has some limitations. In particular, data were gathered from four cases, which is the minimum number of cases suggested by Eisenhardt (1989) to carry out a qualitative research based on multiple case studies. In marketing networks, but actually in networks in general, there could be endless elements of contingency, hence four cases cannot provide full evidence of how all marketing networks develop, despite networks in different industries have been considered. To this regard, only the Italian context has been considered, which limits the scope of validity of the study. For these reasons, evidences should not be treated as generalizable findings, rather findings that lay the foundations for further investigation.

Considering opportunities for future research, marketing networks are an emerging area of research interest and the study of networks themselves presents a complex methodological problem. Hence further research is needed to address the complexity of networks by investigating them over time, in order to capture in greater details their dynamic aspect, and at more than one level. A more precise operationalization of the concept of network success also needs to be defined, which calls for future research in this domain. The framework representing the development process of marketing network and propositions developed from the present study provide the basis for this further investigation. In particular, the framework could be used in order to understand whether other types of networks follow the same pattern or, instead, there are different organizational and managerial factors entering the process and determining success. A more detailed in-depth study of marketing networks which combines both qualitative and quantitative methods in which data is gathered from all actors in the network is called for. Such a study would also allow for a rigorous testing of the propositions developed in the present study. Moreover, a comparison with cases in other countries may represent an interesting path for future research in order to establish a set of good practices within the context of SME marketing networks. Moreover, further investigation is required regarding specific organizational and managerial factors which have not received specific attention by now. For example, branding seems to be particularly relevant in marketing networks, despite this issue is highly under-investigated in previous literature. Understanding the dynamics occurring between the network brand and partner company brands may be an interesting issue, as well as the role played by trust in the different phases of the marketing network development process. In addition, due to the apparently

fundamental role he plays, the figure of the network manager needs to be defined better, specifying his duties and responsibilities, as well as his scope of action, so as to maximize their effectiveness for the network. Also the relationship between these emerging concepts with the concept of leadership in the network literature could represent an interesting area for future research. Lastly, the findings highlighting the importance of knowledge, in its different meanings, gives rise to a new stream of research considering the specific role played by knowledge in networks.

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Knowledge, competitiveness and networking in SMEs: an exploratory study of the Italian “Contratto di Rete” – Network Contract

Francesco Saverio Massari*, Maria Teresa Riggio, Donato Calace

Department of Management
University LUM Jean Monnet
S.S. 100 km 18 Casamassima, BA 70010

* *Corresponding author*

Structured Abstract

Purpose – This study investigates the importance of networking for enhancing companies innovation capabilities and facilitate internationalization, especially for resource restricted companies (like SMEs). Collaboration is regarded as an important factor for the success of SMEs, especially as technology becomes complex, and where knowledge is distributed across various firms (Lee et al., 2010; Bianchi et al., 2010). The Contratto di Rete -CR- (literally translated as “Network Contract”) is a key solution, enhancing growth and increasing innovation capacity and internationalization of SMEs. This is made possible through knowledge sharing leading to higher outcomes (Hau-Siu Chow; 2012). In fact, sharing contributes to knowledge, skill, and ability that is vital to enhance performance. After grounding the Contratto di Rete in the general theory of networking, we propose a model based on Ring and Van de Ven theory (1994) in order to describe how a Contratto di Rete is established and performs.

Design/methodology/approach – We propose a deductive approach through a multiple-case study design. After having selected multiple Italian CRs (through a specified protocol) we make an in depth investigation with recorded semi-structured interviews (Yin, 1989), triangulating data with other relevant sources: internal documents, acts, presentations and the CRs. More in detail, we will answer to the following research question: Is the Contratto di Rete providing competitive support for the Italian SMEs? Outcomes will be compared to theory understanding case-specific patterns, similarities and differences among the case selected.

Originality/value – This methodology puts in evidence if and how – thanks to linkages and knowledge sharing – CR is proving to be effective for Italian SMEs. Additionally, we address to Hofstede’s national culture dimensions to explain further in which ways the Contratto di Rete fits Italian entrepreneurship culture. Since 2009, year when the instrument was introduced, not enough time went by in order to make relevant quantitative studies (Bank of Italy, February 2013). For this reason, we will adopt a qualitative approach, based on interviews and, more specifically, with a multiple case study design.

Practical implications – The outcomes of the study will shed light on this emerging networking phenomenon that is becoming widely applied in Italian SMEs. In particular, entrepreneurs and network managers will find which elements and practices drives the performance of the network. Our original approach links networks structure (nature of network ties, typology of involved firms), networks knowledge (in terms of competences and capabilities) and network performances in terms of innovation and internationalization.

Keywords – SMEs network, knowledge, formal contract, innovation, internationalization

Paper type – Academic Research Paper

1 Introduction

The Contratto di Rete (CR), literally translated as Network Contract, is a new kind of legal contract available for Italian companies to create networks. The EU, considering the principles of the Small Business Act, defines this tool innovative. Indeed, Italian SMEs are widely adopting the CR. In particular, Italian businesses, especially smaller ones, need to develop stable and manageable networks, in addition to the typical Italian “natural” ones (such as the Industrial Districts). Innovation and internationalization processes request shared projects and high investments in new knowledge and sharing resources. SMEs, through trans-sectorial and trans-regional networks, can participate to global dynamics, especially in terms of knowledge exchange.

This study grounds in the social network theory and aims to show the validity of the CR as a tool enabling the creation and the development of networks with the above-cited features.

First, we observe the convenience of the CR with the Italian entrepreneurial culture, as it is a tool available for national firms. For these firms, networking is related to the social capital entrenched in the local contexts. National culture is central in describing the nature of this kind of capital.

Second, we empirically verify whether the CR is creating networks raising the competitive performance of Italian SMEs. Through a multiple case-study methodology, we show how the CR is providing to contract members competitive advantage, in terms of innovation and internationalization.

Our results suggest that the CR is an important support for creating competitive networks and an essential element for the resumption of Italian SMEs.

2 Literature Review

2.1 *Networks and Competitive Advantage*

Network has gathered a significant share of scholarly attention in the last decades, giving birth to a rich and varied stream of study. Authors focused on its organizational nature (Powell, 1990; Larson, 1992), considering its features compared to the traditional organizational forms, market and hierarchy (Coase, 1937). Previously transactions were often concluded through either market transactions (primarily controlled by price) or internal hierarchical arrangements (primarily controlled by administrative authority). Recently firms have been engaging forms of collaboration that resemble neither the familiar alternative of arms' length market contracting nor the former ideal of vertical integration (Powell, 1990; Ring & Van De Ven, 1994).

Some scholars affirm that in between the two poles of market and hierarchical arrangements, we find various intermediate or hybrid forms of organization. At first, the network was depicted as one of the many hybrid organizational forms along the market-hierarchy continuum (Thorelli, 1986). Today the idea that economic exchange is arrayed along a continuum is too quiescent and mechanical and the familiar market-hierarchy continuum does not do justice to the notion of network (Powell, 1990; Larson 1992). So, the three modes of organization – market, hierarchy, and network – need distinct research approaches and theories.

In this paper, we consider networks as a distinctly different organization of coordinating economic activity, separate from market and hierarchy (Powell, 1990) as they are endowed with a set of social dimensions, such as trust, reliability and reputation (Larson, 1992). A network structure avoids the hierarchy and market problems, institutionalizing collaboration, shared information, and assured results (Larson, 1992).

Others researcher observed in which ways a network is born, evolves and dissolves, building networking life-cycle models (Ring & Van de Ven, 1994; Onetti & Zucchella, 2012). Other authors linked networking to firms' performances, in general competitive advantage terms (Dyer & Singh, 1998), or considering specific performance, such as innovation (Gulati 1998; Kogut, 2000; Ahuja, 2000; Gulati et al., 2000) or internationalization processes (McDougall et al. 1994; Oviatt et al., 1994; Coviello et al., 1995; Johanson and Vahlne, 2009). In this section we give a comprehensive overview of this literature, with the aim of creating a sound and complete theoretical ground for the new italian networking tool, the Contratto di Rete.

In the past few years there have been many empirical studies, aiming to understand how economic activities occur in a Network Structure (Gulati 1998; Kogut, 2000; Ahuja, 2000; Gulati et al., 2000; Dyer and Singh 1998) and foster firms' development and success. These analyses provided a significant contribution to the broader strategic field of research, addressing the traditional research question "why firms differ in their conduct and profitability?". According to Gulati, Nohria, & Zaheer (2000), it is necessary to analyze the network of relationships in which companies are included, overcoming the "atomistic" idea of strategic analysis towards a "relational model", in order to explain further differential firm performance. This is a very important contribution, as allows strategy research to overcome the classical juxtaposition (Hoskisson, Hitt, Wan, & Yiu, 1999) between the resource-based view (Penrose, 1959) and the positioning school (Porter M. , 1996). Today, firms are embedded in networks of social, professional, personal, and exchange relationships with other organizational actors (Gulati, 1998). Dyer & Singh (1998) claim that these relationships play a key role in explaining firms advantages and disadvantages. In particular they advance that the source of relational rents are not in simple market relationships, where the exchange between the partners is based on trade transactions, but lie in more deep and idiosyncratic ties. "Relational rents are possible when alliance partners combine, exchange, or invest in idiosyncratic assets, knowledge, and resources/capabilities, and/or they employ effective governance mechanisms that lower transaction costs or permit the realization of rents through the synergetic combination of assets, knowledge, or capabilities." (Dyer & Singh, 1998, p. 662). Relational rents exist in two forms (Kogut, 2000). Burt rents are typical of hierarchical networks, where participating entities competitively struggle to occupy powerful brokerage positions (the s.c. "structural holes") and arbitrate the knowledge and information flows (Burt R. , 1992). Coleman rents characterize flatter networks, and are originated by coordination, repeated exchanges among the members and collective resolutions of problems (Coleman J. , 1990). Accordingly, four elements drive the competitive advantage in network relationships: investments in relation-specific assets; substantial knowledge exchange, which leads to "joint learning"; the combination of complementary and scarce resource and capabilities, which drives the creation of new products and technologies; lower transaction costs than competitor alliances, guaranteed by effective governance. This last element, in particular, has a central role triggering investments in relation-specific assets, sharing knowledge and combining complementary

resources. Indeed, governance has not only a role in setting the rules for the appropriation of network's outcomes, but especially in coordinating the activity (Gulati & Singh, 1998) and creating the so called social capital (Burt R. , 2000; Nahapiet & Ghoshal, 1998). For this to happen, a significant presence of trust, reputation and reliability is required among partners (Larson, *Network Dyads in Entrepreneurial Settings: A Study of the Governance of Exchange*, 1992), as there is "widespread preference for transacting with individuals of known reputation" (Granovetter, 1985, p. 490).

Literature provides many definitions of trust. In broad terms, trust is the common expectation between the parties involved in a deal that the counterpart acts in good faith and behaves in accordance with explicit and implicit commitments, is honest in the negotiations, does not take excessive advantage of another if there is opportunity to (Kassicieh, et al., 2002). Considering the governance of risk point of view, trust is the confidence in the predictability of one's expectations and in another's goodwill (Ring & Van de Ven, 1994). From the knowledge perspective, trust can be defined as "cognitive coordination mechanism" (Lorenzen, 2001, p. 16), and it can be declined in many forms. First, it can be distinguished as dyadic networked trust, featuring strong mutual interest and shared values among partners in small networks, or as social trust, developed in larger industrial clusters through social learning processes. Second, Ettliger (2003) defines emotive trust, developed positive personal feelings about others, and capacity trust, based on the competences of partners in professional contexts. Trust, in all these forms, is involved in networking, as network relations are both professional, interorganizational and personal (Ceci & Iubatti, 2012).

Building such trust requires time, efforts and resources, as well as the integration and interaction of various forms of formal and informal governance tools (Dyer & Singh, 1998). Indeed, succesful alliances use multiple governance mechanisms simultaneously (Borch, *The process of relational contracting: Developing trust-based strategic alliances among small business enterprises*, 1994). Informal sensemaking and formal bargaining are the processes that characterize the negotiations on which a cooperative relationship is created, institutionalized in a formal relational contract (like the *Contratto di Rete*) and informally understood in a psychological contract (Ring & Van de Ven, 1994). Formal governance mechanisms act, on one hand, as a safeguard from opportunistic behaviors when trust is not consolidated, and, as a consequence, its use fades over time, as trust raises and more informal tools are preferred by partners (Gulati, 1995). However, recent

research developments argue against this view, indicating that formal contracts and relational governance are complementary rather than substitutes (Poppo & Zenger, 2002). Mellewigt, Madhok, & Weibel (2007, p. 842) suggest that “trust serves as a moderating variable that influences the direct relationship between control and coordination concerns and contract complexity. Thereby, trust will be at once a substitute of contractual complexity (regarding control concerns) and a complement of contractual complexity (regarding coordination concerns)”. On the other hand, formal governance transforms instrumental transactions into a socially embedded relationship, endowed with norms and values which guarantee the existence and prolonging of the ties over time. This process is called institutionalization under a social-psychological perspective (Ring & Van de Ven, 1994).

Networks of exchange relationships contribute to competence development, thanks to knowledge sharing fostered by trust. An important competence for an organization is the ability to maintain close relationships with partners and customers. “Relational competences” or “network competences” are essential for business innovation as well as business internationalization enhancing the competitiveness of a firm. From this point of view, the creation of new value through alliances is a learning process, as it deals with contracts which cannot prespecify all the interactions among the partners (Anand & Khanna, 2000). Large part of literature addressed to the field of organizational learning (Argyris & Schon, 1978), showing its important contribution in explaining the existence of resource of competences that are inaccessible to competitors. In networks, learning exist *within* the alliance and *across* the alliance too, originating a double-cycle process (Anand & Khanna, 2000).

The first type of learning is based on the transfert of knowledge among the partners. In this sense, the relative positioning of a partner (an “ego”) and the other members (the “alters”) plays a central role in determining the access to new and distinctive knowledge. Egos situated nearby knowledge brokerage positions (s.c. “structural holes”) have greater chance to excel in innovation races (Ahuja, 2000). Russo (2011), in his empirical study, based on a sample of 214 organizations operating in the fuel cell industry, showed that the centrality of a firm in a specific network influences the success of an alliance. Moreover, firms acquire new knowledge through multi-sectoral relations. Therefore, enterprises must be able to handle new relationships, involving organizations operating in several sectors, such as public, private, non-profit (Selski & Parker, 2005) and also coming from

different geographical contexts. With a networking orientation companies adopt a global direction in searching for new opportunities, ideas and resources - especially when networks are activated inside multi-sectoral and multi-territorial dynamics - looking for new markets and develop international strategies, and consolidate their presence on existing markets. As a consequence, learning *within* alliances has a strong tension between competition and cooperation, as confirmed by the existence of internal learning races (Gulati, Nohria, & Zaheer, 2000). The second kind of learning, that is *across* alliances, refers to the “processes by which a firm can systematize the acquisition or development of an alliance capability” (Anand & Khanna, 2000, p. 298). A long history of networking experiences builds up a specific knowledge about “learning through networks” skills, in a typical “learning to learn” phenomenon (Estes, 1970).

Allowing the sharing and creation of new and idiosyncratic knowledge, networking enhances specific performances in terms of innovation and internationalization. Operating in a network triggers a set of strategic and organizational advantages: 1) it is possible to take benefit of external specializations and focus more on what you excel. 2) Take advantage of various types of economies and cost reductions. 3) Introduce new ideas and different views that reduce complexity and develop innovation. 4) Reduce risks, which are shared among several participants. 5) Promote new standards and introduce new technologies in the market. 6) Acquire a global orientation in searching for new opportunities and resources (Gulati, 1998; Kogut, 2000). In particular, networking is beneficial for resource-constrained firms, who can enjoy relationships and resources typical of more established ones (Powell, Koput, & Smith-Doerr, 1996). Strategic alliances with other SMEs, big companies or other individuals, bring positive influences for SMEs, since they can access to resource difficult to develop on their own, guaranteeing at the same time, a high flexibility and enhancing their growth capacity (Powell, Koput, & Smith-Doerr, 1996) enhancing innovation and internationalization. Network relations brings different benefits and opportunities for SMEs: 1) provides value-added services through a well-connected network of different knowledge sources, overcoming some of their barriers related to the limited information sources, knowledge, and financial resources. 2) Helps SMEs specialize and focus on particular functions where they have competitive advantages and access a wide availability of knowledge throughout the establishment of contract of mutual trust (Lee, Park, Yoon, & Park, 2010). 3) Allows them to distribute the costs and risks of the innovation process with a larger basis of

actors by reinforcing firms' positioning in the challenge for the competitiveness (Gronum, Verreyne, & Kastle, 2012). 4) Helps them develop "international networks" which allows them to overcome size constraints on internationalization, provide additional resources needed in the route for internationalization and facilitate product commercialization across international markets (Valsilenko & Morrish, 2011).

2.2 Networks and the Competitiveness of Italian SMEs

We have seen so far how networking is important for enhancing companies competitiveness. This is true especially for resource restricted companies (like SMEs).

Many Italian SMEs were unable to implement innovation strategies and least of all to take full advantage of development opportunities that despite the crisis have emerged in the last decade. Italy, compared to other European competitors, has been highly exposed to competition coming from new emerging countries. According to most scholars and analysts, this is related to the size issue. In fact, the Italian productive system for more than 99.7%, is made up of SMEs (the EU average is 99.1%). However SMEs are the backbone of the Italian economy and the engine of the European one. The Italian SMEs perform at least the 80% of the GDP making a substantial contribution to economic development and growth (OECD, 2009).

Italian SMEs make "innovation without research" (Hall, Lotti, & Mairesse, 2009), investing less in R&D activities. Italian firms are highly focused on traditional productions with a low technological content. In fact, most of the Italian SMEs operate in traditional sectors with a labour-intensive orientation. Furthermore partnerships are restricted to traditional partners such as suppliers and cannot easily find the financial resources (both public and private) to allocate for innovation. SMEs have difficult relationship with the banking system, and while in other countries there are specialized agents (e.g. venture capitalist) that are able to intercept, evaluate, and finance R&D projects, in Italy the rarity of these figures generates less opportunities of investing in research (Hall, Lotti, & Mairesse, 2009). With regard to distribution, marketing and general relational competence SMEs act as large workers strongly oriented "to the task, and less to relations" (Ghiringhelli & Pero, 2010). There are a small number of collaborations with universities and national and international research centres.

Other important reasons are related to socio-cultural factors (on which we will focus in the next pages), with a governance focused on the family control (Van de Vrande, De

Jong, & Vanhaverbeke, 2009; Hall, Lotti, & Mairesse, 2009; Lee, Park, Yoon, & Park, 2010; Bianchi, Campodall'Orto, Frattini, & Vercesi, 2010) with a pyramidal structure, and a governance focused on family control.

As Furlan and Grandinetti (2011) suggest, SMEs growth is not related only to the increase in size. They need to integrate the relationship growth and the capability growth. Concerning the first notion, “the extent of external resources can grow both as a result of an increase in the number of relationships and as a result of an increase of the value of existing relationships. In the former case, the firm extends its value network, namely the set of relationships that the firm uses to get access to external resources. In the latter case, the firm keeps its network stable, but evolves its existing relationships towards more valuable configurations” (Furlan & Grandinetti, 2011, p. 198). The capability growth regards the systematic accrual of specific capabilities (such as functional, market related, etc.), organizational and learning routines helping firms to continuously innovate and to be competitive (Verona, 2000; Grant, 1996)

The above mentioned factors limit investments in innovation and restrict the internationalization activities. Nevertheless, the Italian SMEs can count on strong points: the entrepreneurial brilliance in pursuing niche strategies joined to the ability of developing tailored products or original solutions; the ability to benefit from the division of labour and from knowledge sharing, mediated by interpersonal relationships and the social capital settled in the territory, last but not least, the capacity of adaptability, daughter of “diversity” (in knowledge and skills at regional level, in forms of specialization, in local manufacturing systems, etc..) that is peculiar to the Italian context.

The creation of new dynamics that boost the competitiveness of Italian SMEs is necessarily the inclination and the ability to work in a network. The type of network that has beneficial for the success of the Italian industry on the international scale, studied at the international level (Porter M., 1990, 1998; Powell, 1990; Gulati, 1995) is the industrial district. It is defined as: “a socio- territorial entity characterized by the active presence of a group of persons and a population of firms in a given historical and geographical dimension” (Becattini, 1990). Currently, 40% of the Italian manufacturing firms is located in the districts, and achieves the 27.2% of GDP and the 37.2% of exports. In the industrial districts, interactions in the local social collectivity produce “intellectual capital” (Nahapiet & Ghoshal, 1998). As Camuffo and Grandinetti (2012, p.826) advance, “the community dimension works like an immaterial resource, being both collective and

district specific. First, its presence facilitates the establishment of inter-firm (inter-organizational and interpersonal) relations within the local cluster, cutting down on barriers to communication. Second, it increases the ‘average’ level of trust in local relationships. Both these effects can be regarded as cognitive premises of cognitive interaction”. Industrial experience, technical expertise and knowledge specific to manufacturing are closely connected to the district’s social capital. So these competitive elements are created and available for local businesses in an exclusive way and with lower costs compared to non-district firms (Ricciardi, *Strategie di cooperazione tra aziende e mitigazione del rischio operativo: i vantaggi competitivi delle reti di imprese*, 2010). District’s social capital system will also allow to apply sanctions for opportunistic behavior carried out from individual entrepreneurs and reward favorable ones. Consequently, transaction costs are reduced, since many agreements may also be informal.

With the changing of environmental dynamics, the district is losing its competitive advantage, even though it is still important for the Italian productive system (Ricciardi, 2013; Palmieri, 2009).

Italians industrial districts cannot remain geographically and culturally embedded, they need to spread all over the world, including regions of Italy itself (Zeleney, 1999).

Rullani argues that there are two characteristics of the district that need to be called into question: 1) it is a form of voluntary cooperation (between the customer and the supplier in the supply chain), but more an involuntary form; 2) the network of collaboration is a “natural” network, not designed but emerging from the individual units, mostly supported by the social capital of the area (trust, social and cultural proximity, etc.).

Among other things, the most popular model of SMEs inside the districts is the one of “traditional local enterprise” which has a low coverage in end markets; a low (or no) international projection of production and a reactive attitude towards innovation.

Nowadays, innovation and internationalization processes require shared projects by stakeholders and substantial investments in new knowledge and resources. This is the “cognitive” meaning of internationalization, that makes it increasingly interconnected with innovation. “Knowledge moves with great ease and speed from one corner to another of the ‘global village’, moving along networks of science and technology, beside the lines of long distance communication (which moves goods, people and information).

The internationalization becomes a process of transnational spread of knowledge from one firm to another, from one country to another. In other words, since several years the real internationalization process has become invisible” (Rullani, 2006). Therefore, in addition to district networks, Italian SMEs need network that are more stable and better governed, in which autonomy and realizable synergies need to coexist. At the same time it is necessary to extend the old short networks which are a characteristic of districts, making them more cross-sectorial and cross-territorial. In short, we need networks that have to facilitate global participation.

2.3 The Italian “Contratto di rete”: a new instrument for competitiveness?

Introduced in 2009 by the Law Decree 5/2009¹, the CR has certainly raised the qualitative and quantitative development of networks which are suitable for the modern internationalization and innovation processes.

In particular, the Law Decree (and its subsequent modifications and integrations) states that with the CR a group of entrepreneurs aims to accrue, individually and collectively, their innovative capacity and their competitiveness on the market. In order to fulfil their aim, they commit themselves to: 1) cooperate in forms and fields fitting their business activities. 2) Sharing industrial, commercial, technical or technologic information or services. 3) Carry out together one or more activities convenient with their business activities.

The essential elements of the CR are 1) the group of participants: Italian single entrepreneurs, companies, cooperatives and Consortiums can participate to the CR. 2) The strategic goals and their assessment system. 3) The CR Program, specifying rights and duties of the members and the planning to fulfil the aim of the CR. 4) The length of the partnership: an analysis by Unioncamere shows that more than one third of the CRs plan to last more than 10 years. 5) The enter conditions for new members. 6) Decision making rules on topics of common interest.

The CR can include the creation of a common fund and the establishment of a governance body, which manages the execution of the Contract in behalf of the members. Although these last elements are voluntary, most of the CR includes them.

¹ For further information regarding the law regulating the CRs:
<http://www.retimpresa.it/index.php/it/documenti>

The attribution of legal subjectivity (which creates the s.c. “Rete Soggetto” in opposition to the CR without legal subjectivity, called “Rete Contratto”) is recognized drawing up the contract referred to art. 3, co. 4-tert ss., L.D. n. 5/2009 and is, according to the present law, “optional and contingent” to the registration in the Business Register in which it is located. For the purposes of such registration it is required: setting up a common fund, and drawing up the contract through public deed, private writing, or digital signing ex-art. 25 L.D. n. 82/2005.

The CR is spreading rapidly: as of 1st March 2014, there were 1.344 CRs, involving about 6.500 firms. In September 2012, there were 458 CRs, counting 2.400 companies (Unioncamere).

The European Commission, found this tool very innovative and in line with the principles contained in the Small Business Act (SBA)². Collaboration in fact is considered an effective solution and is mentioned among the practical measures to implement the SBA. EU is also considering an European version of the CR.

In this paper, our aim is to ground the CR phenomenon in the general network theory, understanding and explaining its idiosyncrasies. In particular, we advance the following propositions:

1. *The CR is an innovative networking tool convenient with the cultural characteristics of the Italian entrepreneur;*
2. *The CR allows the creation of networks that drives superior competitive performance for the Italian SMEs*

3 Methodology

Since 2009, year when the instrument was introduced, not enough time went by in order to make relevant quantitative studies.

For this reason, we will adopt a qualitative approach, more specifically a multiple case study design (Yin, 2003), based on interviews and company visits to the three networks under investigation.

² *The ten key principles are the following: create a “friendly environment” for entrepreneur and family businesses; support honest entrepreneurs who faced bankruptcy, providing them a “second chance”; design rules according to the “Think Small First” principle; adapt public administration to the needs of SMEs, removing administrative barriers; adapt public policy tools to the needs of SMEs, in particular in terms of awarding public procurement contracts and allocating State aid; facilitate SMEs’ access to different types of finance; ensure that SMEs benefit from the opportunities offered by the Single Market; promote SMEs’ potentials for innovation, research, and development; foster the turning of environmental challenges into opportunities for SMEs; support SMEs in opening towards external markets*

We selected three CRs following a specified protocol: first we analyzed CRs that have at least one year of operation in order to obtain more reliable results (data were obtained by the Italian Chamber of Commerce, section Info Camere, November 2013). After an initial phase of contact, where companies have been submitted to a brief informative telephone interview (reaching 200 companies of 52 CRs), we selected those cases whose experience has shown higher managerial and organizational implications, following a technique of theoretical sampling indicated by Eisenhardt and Graebner (2007).

Once having obtained their availability, we selected and interviewed them. For the purpose of this study, we selected three cases particularly suitable for illuminating relationships and logic among construct (Eisenhardt & Graebner, 2007). These three case studies will be called with fantasy names to avoid social-desirability answers issues: Alfa-net, Beta-net and Gamma-net (also, companies participating to the networks will have fantasy names).

Details of the Italian CRs and the companies involved inside the network are set out in Table 1 (*Summary of Case Details*).

Table 1 - “*Summary of Case Details*”

CR	YEAR	REGION	INTERVIEWED COMPANIES	FOCUS OF THE NETORK CONTRACT	ACTIVITY
<i>ALFA-NET</i>	2011	Emilia Romagna	<ul style="list-style-type: none"> • Circle Ltd • Square Ltd • Triangle Ltd 	Innovation	development of an experimental waste collection system
<i>BETA-NET</i>	2013	Puglia	<ul style="list-style-type: none"> • One Ltd • Two Ltd • Network Manager (external) 	Internationalization	Commercialization of innovative products in the field of precision mechanics
<i>GAMMA-NET</i>	2011	Puglia Toscana Veneto	<ul style="list-style-type: none"> • Sun Ltd • Moon Ltd • Cloud Inc (external) 	Marketing	promotion, workshops, events, trade fairs

As guided by Yin (2003), we collected the main data through recorded semi-structured interviews, ensuring for all similar procedures, for a total of 8 interviews. These interviews were conducted mainly to the responsible for decisions related to the CR (e.g. President or Representative/Responsible of the CR). For each case, at least two interviews were made, this in order to guarantee the validity and coherence of information, collected from different point of views.

Considering the roles of the respondents, together with the president³ of the network, for each case study it was interviewed a representative (owner or manager) of at least two of the member companies: this because we wanted to listen to the experience and the voice of the companies involved in the network. In addition, the analysis developed for each case was submitted to the interviewees, so that they would guarantee the correct and faithful data retrieval of the information collected through the testimonies.

It was satisfied the criteria that the informant must be a prominent and well-informed person in the case selected, on the basis of his/her expertise in the areas relevant for our research (Yin, 1989).

Each interview lasted on average 45 minutes, covering the following topics:

- The role of the interviewed inside the network and free description of the CR;
- The motivation that led to the entrance/foundation of the network and the main objective in stipulating the contract;
- The outputs achieved in terms of innovation/internationalization/competitiveness;
- Organizational dynamics of the network: structure, relationships between members and third parties;

To supplement to the interview material, we collected secondary data, both internal material and published material, that were relevant for the study. To have a clear overview of the supplemental material collected, see Table 2.

Where possible, we examined websites of the CRs/Companies, before the interview this in order to gain background information and identify specific issues useful for the interview.

We also collected internal documents, like the certificate of incorporation of the CR, where we found a better definition of the network program specifying the common

³ *In his absence or unavailability, it was interviewed the subject referred to as representative or responsible for the network contract*

purpose together with strategic goals and economic activities implemented by the network.

Table 2: Summary of supplemental documents

Italian CR	Internal Documents	Published materials (quantity)
<i>ALFA-NET</i>	Certificate of incorporation Internal presentations notes and slides	Companies websites (4) Press release/media statements (2)
<i>BETA-NET</i>	Certificate of incorporation Internal Report Internal presentations notes and slides	Companies websites (5) Press release/media statements (14) Public presentations (1)
<i>GAMMA-NET</i>	Certificate of incorporation Internal presentations notes and slides	Companies websites (5) Brochures

Following Yin's (2003) suggestions, we maintained a database of all the recorded interviews, transcripts and notes.

Here we provide a brief description of the analyzed CRs:

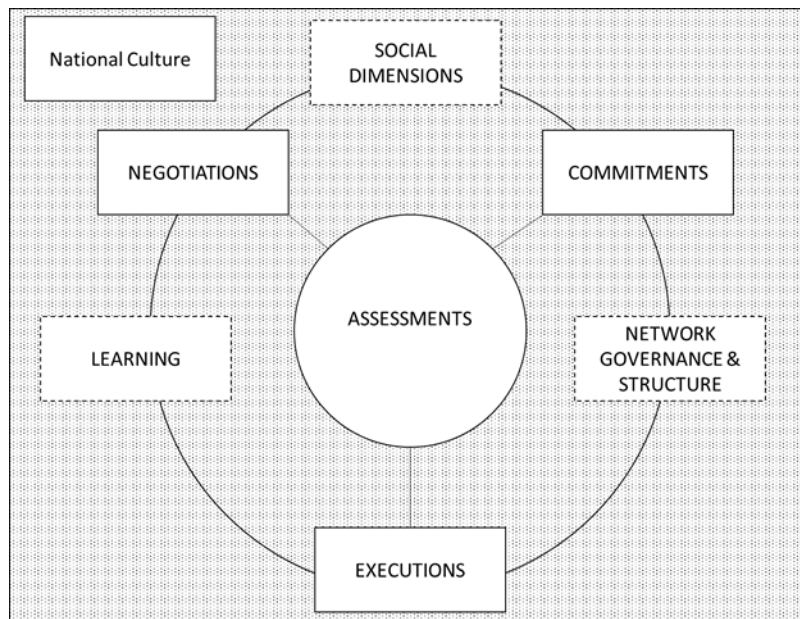
- *Alfa-Net* was founded on August 4, 2011 and is composed by three SMEs all coming from Emilia Romagna (Circle Ltd, Square Ltd and Triangle Ltd). The aim of the relationship is to develop a new project through the commercialization of a new technologically advanced product in the field of urban solid waste. It is, in particular, an electronic system able to monitor users refuse in normal waste bins, distributed throughout the area. In addition, the technology allows you to tighten up the bins when not in use. Thanks to an electronic key, it is possible to unlock them and record data access. The development of the product has been possible thanks to the participation of a large multi utility, H-Group, which holds 40% of its patent (external to the network). The remainder is equally distributed among the three members of the CR. The President is responsible for business relationships with customers, and a Technical Manager, acting as a Project Manager, follows the technical and electronic part for the development of the hardware at the base of the new product.
- *Beta-Net* was founded on January 24, 2013 and is composed by seven SMEs operating in the field of the precision mechanic, located between Bisceglie and Molfetta (Puglia). The participants have years of experience, also international,

within the industry. With this agreement, their intent was to strengthen their planning capacity in innovation and internationalization activities. The purpose of the network is strengthening *Beta-Net* competitive advantage, and so of their group members. This is done through: the development of their value proposition brought to the market, the introduction of products and services with higher added value and the strong orientation towards internationalization. The President has the function of management representative of the network guiding the activities of the common body. *Beta-Net* is a “Rete Soggetto”, as it has legal subjectivity.

- *Gamma-Net* was founded on July 7, 2011 and is composed by eleven companies coming from Puglia, Toscana and Veneto, which operate in the context of alternative energy sources. The members differ in size, as *Gamma-Net* includes large firms and micro firms too. The purpose of the network is “the creation of an innovative organizational model designed to create strategic and operational synergies between the members”. Under a common brand, the participating companies are aiming to increase their competitiveness through the development of communicative activities, capturing potential business opportunities. Cloud Inc. an external company that operates in the consultancy field supports this network. Therefore, while the strategic and operational decisions are the responsibilities of the common body and the President, the external support deals with the administration of the network. After the creation of the website and the development of promotional activities, *Gamma-Net* has entered in a stalling situation, continuing up to now. Some companies, in fact, do not adhere anymore to the CR.

4 Findings and Discussion

We introduce a revised version of a model originally introduced by Ring and Van de Ven (1994) in order to validate our propositions.



Source: Authors' elaboration on Ring & Van de Ven, 1994

Figure 1: Development of cooperative inter-organizational relationships within the CRs

The proposed model is cyclical and features overlapping stages in recurring sequences that are separated for analytical purposes. The whole model is embedded in the Italian national culture, as the CR is available only for Italian companies. We found culture significant to explain the adoption of the CR.

In order to understand the relationship between national culture and network dynamics, we propose to integrate Hofstede's studies with the findings of a more specific cross-cultural analysis by Del Junco & Bràs-dos-Santos, 2009 regarding cultural and social values of owner-managers of SMEs from different countries (Italy, Germany, and Spain).

Hofstede model (1983), which is one of the most established tool of analysis and reviewed in the organizational literature, highlights the culturally determined values of people from a particular country or region. From this perspective the scholar arrives to the definition of four dimensions of national culture⁴:

⁴ There is also a fifth dimension independent of the four others and is called "confucian dynamism" opposing a long-term or short-term orientation in life and work (Hofstede; 1990). Each dimension has an index value between 0 – 100. These dimensions were found through multivariate statistics and theoretical reasoning. The value for each nation helps compare with other national cultures.

- “Individualism versus Collectivism (IDV)”, explains the relationship between the individual and the group. The degree of Individualism in a country is statistically related to that country’s wealth⁵.
- “Large or Small Power Distance (PDI)”, it can be defined as the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally. In other terms, in societies where this index is high, it is expected that everyone accepts the authority of those with a higher power.
- “Strong or Weak Uncertainty Avoidance (UAI)”, society deals with the fact that the future can never be known. This ambiguity brings with it anxiety and different cultures have learnt to deal with this anxiety in different ways. We have cultures that wish to avoid any form of ambiguity and uncertainty, and those where this need is felt less.
- “Masculinity versus Femininity (MAS)”, are the social implications of having been born as a boy or a girl. A high score (masculine) on this dimension indicates that the society will be driven by competition, achievement and success. A low score (feminine) on the dimension means that the dominant values in society are caring for others and quality of life⁶.

These dimensions are relative, do not change over time and express a dominant culture (Hofstede, 1983).

If we explore the Italian dominant culture through the lens of the Hofstede’s four dimension model, we can get a good overview of the deep drivers of Italian culture⁷. Italy, in common with other southern European countries and some countries in Central Europe where the Roman Empire has left its mark, has a relatively high index in the hierarchical distance.

Integrating Hofstede’s model information with the findings of Junco et.. analysis, it’s possible to note that:

- at a score of 76 Italy is an Individualistic culture, “me” centered, especially in the big and rich cities of the North. Individualism reflects the desire to be free to plan one’s

⁵ *Wealth countries (like USA, Great Britain, etc.) are more Individualist and poor countries (like Colombia, Taiwan, etc.) are more Collectivist.*

⁶ *The fundamental issue here is what motivates people, wanting to be the best (masculine) or liking what you do (feminine).*

⁷ *These information were taken from Hofstede’s web site www.geert-hofstede.com.*

own work (Hofstede, 1990). This dimension does vary in Southern Italy where less individualistic behavior can be observed: the family network and the group one belongs to are important social aspects. People going from Southern Italy to the North say that they feel cold not only for the different climate but for the less “warm” approach in relationships. With regard to Italian entrepreneurs, the IDV index is twenty points lower than Hofstede’s results (56 instead of 76). This implies that Italian entrepreneurs are roughly half-way between Individualism and Collectivism. Moreover, in business, a friend is reputed “someone that you know and can be useful for introducing you to the important or powerful people” (Hofstede, Hofstede, & Minkov, 2010);

- considering the Power Distance dimension, with a score of 50, specially Northern Italy tends to prefer equality and a decentralization of power and decision-making. Control and formal supervision is generally disliked among the younger generation, who demonstrate a preference for teamwork and an open management style. With regard to Italian entrepreneurs, the results show a very low value compared to Hofstede’s study (3 instead of 50). Therefore, Italian entrepreneurs have a strong need for independence. The high score on Individualism accentuates this aversion of being controlled and told what to do;
- at 75 Italy has a high score on Uncertainty Avoidance, which means that as a nation Italians are not comfortable in ambiguous situations. Formality is important and Italians wish to avoid ways of dealing with uncertainty. Laws, rules, and regulations are seen as ways in which a society tries to prevent uncertainties in the behavior of people (Hofstede, Hofstede, & Minkov, 2010). In societies where this index is high, we have more formal laws and informal rules controlling the rights and duties of people. With regard to Italian entrepreneurs, the value is lower than Hofstede’s study (38 instead of 75), showing that they do not show much concern for uncertainty avoidance;
- at 70 Italy is a considered masculine society – highly success oriented and driven (Hofstede, 1983). Therefore, competition can be very strong. With regard to Italian entrepreneurs, the value is twenty-two points lower (48 instead of 70) than the one found in Hofstede model. The presence of a more feminine culture indicates that entrepreneurs prefer to resolve their conflicts via compromise and negotiation.

Developing feminine value in organizations is very important for improving business strategies (Chorn, 1995).

Typically, when the Italian SMEs have decided to connect themselves, the tendency towards individualism and autonomy of the Italian capitalism, has led them to prefer “natural” networks (like industrial districts) with respect to mergers or acquisitions.

However, nowadays we increasingly need to create more stable and better governed networks. Unlike what happens into the “district”, nowadays, innovation needs a project shared by the various stakeholders and significant common investments in knowledge and resources. “When you begin to explore new lands which require substantial investments, being unconsciously in a network, as in the case of the district, is not enough. Being in a network with identified partners requires a conscious choice and a strategic plan” (Rullani, 2008).

The CR is a key solution in responding to Italian SMEs needs. As it was possible to note, the tool is marked by a broad concept but also from a meagre discipline: the rules are both dictated by the legislator and especially decided by the firms’ own autonomy (Cafaggi, 2010). Therefore, the legislation, is incomplete in the sense that the legislature intended to draw only a frame, giving the possibility to the companies to complete it with contents and details in accordance to their needs. For this reason it is a new instrument compared to other tools that had little or no success, since they ignored the practical needs of entrepreneurs. Alternatively, the CR is shaped step by step, giving the possibility to maintain a high autonomy, important for many small and medium entrepreneurs (Preti & Vignali, 2013).

The CR raises from trust and commitment.

In order to develop an efficient CR you need to know each other. Trust between people is essential, as well as their capabilities and their reliability. With Triangle Ltd, it is 20 years that we collaborate together, and with Circle Ltd it is already 5 years. We also have relationship with the H-Group, our direct client. We have been taking care of all their optical fibre networks that they have in our region, for almost more than 10 years. (Alfa-Net, Owner Square Ltd).

You cannot make a CR without knowing already each other. This tool helped formalizing a temporary relationships, in order to create a stronger one in the future (Beta-Net, Owner of One Ltd)

Compared to other traditional aggregations - like Temporary Joint Ventures (A.T.I), Consortium etc. - which are more focused on specific and short-medium term goals, the CR places itself as an open, volunteer and convinced aggregation between entrepreneurs with the aim of increasing their potential for innovation and internationalization (Di Seri, 2012). Compared to other types of collaboration, it has a greater flexibility in defining scope and boundaries of the network, and degree of participation of the partners (Cafaggi, 2010). Both the Consortium and the Temporary Joint venture have a definite function, limited to the fulfillment of a specific business or at the execution of certain phases of the activity of the companies; what is missing to both is “the purse of a durable common program”.

We have created a CR with as much flexibility as possible. The CR shows a great flexibility and helps SMEs overcoming dimensional limitations and difficult economic conditions. We prefer growth strategies that do not imply the creation of a separate entity, and so the loss of independence, setting up a new organization could be more costly and generate greater rigidity. (Alfa-Net, Owner Circle Ltd).

I believe that the CR has a big advantage: the flexibility (Beta-Net, Network Manager).

We chose the CR, compared to an ATI or a Consortium because it is much more flexible. If there is the need of other participants, they can enter and we avoid the too much bureaucracy. It's much more slim (Gamma-Net, Manager Sun Ltd).

The “network program” is a key element of the CR, and can be seen as a platform for the dialogue among the participating companies. Other important elements are: the strategic objectives; the rights and duties of each participant; the definition of roles and conducts and programming tools and checking the obtained results.

The CR is designed in order to help businesses work in the medium-long term, without having to give up their independence. The discipline regulates a form of inter-entrepreneurial collaboration in a contractual nature promoting new forms of cooperation, supporting and increasing in the business's competitive capacity.

This tool is not specifically targeted to SMEs, but it is a general tool of collaboration to be used by enterprises of any dimension. However the law is suited for SMEs, in fact helps them overcoming limitations due to their dimensions without causing them to lose independence, while also enabling them to collaborate with firms of different dimensions (Ferrari, 2010).

Thanks to this tool SMEs can cooperate on a specific project, focus on a specific task, improve efficiency, organize innovation activities held by actors from several knowledge fields, improve relation with clients, suppliers, research institutes, and share economic and financial capacity.

Last but not least, the CR continuously enhances and valorizes “territories”, especially for the Italian context, where social capital is located, in terms of production and knowledge sharing (Rullani, 2013). For example, the CR both integrates positives district logics and eliminates some important limitations of the same, re-launching it towards a new modernity.

As stated by Ricciardi (2013), “collaborative networks should be a key priority for the districts: ‘overflowing the boundaries of localism and broadening the vision has to be an important target for growth’. The district, can be the basis through which new and wide networks are created”.

Stable networks, arising from a CR can transform the industrial districts in open systems to non-local processes and skills. It opens the district to external expertise, often integrated to those available in the territory, reorganizing them and meeting the challenges of globalization. District firms have the opportunity to implement networks that are more stable, better governed and more extended (more cross-sectorial and more cross-territorial).

In turn, districts give to the “new” networks (formalized by contracts) their precious heritage of social capital (trust, commitment, learning) and specific synergies and skills.

Currently, one-fifth of the manufacturing firms participating to CR comes from a district unit (Centro Studi Unioncamere, 2013). In addition, the CR arising from the districts shows a greater commitment for “cross-sectoriality”: 64.4% of them are made up of companies that are specialized in different macro-economic sectors (2nd Observatory Intesa Sanpaolo).

Negotiations

During the negotiations stage, “the parties develop joint (not individual) expectations about their motivations, possible investments, and perceived uncertainties of a business deal that they are exploring to undertake jointly.” (Ring & Van de Ven, 1994, p.97). This stage creates the antecedents and sets the ground for the subsequent commitment in a shared initiative. Parties argue and debate over the possible terms and conditions of the potential relationship, understanding opportunities and assessing risks. Formal bargaining

is sided by socio-psychological sense making. In this process, social dimensions like trustworthiness, reputation, reliability play an important role moderating the relationship between the negotiation stage and the commitment one. As seen before, national culture is one of the most important antecedents of these social dimensions.

Through the dialogue, then you realize that there are real opportunities that can be managed together, and which otherwise could not be managed, and so in this way you start to have an inclination towards collaboration (Beta-Net, Owner Two Ltd).

Not by chance, most CRs are born within existing systems of relationship, such as industrial districts, industrial associations, other groupings (Gretzinger & Hinz, 2010).

Existing relationships in the Apulia Mechanical District and in the local industrial association helped the creation of the network and its formalization through the CR. (Beta-Net, Network Manager)

Commitments

At this stage, we see how a collaboration is institutionalized, trying to achieve the most appropriate balance between formal and informal processes (Ring & Van de Ven, 1994).

Formalizing a collaboration is important, first for the purpose of enforceability against third parties and also for the recognition of the network by the various stakeholders who contribute to the creation of knowledge and its transformation into value.

With regards to internal relationships, the contract acts as a control function. In this case, the contract complexity must take into account the level of confidence (and, therefore of commitment) that has developed between the parties.

Normally the trust has been seen as a substitute for formal contracts, able to gradually reduce opportunistic behaviour making collaborative processes (Gulati, 1995) faster and more flexible (sometimes via a “handshake”).

In addition, trust helps reducing the costs related to contracts that, may give rise to mistrust and even the fear of preserving their independence and their competences (Macaulay, 1963). All these aspects are carefully taken into account by the Italian SMEs.

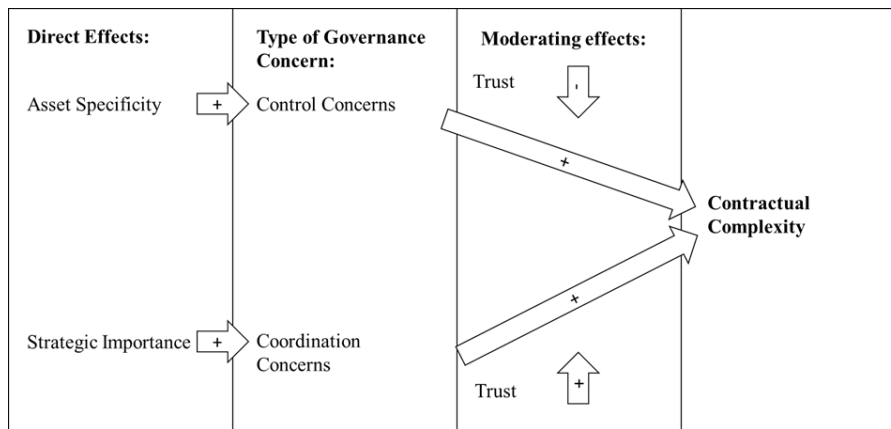
However other scholars, have pointed out that such substitution is not possible at all. With their study, Poppo and Zenger have shown that as the collaboration takes place and the investment in assets become more specific (Asset Specificity), the degree of complexity and level of detail in the contract tends to increase.

Though, for other scholars (Loasby, 1998; Foss, 1997) considering the internal and external complexity of enterprises, the coordination would assume even greater importance for the control: “while opportunism is significant, the problems and opportunities of developing and coordinating knowledge deserve priority” (Loasby, 1998).

Gulati, Wohlgezogen and Zhelyazkov (2012, p.537) define the coordination as the “the deliberate and orderly alignment or adjustment of partners’ actions to achieve jointly determined goals. Coordination is an outcome that can be characterized by efficiency, the relative cost of designing and operating coordination mechanisms and, by effectiveness, the degree to which coordination efforts actually produce the desired alignment or adjustment of action. Coordination typically involves the specification and operation of information-sharing, decision-making, and feedback mechanisms in the relationship to unify and bring order to partners’ efforts, and to combine partners’ resources in productive ways”.

As stated by Mellewigt, Madhok, and Weibel (2007), the contract can be a strategic tool for coordination, that if coherently used with the need of control, it can produce a competitive advantage for the firms. According to these scholars, its clauses can precisely enumerate the tasks to be accomplished, define procedures to be used and lay out quality standards to be fulfilled. On the other hand, contracts can specify the decision rights in IORs and may structure communication flows in a decisive way. For example, contracts may prescribe information duties, conflict resolution procedures and boundary departments.

Trust is itself an important resource of coordination, especially when in time it develops a strong collective identity. On the other hand, relations supported by a growing confidence, will evolve becoming more interdependent and intricate, and there will be a greater need for coordination. As a result, it will increase the complexity of the contract (see figure below).



Source: Mellewigt, Madhok, & Weibel, 2007

Figure 2 Trust and Contractual Complexity

The issues previously discussed are fully reflected in the high level of functionality and flexibility of the CR that for the latter can be considered as a “work in progress” supporting various networking needs.

The formalization through the agreement is important for the visibility and collaboration with those third parties that are essential in achieving the network objective: business partners, customers, suppliers, consumers, citizens with whom it is possible to co-produce value; trade associations, chambers of commerce and districts that are real incubators of relationships needed for signing the CR, as well as a key factor for dialoguing with other actors (Gretzinger & Hinz, 2010). Universities, fundamental supporting institution, with their training activities, research centres and technology transfer; banks and venture capital funds, which act as financial advisors for the internal network projects and accessible solutions for customers; public administrations, who have an burning duty of encouraging this tool in an innovative way.

As already noted, the CR was born as a free, voluntary and convinced aggregation among entrepreneurs. Therefore, the network will continue to grow when there will be a high level of confidence and commitment. Thanks to its flexibility, the tool allows to quickly fulfil the changing control needs of occurred in the network. The participating companies will be able to easily modify it by inserting new references to clauses or regulations governing the internal conduct.

The CR assumes a significant strategic value when it is framed as an instrument of coordination. Through the objectives and the program, the cooperation between the

parties is institutionalized. In fact it makes the relationships socially embedded by infusing them with norms and values that permit them to be reproduced and perpetuated (Ring and Van De Ven, 1994; Berger and Luckmann, 1966). In this way, in a sensemaking view, it will foster a higher sense of belonging and the network will become increasingly seen as a collective construct, result of an intended action from the participants.

The companies knew each other before the CR: the tool did not bring to the collaboration. Rather, the collaboration has led to the CR, proving to be an effective way to formalize the existing relationships. To this day the contract has worked in giving a unified vision for this project and to the members who participated in the development (Alfa-Net, President of the CR).

Apart from outlining a vision useful for commitment, the contents of the CR specify and explain firms what these are: the objectives; the roles and responsibilities for each in relation to the objects; mechanisms of integration; mutual expectations; standards and languages required in order to best operate; the communication channels available, etc. (Mayer & Argyres, 2004).

Feedback transparent channels and the concept of the CR as a “repository of knowledge” will be useful for understanding the possible errors and, through the learning process, from start to redesign themselves to better understand the dynamics of the network (Argyres & Mayer, 2007).

The CR needs to be focused on a strategic focus, along with a clearly defined program.

The specific aim of the CR in terms of waste collection system, is focused on the “supply, installation, maintenance of an experimental monitoring system for the waste collection system, and supply of electronic keys that are attached to this experimental system” (Alfa-Net, President of the CR).

The aim of Gamma-Net is in the creation of an innovative organizational model designed to create strategic and operational synergies between the members. The participating companies intention is to increase their competitiveness through the development of communicative activities, capturing potential business opportunities (Gamma-Net, Cloud Inc.).

In accordance with its competences, each participating company must keep in mind its tasks, rights and obligations within the network.

Therefore, institutionalization is also used to “transform informal commitments into organizational routine” (Ring and Van De Ven, 1994; Berger and Luckmann, 1966; Zucker, 1977). Other critical points regard the identification of the structure and governance, and the choice of its members. For the latter, the match of skills and knowledge coming from different sectors can promote the development of technological innovations in totally new areas (Russo, 2011). In this sense, the present discipline of the CR allows the participation of companies that have different but complementary skills within the same industry or firms coming from different industrial sectors. As already mentioned, it is expected the participation of cooperatives and academic spin-offs. On the other hand, if not properly managed, belonging to different sectors and regions can represent a major obstacle for the network activities.

The crucial point is to put together the right companies in order to collaborate in an efficient way. (Alfa-Net, Owner Triangle Ltd).

Probably one of the errors of setting up the CR was to involve firms of different sizes. Large companies already carry out most or part of the typical activities of the sector. So it becomes difficult for other smaller businesses to make a significant contribution. We also had problems in relation to the willingness to cooperate from the most large companies. On the other hand, however, there were also small companies that were not structured: they were simple engineering consultants. Other realities instead had a purely speculative philosophy. The network would have had different perspectives if it had put together companies of the same size but s aimed at specific segments of the industry and market (Gamma-Net, Manager of Moon Ltd).

The actors who formed the network were overly presumptuous: no one has taken the lead or involved the partners in projects going beyond the first steps taken (Gamma-Net, Manager of Moon Ltd).

In structural terms, the relations must be based considering that the “tie strength ensures social capital and solidarity benefits that are important for the tacit characteristics of innovations, that is, knowledge recognition and realization” (Rost, 1994; Coleman, 1990). At the same time, the inclusion of “broker” companies will be important to access information and new opportunities also distant from each other (Burt, 2000; Ahuja, 2000; Rost, 1994; Capaldo, 2007).

However given that the contract is primarily based on trust, commitment and independence, governance mechanisms should be appropriately set in order to ensure a

democratic participation for network choices and to limit the authoritarian pressures of those firms that, over time will take on a leadership role or they will ensure rent due to property rights or bottleneck resources (Kogut, 2000). On the other hand, leadership is important for guiding complex networks (Muller-Seitz, 2012).

However, the network has come to face a difficult situation. But it was not an issue of trust. It was due to the lack of an “enabling force”, someone who would bring the network to meet and manage opportunities. From what our experience shows, networks that are able to overcome these difficulties are those that have a leader. There must be a person who drives the activity of the network. From the operational point of view, being able to coordinate all of these companies, even geographically distant, was a huge obstacle. I can affirm then that the presence of a strong leader, makes the network work better, especially in networks like this, that bring together 11 different realities, including Ltd, Inc., Lp.(Gamma-Net, Manager of Sun Ltd)

For innovative purposes the network’s governance structure for selecting problems and solutions could be flat or hierarchical. Following the approach of Pisano and Verganti, (2008), you will have networks associated to “innovation Consortiums”, which operate like a private club, with participants jointly selecting problems, deciding how to conduct work, and choosing solutions. In this clubs, the expertise of all participants is needed and firms can share the resulting intellectual property with the other participants. Other networks, could be organized as “innovation Elite circle” in which one company selects the participants, defines the problem, and chooses the solutions.

Executions

In the executions stage, “the commitments and rules of action are carried into effect” (Ring & Van de Ven, 1994, p.98). SMEs can go beyond the simple dyadic relation and experience the importance of synergies, achieved within the CR and with external partners too. Indeed, “a firm grows by being a player; it does not become a player by growing” (Powell, Kogut and Smith-Doerr 1996).

The CR provide SMEs with a set of opportunities that they would not have if taken individually. They can manage an higher complexity in terms of activities and knowledge. In particular, the competitive advantage fostered by the CR consist in the following elements:

1) Breaking the “size issue”, that chokes Italian SMEs development. Small businesses can grow (especially in qualitative terms) and follow development paths that were inaccessible before because of their size limits. This growth happens without takeovers or mergers, which are far from the Italian entrepreneurial culture. Firms’ independence is safe, and the relational and social capital accrue.

2) Synergies in the use of resources reduce costs. SMEs can adopt technological solutions (e.g. advanced ICT systems of “social enterprise”), that were too costly for a single business.

3) SMEs can take internationalization paths. They can enter in touch with internationalized partners and take advantage of established global relations to build new ones (Johanson & Vahlne, 2009). The CR acts in global markets as a unique player, with an increased bargaining and competitive power. Moreover, it enables processes of cognitive internationalization (Rullani, 2006), raising the exchange of flows of knowledge and resources with international firms.

4) It promotes trans-sectorial and trans-territorial dynamics, which drive innovation processes. Firms can identify and create new opportunities in emergent industries and/or markets. They can innovate in an open way, or following design-driven logics, creative new meanings for their products (Verganti, 2009). Today design does not concern only the physical requirements of products, but it becomes “a creative conciliation of functionality and form, a tool to communicate values and contents, esthetic element and brand” (Baglieri & Loiacono, 2009)

5) Increased bargaining power and better relationships with stakeholders eventually determine a better relationship with the local context. This creates new social capital. In particular, the CRs ease access to financial resources and credit, allowing SMEs to invest in their regions.

6) CRs overcome some well-known limitations of the district-based networking model, allowing a modernization of this traditional dimension.

7) CRs have access to fiscal benefits and incentives, and institutions at regional, national and European level give financial support to firms adopting this new tool.

Working through a network you can do something that alone you could not afford. We do not have expertise in the field of electronics, software, or plant design. The network is the only way for small companies like us to work not only on behalf of third parties, but to

develop a new product and have direct contact with the market” (Alfa-Net, Owner of Triangle Ltd).

The network allows us to do things that otherwise we could not do that alone. We believe the combination of our competences must be greater than the sum of our know-how, thanks to a multiplier effect. The shared competences are the basis to find our points of contact. On the competences you optimize business opportunities, investment evaluations and internationalization strategies” (Beta-Net, President of the CR).

Thanks to the network we can have various specializations that otherwise would be impossible to have. (Alfa Net, Manager of Circle Ltd)

Being part of a network is the only way to approach certain customers, even if we make innovation since 8 years, we would never be able to create our system without being an enterprise network. This because the mechanical and business skills that were necessary would have been unknown to our reality, so being in a network was an imperative. (Alfa-Net, Owner of Square Ltd)

We made an initial agreement as a network with a Swiss multinational, which operates worldwide in Spain, Singapore, United Arab Emirates. (Alfa-Net, President of the CR)

The CR is a tool that allows us to operate on international markets. If we go abroad as a company with ten employees has an effect, but if we go as a group with two-hundred employees has another effect since we have a business plan of relations that none of the companies pursued before entering in the CR, such as relations with trade associations.(Beta-Net, President of the CR)

If you have a small size company, you are seen as a simple supplier and you find yourself at the bottom of the chain. (Beta-Net, Owner of Two Ltd)

We can obtain higher results thanks to knowledge sharing. We reach this thanks to research and development. The CR is essential for attracting other actors like Universities, think tanks, and to enter into new and high-tech industries like aerospace, defence, oil&gas and energy. (Beta-Net, Manager of the CR)

From the point of view of appearance, the network has guaranteed a greater visibility, both in institutional terms and media.(Gamma-Net, Manager of Sun Ltd)

Assessments

As stated before, the proposed adaptation of Ring and Van de Ven's model follows a cyclical logic, depicting a looping process of network creation and enactment. Such circuit triggers a process of learning *within* and *across* the Contratto di Rete (Anand & Khanna, 2000). The first type of learning directly depends on the access to new knowledge: multi-sectoral CRs have amplified chances to increase their innovative capacity, as they can combine and coordinate diverse sets of capabilities and skills. This learning have a significant impact on competitive performance.

The Contratto di Rete importance is related to the second type of learning too. "In order to carry out a business deal, a cooperative inter-organizational relationship may need to remain in effect for a long term. With time, misunderstandings, conflicts, and changing expectations among the parties are inevitable, and these factors can provide cause for rethinking the terms of the relationship" (Ring and Van de Ven, 1994., p.98). Once negotiated the conditions of the partnership and committed formally, partners execute the program shared in the CR. During all these overlapping stages, a continuous process of assessment evaluates the transactions and the relationships built and enacted in the CR. If they are not carried out in an equitable and efficient manner, partners will take corrective measures by re-negotiating the terms of their alliance, and/or reducing their formal commitment through less demanding requirements of their Contratto di Rete. If their alliance provides good performances, proving its effectiveness (Snow, Miles, & Coleman, 1993), enhancing partners' competitiveness, innovation capacity and internationalization processes, they may decide to improve their commitment, establishing, as an example, the so called "Rete Soggetto".

This continuous progression of assessment and adjustment is essential for the *across* alliances learning process, which accrues the networking or relational capability of the firm (Anand & Khanna, 2000). Contratto di Rete's flexible nature is convenient with this meta-learning dimension, encouraging the individualistic or family-centered Italian entrepreneur to learn how to open his business to partners, how to manage relationships, how to build his own social capital (Nahapiet & Ghoshal, 1998). The accrual of the relational capability is obviously a process that goes by during the whole networking activity, but we decided to put it after the execution stage and before the new negotiation stage in our model because that is the moment where all the new knowledge resulting from the networking activity is gathered and systematized in new relational capability.

5 Conclusion

Our study addresses a new pattern of networking for Italian SMEs that goes beyond the quantitative increase in size. They need to integrate the relationship growth and the capability growth, adopting an holistic approach that is focused on networking.

The inclination and the ability of networking is influenced by entrepreneurs' national culture and social values.

For the Italian case, many studies (Hofstede, Hofstede, & Minkov, 2010; Del Junco & Bràs-dos-Santos, 2009) show that Italian entrepreneurs are individualistic and prone to autonomy. Collaboration occurs when negotiated and when is able to create relationships which can be useful for business purposes. As a consequence, Italian entrepreneurs prefer local "natural" networks rather than mergers or acquisitions. These "natural" networks produce operative flexibility and knowledge sharing related to the local social capital. Many SMEs (including the 40% of Italian manufacturing companies) raise from industrial districts, which has always been significant for their international competitive success.

Notwithstanding, current innovation and internationalization processes are more and more at the crossroad of diverse forms of knowledge. So, they require the development of networks which are highly designed, governed, large, cross-sectorial and stable.

In the Italian context, we advance that the CR can create networks with the above mentioned features, considering at the same time the idiosyncrasies of the Italian entrepreneurs. The law regulates only the essential frame, giving the possibility to the companies to complete it with contents and details in accordance to strategic and operative needs, maintaining their autonomy.

Moreover, our findings show that the CR is effective for the competitive performance of the involved firms. Considering innovation, the tool allows firms to integrate their competences (as showed by Alfa-Net and Beta-Net cases) and connects technology development to market needs (Alfa-Net case). In terms of internationalization, the CR provides the participation in international networks, and speeds up the global relational growth (Beta-Net case). Nevertheless, when the strategic focus is missing or is not well defined, and the partners are not selected in a proper way, the CR fails to deliver results (Gamma-Net case).

The CR was born to support in a long term perspective cohesion, coordination and learning among the partners in terms of innovation, internationalization and marketing, fulfilling goals difficult to achieve alone. Our contribution is twofold: first, we show that

CR is an innovative networking tool convenient with the cultural characteristics of the Italian entrepreneur; second, the CR allows the creation of networks that drives superior competitive performances for the Italian SMEs.

Our study is exploratory and calls for an empirical and quantitative deepening. This is because the CR is still a recent tool and not enough time went by since its introduction in order to make relevant quantitative studies, especially in financial terms. In particular, it would be of interest to study the use of this tool in various industries, focusing on cross-sectorial and cross-territorial dynamics, as well as collecting more quantitative data.

We provide implications for both academia and practitioners (managers, entrepreneurs, public administrators) showing that there is a new way for networking in Italy, driven by the Contratto di Rete.

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Intellectual capital and performance – Empirical findings from Finnish firms

Henri Inkinen*, Aino Kianto, Mika Vanhala,
Paavo Ritala

School of Business
Lappeenranta University of Technology
P.O. Box 20, FI-53851 Lappeenranta, Finland

* *Corresponding author*

Structured Abstract

Purpose – Organizational performance is increasingly grounded on knowledge-related issues. The seminal academic discussions addressing this phenomenon revolve around the concept of Intellectual Capital (IC) (e.g. Edvinsson & Malone, 1997; Sullivan, 1998). IC is typically divided to human, structural and relational capital assets possessed by an organization (e.g. Bontis, 2001; Guthrie, 2001). We expand this focus further on renewal capital (e.g. Kianto et al., 2010) entrepreneurial capital (e.g. Erikson, 2002) and trust capital (Mayer et al., 1995). There has been inconclusive evidence on the performance outcomes of possessing IC in firms. In general, IC has been seen to increase firm's performance in various aspects, but the evidence is mixed and based on various types of measures (e.g. Bontis, 1998; Chen et al., 2006; Subramanian and Youndt, 2005; Tovstiga and Tulugurova, 2007). Therefore, to understand better the role of IC in firms' value creation, we will analyze here empirically the effect of different IC categories on performance measures using psychometrically robust scales developed to capture the whole essence of the phenomenon. Our purpose is to provide detailed evidence on the different performance implications of IC categories in firms, and thus bring about new knowledge to the field.

Design/methodology/approach – Our results are based on a survey data, collected in Finland during 2013. The data consist of 262 responses from firms with at least 100 people employed. We analyze seven different categories of intellectual capital, and examine their influence on various market and innovation performance measures. The used measures are based on multiple-item scales, developed on basis of earlier research, as well as including new measures developed by the authors. The Partial Least Squares (PLS) was used for the analyses by first assessing the reliability and validity of the measurement models and then the structural models to test our hypotheses.

Originality/value – In this study, we examine the firm-level performance outcomes of intellectual capital. We utilize a broad set of measures for IC, including six categories of human, relational, structural, renewal, entrepreneurial, and trust capital. The first three categories are well-established and often utilized conceptualizations, while we suggest here that the latter three cover important facets of IC that should also be analyzed to get

an overarching picture of the phenomenon. Our results show that the various IC categories have different implications for firms in terms of their performance.

Practical implications – The results of this study help managers in firms to better understand the potentially best-performing categories of IC. Moreover, the results provide key performance outcomes for IC, which can be utilized to measure the return-on-investment of IC initiatives accurately and reliably. Thus, our findings provide the managers with a sound decision making tool regarding the investments on IC.

Keywords – Intellectual Capital, Knowledge Management, Value Creation, Organizational Performance

Paper type – Academic Research Paper

1 Introduction

Organizational performance is nowadays grounded largely on intangible assets, i.e. intellectual capital (IC) (Drucker, 1993; Grant, 1996; Edvinsson and Malone, 1997; Stewart, 1997; Sveiby, 1997). Edvinsson and Malone (1997) suggested already more than fifteen years ago that corporate intellectual assets clearly outweigh the tangible value, and a study by the World Bank (2005) found that intangible capital accounts as much as 77% of total wealth worldwide. Knowledge assets have also been linked to companies' ability to innovate (Subramaniam and Youndt, 2005; Youndt et al., 2004), and to compete (Stewart, 1997; Teece et al., 1997; Zack, 1999) in the modern knowledge economy.

Early conceptualizations in the late 1990s divided IC mainly into human-centred, organization-centred and relationship-centred assets (Edvinsson and Malone, 1997; Nahapiet and Ghoshal, 1998; Roos and Roos, 1997; Stewart, 1997; Sullivan, 1998; Sveiby, 1997; Bontis, 1998). Accordingly, the majority of studies consider that IC consists of three elements, i.e. IC stocks: human capital, structural capital and relational capital. However, we consider that there are further dimensions of IC that have not been generally addressed – renewal capital (e.g. Kianto et al., 2010), entrepreneurial capital (e.g. Erikson, 2002) and trust capital (Mayer et al., 1995). We also suggest that these IC stocks that can be utilized to measure organizations' IC and thus help us to gain more holistic understanding of the phenomenon.

Generally speaking, the research suggests that IC has a positive and significant influence on firm performance, but the evidence is mixed and based on various types of measures (e.g. Bontis, 1998; Chen et al., 2006; Subramaniam and Youndt, 2005; Tovstiga

and Tulugurova, 2007). Thus, the purpose of this paper is to shed more light on the phenomenon by empirically analyzing the effect of different IC stocks on firm performance in terms of market and innovation performance.

2 Intellectual capital stocks

IC can be defined as "the possession of the knowledge, applied experience, organizational technology, customer relationships and professional skills that provide a company with a competitive edge in the market" (Edvinsson and Malone, 1997). According to other definition by Stewart (1997), IC stands for the information, intellectual property, intellectual material, knowledge, core technique, customer relationship and experience that can be utilized to make company rich. Further, Sullivan (1998) considers that IC consists of "knowledge-based resources that contribute to the sustained competitive advantage of the firm".

The majority of studies in the field consider that IC consists of three elements: human capital, structural capital and relational capital. Thus it has been seen to include the human skills, expertise and motivation; the structural features of production embedded in organizational processes, systems, solutions, databases, patents and IPs; and the value embedded in the network of relationships. In addition, we suggest that there are also four other elements that could be seen as parts of IC: "renewal capital" in terms of innovative solutions, products and services available for the firm (e.g. Kianto, 2008) "trust capital", i.e. the trust embedded in its internal and external relationships (e.g. Mayer et al., 1995); and "entrepreneurial capital" i.e. the competence and commitment related to entrepreneurial activities in the organization (e.g. Erikson, 2002). Moreover, we decided to split relational capital into "internal" and "external" categories, because the two categories relate to relationships with different stakeholders. Traditionally relational capital only refers to an organization's relationships with external parties, but in our model, we separate intra-organizational relationships as a facet of IC of its own. This broad 7-partite definition of intellectual is based upon a wide understanding of knowledge, as not only the explicit outcomes of knowledge-intensive work such as patents, formulae and actualized products, but also as the tacit potential of organizational actors to e.g. flexibly react to unexpected situations and rapidly changing customer demands.

3 Intellectual capital as a firm performance driver

The majority of the empirical literature seems to agree that the IC stocks are interlinked by nature and influence firm performance the most when combined. Thus, it is seen that the firms which possess high overall IC gain also better results in terms of financial performance (Youndt et al., 2004); new product development performance (Chen et al., 2006); new product sales performance (Chien and Chao, 2011); knowledge productivity (Huang and Wu, 2010); amount of intellectual property and related firm performance (Namvar, 2010); process flexibility (Menor et al., 2007); and innovation (Wu et al., 2008).

The relative impact of various IC stocks on company performance has been addressed in a number of studies. The results gained have not been unanimous. There are some studies that have found human capital to be the most important performance driver. It has been found that organizations with high amounts of human capital tend to achieve also higher export intensity (Bontis et al., 2007); innovation performance (Cabello-Medina et al., 2011); and competitiveness (Tovstiga and Tulugurova, 2007). In addition, Hormiga et al., (2011) noticed that human capital was a powerful predictor of the success of young enterprises.

According to some other studies, the relationship between structural capital and firm performance is the most significant among all of the IC stocks. It is stated that structural capital has a positive influence on new product development (Aramburu and Saenz, 2011) and innovation performance (Delgado-Verde et al., 2011a). Furthermore, Yang and Lin (2009) studied IC in the Taiwanese healthcare industry, and found that organizational (structural) capital had almost two times the explanatory power over firm performance compared to human and relational capital.

Relational capital has also been touted as a crucial factor that influences firm performance. Bozbura (2004) found that relation(al) capital of firms was positively and significantly related to the market-to-book value of firms. In addition, relational capital has been discovered to positively affect also cost-leadership and differentiation advantage (Čater and Čater); radical innovations (Delgado-Verde et al., 2011b); and financial and operating performance (Huang and Hsueh, 2010).

In addition to the three traditionally considered IC stocks, we suggest that also renewal capital, entrepreneurial capital and trust capital are likely to function as important assets of the firm that increase its performance.

Renewal capital represents the resources of the firm for renewing what it knows and can do. It consists of the ability of the firm to acquire new information, develop skills and to learn. An organization with high renewal capital, sometimes also called innovation capital (Chen et al., 2004), is able to build on previous knowledge and to generate new knowledge (Madinios et al., 2010), as well as to develop new products, services and innovative ideas on a continuous basis (Tseng and Goo, 2005). The organizational learning literature underlines that the main mechanism for building new knowledge assets is learning (Argyris, 2002), and from this perspective renewal capital as an intangible resource can be characterized as the actualized learning capability of the firm. It has been found that the capacity to learn and to acquire new knowledge by a firm is strongly related with several aspects of firm performance. E.g. Nonaka and Takeuchi (1995) have argued that knowledge creation is a key factor in enabling company competitiveness and sustained performance. Andreeva and Kianto (2011) found that knowledge creation was the key explanatory of firms' innovation performance. In a similar vein, the dynamic capabilities approach (Teece et al., 1997; Eisenhardt and Martin, 2000) argues that the ability of a firm to update and modify its knowledge and capabilities is important for sustaining competitiveness, especially for in conditions of turbulent and hyper-competitive market environments. Edvinsson (2002) has even argued that as organizations have to survive in turbulently and unexpectedly changing environments, renewal capital has become the most important facet of IC (Edvinsson, 2002).

Whereas renewal capital is about the firm's ability to learn and to acquire new knowledge and skills, entrepreneurial capital is related with the entrepreneurial behavior exerted by organizational actors. Concerning entrepreneurial capital, i.e. the courage, initiative-taking and pro-activeness in an organization, there is some evidence from previous research that these qualities increase organizational performance (Hughes and Morgan, 2007). E.g. this kind of orientation is likely to increase innovation performance by allowing more self-directed development activities in the firm. Risk-taking, recognizing new business opportunities and ability to make bold decisions will also help the organization to produce and to prototype innovative ideas. An organization with high entrepreneurial capital will be more competitive through having employees that are willing and empowered to make fast localized decisions and to show initiative in solving problems.

On trust capital side, there is evidence among literature that it has powerful explanatory power over organizational performance. Mayer et al. (1995) stated that trust contributes to organizational cooperation and collaboration; Costigan et al. (1998) found out that high trust among colleagues generated an environment that supported calculated risk-taking and entrepreneurial orientation; Blomqvist (2002) wrote that trust increased the efficiency and effectiveness of communication and knowledge-creation processes; Zeffane and Connell (2003) concluded that organizational efficiency is possible only when the actors work together in a climate of positive trust; Ellonen et al., (2008) noted that trust added to the efficiency, effectiveness and innovation performance of organizations which rely heavily on their interpersonal and intra-organizational collaboration; and Chen and Hung (2010) established that trust generated improved resource exchange and production innovation.

Based on the preceding argumentation, we posit the following sets of hypotheses concerning the performance impacts of the various types of IC stocks:

- H1: Renewal capital → Market performance
- H2: Entrepreneurial capital → Market performance
- H3: Human capital → Market performance
- H4: Structural capital → Market performance
- H5: Internal relational capital → Market performance
- H6 : External relational capital → Market performance
- H7: Trust capital → Market performance

- H8: Renewal capital → Innovation performance
- H9: Entrepreneurial capital → Innovation performance
- H10: Human capital → Innovation performance
- H11: Structural capital → Innovation performance
- H12: Internal relational capital → Innovation performance
- H13: External relational capital → Innovation performance
- H14: Trust capital → Innovation performance

4 Research design

4.1 Sample and data collection

We tested the hypotheses with a survey data that was collected in Finland in 2013 by means of a structured questionnaire, using key-informant technique. The initial population comprised a cross-industry sample of Finnish companies that included all firms with at least 100 employees. The Intellia database was utilized in identifying the

companies. A total of 1523 companies were considered suitable for the initial sample. All the eligible firms were contacted by external research company by telephone and the person in charge of the human resources were asked to respond to the questionnaire. Confidentiality was emphasized and a summary of the results was promised to the respondents. Out of the 1523 companies 262 responses were received, representing a response rate of 17.2 per cent (262/1523). Most of the respondents held position such as a HR director or manager (77.9 %), other director or manager (8.8 %) or managing director (6,9 %), indicating their sufficient expertise and key position regarding the issues of intellectual capital and performance.

4.2 Measures

Independent variables. IC stocks were measured by scales developed mostly by the authors. The internal relational capital and human capital scales got inspiration from Yang and Lin (2009) and the scale for entrepreneurial capital is based on work by Hughes and Morgan (2007). The 23 items covered seven IC stocks: renewal capital (3 items), entrepreneurial capital (4 items), human capital (2 items), structural capital (3 items), internal (3 items) and external (3 items) relational capital, and trust capital (5 items). All of the measures were based on a five-point Likert scale (1-strongly disagree, 5-strongly agree). See Appendix 1 for the measures and the wording of the items.

Dependent variables. Market performance was measured on a scale developed by Delaney and Huselid (1996) and a scale for innovation performance relied on work by Weerawardena (2003). Market performance (3 items) was covered by asking respondents to compare their company's success against other companies in its sector. For the innovation performance (5 items) respondents compared their company's success to the competitors' in terms of creating innovations or new operating methods. For both scales a list of different areas of performance were listed and the respondents rated these on a five-point Likert scale (1-very poorly, 5-very well). See Appendix 1 for the measures and the wording of the items.

Control variables. Three variables (firm age, sales and industry) were used as control variables to eliminate whatever effects might have had on market and innovation performance. Firm age was measured in terms of years since establishment. Sales was measured in 1000 euros, and industry was classified to eight categories.

4.3 Assessment of bias

The data relied on self-report measures, and therefore common method variance might have biased the findings. Common method bias is of particular concern when survey respondents are asked to fill out items covering both independent and dependent variables. We used Harman's one-factor test (Podsakoff et al., 2003) in order to assess the risk of such bias, and conducted a principal component analysis that incorporated all the items from all of the constructs. We investigated the solution in order to determine the number of factors required to account for the variance in all the items. The largest factor accounted for 28.3 per cent, which suggests that common method bias was not a concern.

5 Results

We used Partial Least Squares (PLS) for the analyses (version 2.0M3 of SmartPLS). The first step was to assess the reliability and validity of the measurement models. We then used the structural models to test our hypotheses.

5.1 Correlation analysis

Table 1 and 2 present the means and standard deviations, and provides correlation matrixes.

Table 1 Correlation matrix for market performance model

	Mean	SD	1	2	3	4	5	6	7
1. Market performance	3.46	0.64							
2. Renewal capital	3.52	0.66	0.291**						
3. Entrepreneurial capital	3.29	0.66	0.125*	0.572**					
4. Human capital	4.01	0.54	0.115**	0.466**	0.410**				
5. Structural capital	3.54	0.78	0.035	0.407**	0.282**	0.385**			
6. Internal relational capital	3.50	0.63	0.212**	0.432**	0.390**	0.376**	0.400**		
7. External relational capital	3.56	0.57	0.215**	0.353**	0.333**	0.221**	0.238**	0.274**	
8. Trust capital	3.96	0.51	0.372**	0.546**	0.481**	0.470**	0.372**	0.507**	0.468**

Notes: ** Correlation is significant at the 0.01 level; * Correlation is significant at the 0.05 level

Table 2 Correlation matrix for innovation performance model

	Mean	SD	1	2	3	4	5	6	7
1. Innovation performance	3.32	0.55							
2. Renewal capital	3.52	0.66	0.468**						
3. Entrepreneurial capital	3.29	0.66	0.330**	0.572**					
4. Human capital	4.01	0.54	0.200**	0.466**	0.410**				
5. Structural capital	3.34	0.78	0.164**	0.363**	0.307**	0.326**			
6. Internal relational capital	3.40	0.62	0.268**	0.339**	0.287**	0.274**	0.339**		
7. External relational capital	3.56	0.57	0.266**	0.353**	0.333**	0.221**	0.225**	0.273**	
8. Trust capital	3.96	0.51	0.383**	0.546**	0.481**	0.470**	0.315**	0.439**	0.468**

Notes: ** Correlation is significant at the 0.01 level; * Correlation is significant at the 0.05 level

As the matrixes show, there are significant correlations between the independent variables (i.e. IC stocks) and the dependent variables (i.e. market and innovation performance). This indicates and supports our expectations of interconnectedness between IC stocks and these two types of firm performance.

5.2 Measurement models

In order to test the measurement models we assessed the internal consistency as well as the discriminant validity.

Internal consistency. Measures of construct reliability (CR) and convergent validity represent internal consistency. According to the CR test, all the constructs showed a value above the threshold (0.7, adopted by Bagozzi and Yi, 1988) (see Appendix 1). In order to test for convergent validity we examined CR, the factor loading and Average Variance Extracted (AVE). Firstly, the loadings of all the items were high and statistically significant (see Appendix 1). This means that they were all related to their specific constructs, verifying the posited relationships among the indicators and constructs. Secondly, the AVE measure exceeded the cut-off (0.50, see e.g., Fornell and Larcker, 1981) for all of our constructs.

Discriminant validity. This indicates the extent to which any one construct differs from the others, and in assessing it the AVE should be greater than the variance shared between that construct and the other constructs in the model (i.e. the squared correlation between two constructs) (Fornell and Larcker, 1981). The constructs of our study fulfil this condition: in our two models (see Tables 3-4) the diagonal elements (AVEs) are greater than the off-diagonal elements in the corresponding rows and columns.

In sum, the model assessments gave good evidence of validity and reliability for the operationalization of the concepts.

Table 3 Discriminant validity for the market performance model

	1	2	3	4	5	6	7	8
1. Market performance	0.77							
2. Renewal capital	0.08	0.68						
3. Entrepreneurial capital	0.02	0.33	0.64					
4. Human capital	0.01	0.22	0.17	0.64				
5. Structural capital	0.00	0.17	0.08	0.15	0.70			
6. Internal relational capital	0.04	0.19	0.15	0.14	0.16	0.76		
7. External relational capital	0.05	0.12	0.11	0.05	0.06	0.07	0.80	
8. Trust capital	0.14	0.30	0.23	0.22	0.14	0.19	0.26	0.64

Notes: AVE associated with the construct is presented diagonally.
The squared correlations between constructs are presented in the lower left triangle.

Table 4 Discriminant validity for the innovation performance model

	1	2	3	4	5	6	7	8
1. Innovation performance	0.74							
2. Renewal capital	0.22	0.72						
3. Entrepreneurial capital	0.11	0.33	0.60					
4. Human capital	0.04	0.22	0.17	0.64				
5. Structural capital	0.03	0.13	0.09	0.11	0.65			
6. Internal relational capital	0.07	0.11	0.08	0.08	0.11	0.58		
7. External relational capital	0.07	0.12	0.11	0.05	0.05	0.07	0.80	
8. Trust capital	0.15	0.30	0.23	0.22	0.10	0.19	0.26	0.54

Notes: AVE associated with the construct is presented diagonally.

The squared correlations between constructs are presented in the lower left triangle.

5.3 Testing the research models

As Tables 5 and 6 shows, our research models could explain 20.5 and 18.5 per cent of the variance in market and innovation performance, respectively.

We estimated path models reflecting the posited relationships between IC stocks and both market and innovation performance in order to test the hypotheses.

In market performance model (see Table 5) only path estimates from both internal (H5) and external (H6) relational capital as well as from trust capital (H7) to market performance were as hypothesized. Internal relational capital ($B=0.165$, $p < 0.05$), external relational capital ($B=0.125$, $p < 0.10$), and trust capital ($B=0.211$, $p < 0.05$) each had a significant, positive impact on the market performance. Contrary to our hypotheses, renewal capital ($B=-0.145$, $p < 0.05$), human capital ($B=-0.111$, $p < 0.05$) and structural capital ($B=-0.111$, $p < 0.05$) had a negative impact on market performance.

Table 5 Results of testing the market performance model

Path	Path coefficient	t-value
<i>Path</i>		
Renewal capital → Market performance	-0.145*	1.762
Entrepreneurial capital → Market performance	0.05 n.s.	0.840
Human capital → Market performance	-0.111*	2.113
Structural capital → Market performance	-0.111*	1.801
Internal relational capital → Market performance	0.165**	2.446
External relational capital → Market performance	0.125 ^a	1.584
Trust capital → Market performance	0.211*	1.900
R^2		.205

Notes: *** Significance < 0.005; ** Significance < 0.01; * Significance < 0.05; ^a Significance < 0.10

For the clarity reasons results for the control variables are not presented

In innovation performance model (see Table 6) both internal (H12) as well as external (H13) relational capital were as hypothesized. As expected, the effects of internal ($B=0.123$, $p < 0.05$) and external ($B=0.280$, $p < 0.05$) relational capital on innovation

performance were significant and in the predicted direction. Again some of the paths were contrary to our hypotheses. Human capital ($B=-0.134$, $p < 0.05$) had a negative effect on innovation performance. In addition, for structural capital there was a statistically significant (at 10% level) impact to innovation performance, but the strength of that was so low ($B=-0.086$) that in practice it has no effect.

Table 6 Results of testing the innovation performance model

Path	Path coefficient	t-value
<i>Path</i>		
Renewal capital → Innovation performance	-0.034 n.s.	0.466
Entrepreneurial capital → Innovation performance	0.052 n.s.	0.683
Human capital → Innovation performance	-0.134*	2.290
Structural capital → Innovation performance	-0.086 ^a	1.544
Internal relational capital → Innovation performance	0.123*	2.013
External relational capital → Innovation performance	0.280*	2.270
Trust capital → Innovation performance	0.087 n.s.	1.104
R^2		.185

Notes: *** Significance < 0.005; ** Significance < 0.01; * Significance < 0.05; ^a Significance < 0.10
For the clarity reasons results for the control variables are not presented

6 Conclusions

This paper examined the impact of intellectual capital on the organizations' market and innovation performance. Especially, this study concentrated to evaluate the performance enhancing influence of the three traditional IC stocks, namely human, structural and relational capital, as well as four IC stocks that the authors considered as important additions to achieve an overarching measurement model of the phenomenon. In contrast with the majority of the existing IC literature, our results demonstrated that most of the IC stocks are not directly related to organizations' market and innovation performance.

However, the results were mixed. As hypothesized both internal and external relational capital had a positive and significant influence on firms' market and innovation performance. Thus, it can be stated that both internal and external collaboration and understanding between the stakeholders are able to generate value to the companies. This result follows the findings from Delgado-Verde et al. (2011b), who found out in their study that both external relational capital and internal social collaboration had a positive influence on radical innovations, with external relation capital being more significant of the two. Similarly, Čater and Čater (2009) established that firms with more relational

capital were more competitive than those with less relational capital, and Huang and Hsueh (2010) accompanied that relational capital not only had a direct influence on firm performance but it also mediated the influence of other IC stocks. Relationships function as channels for flows of intangible and tangible resources. Especially relationships with extra-firm parties can bring new knowledge and insights into the firm, allowing for novel constellations of ideas and collaborations, as argued by the literature on open innovation (e.g. Chesbrough, 2003; Huizingh, 2011).

Contrary to our hypotheses, renewal capital, human capital, and structural capital had negative impacts on market performance, and human capital had a further negative effect also on innovation performance. According to Kianto (2007), possessing intellectual assets does not singlehandedly facilitate improved organizational performance, but the other equally important factor is what the organization does with it. In other words, organizations should use proper management methods, i.e. knowledge management practices, to leverage on the IC stocks. For instance, good supervisory work boosts the employees' willingness to share knowledge and innovate risks, whereas bad management can leave the employees ineffective and without aspiration. Therefore, we suggest that comprehensive understanding of IC stocks' influence on firm performance requires that knowledge management practices are also analyzed.

One limitation of this study is that the data was collected only from Finland. Another limitation is that we only examined the direct singular impacts of the IC stocks on performance. It may well be that IC stocks function in interaction with each other to produce performance outcomes. The further examination of the IC asset bundles in terms of their optimal combinations is a task that is left for future research endeavors. Finally, the performance metrics used were based on self-evaluation by company executives, leaving space for doubt in terms of their validity. This calls for further studies utilizing objective performance assessments as dependent variables.

This paper contributes to the theoretical discussion by identifying and demonstrating the viability of three novel types of IC, which have been relatively neglected by the emerging standard in the field to divide IC into the three elements of human, structural and relational capital. In addition, renewal capital was divided into two distinct aspects, addressing firm-internal and firm-external relationships separately. This kind of a classification was supported by the inspection of the measurement model.

From a managerial perspective, our results demonstrate that “more IC is better” may not be a valid assumption. It seems that different facets of organizational overall performance have various supporting IC categories. Specifically, for ensuring market performance, investments on building functional intra-firm collaboration and a climate of trust are especially relevant. Relationships with extra-firm partners on the other hand seem to be the best bet for investments for improving innovation performance.

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Appendix 1. Measurement items

<i>Concept</i>	<i>Item</i>	<i>Factor loading</i>	<i>CR</i>	<i>AVE</i>
Market performance	Compared to other companies in its sector, how do you think your company has succeeded in the following areas over the past year?		.91	.77
	Net sales growth	.913***		
	Profitability	.909***		
	Market share	.798***		
Innovation performance	Compared to its competitors, how successfully has your company managed to create innovations/new operating methods in the following areas over the past year?		.94	.74
	Products and services for customers	.883***		
	Production methods and processes	.793***		
	Management practices	.900***		
	Marketing practices	.855***		
Business models	.869***			
Renewal capital	Our company has acquired a great deal of new and important information	.818***	.88	.68
	Our employees have acquired a great deal of important skills and abilities	.855***		
	Our company can be described as a learning organisation.	.808***		
	Our employees take considered risks related to new ideas.	.849***		
Entrepreneurial capital	Our employees show initiative.	.734***	.86	.60
	The operations of our company are defined by independence and freedom in performing duties.	.924***		
	Our employees have the courage to make bold and difficult decisions.	.722***		
	Our employees are highly skilled at their jobs.	.818***		
Human capital	Our employees have a high level of expertise.	.787***	.78	.64
Structural capital	Our company has efficient and relevant information systems to support business operations. (B)	.752***	.78	.65
	Our company has a great deal of useful information in documents and databases. (A)	.684***		
	Older documents and solutions are easily accessible. (A)			
	(B)	.961***		
Internal relational capital	Different units and functions within our company – such as R&D, marketing and production – understand each other well. (B)	.481***	.71	.58
	Our employees frequently collaborate to solve problems. (A)	.931***		
	Internal cooperation in our company runs smoothly. (A)			
	(B)	.808***		
External relational capital	Our company and its external stakeholders – such as customers, suppliers and partners – understand each other well.	.924***	.92	.80
	Our company and its external stakeholders frequently collaborate to solve problems.	.864***		
	Cooperation between our company and its external stakeholders runs smoothly.	.892***		
	The operations of our company are defined by an atmosphere of trust.	.573***		
Trust capital	We keep our promises and agreements.	.548***	.83	.54
	Our company seeks to take the interests of its stakeholders into account in its operations.	.936***		
	The expertise of our company inspires trust in stakeholders.	.899***		
	The image and reputation of our company inspire trust in stakeholders.	.953***		

Notes: *** Statistically significant at a 0.005 significance level.

(A) Item used only in Market performance model. (B) Item used only in Innovation performance model

The intellectual capital and the relationship with shareholder value creation and sustainability results

Michela Pellicelli *

Department of Economics and Management
University of Pavia
Via San Felice 5, 27100 Pavia, Italy

Cecilia Casalegno

Department of Management, University of Turin
Corso Unione Sovietica 218 bis
10100 Torino, Italy

** Corresponding author*

Structured Abstract

Purpose – This study examines how intellectual capital can affect firms' value creation. The aim is to investigate the effects of the best practices' adopted in this field on shareholders value and sustainability results, considering the human factor as the part of intellectual capital filled from the rising of the knowledge. For this reason managers should maintain skilled people inside the firm, considering a new respect for people.

Is analysed the relationship between people management best practices and shareholder value creation. By the other side, the notion of the production of economic and financial value for shareholders is, though, ever more broadened to also take in the social shared "value". So, in conclusion and for a broader qualitative and quantitative analysis, is also analysed the relationship with sustainability results.

Design/methodology/approach – We propose an approach based on the analysis of the largest companies in Europe according to 2013 rankings. The qualitative and quantitative analysis is based on the comparison of accounting/market based value measures and social/environmental performance indicators, together with the analysis of best practices on human resources management which are possible to underline with the case analysis methodology.

Originality/value – This methodology puts in evidence the strong link between people capital strategies and firm value creation and sustainability results. As we aim to prove, companies giving greater attention to the working conditions of their own workforce not only make people working inside more faithful and involved, but also handle a strategic lever able to create value for shareholders.

Practical implications – The outcomes of the application could be a suggestion method for managers who want to find new opportunities in managing intangibles inside their organization and recognise their effects on shareholder value and sustainability results.

Keywords – people capital, intellectual capital, shareholder value creation, sustainability results, performance measures.

Paper type – Academic Research Paper¹

1 Introduction

From the mid-eighties until 2000 the United States experienced a period of economic growth at rates higher than those of the other main industrial countries, in particular Germany and Japan. Other economic indicators also gave clearly superior results: lower unemployment and inflation rates and a higher capital productivity. In a dynamic economy new opportunities continually arise. Under such a stimulus to growth – according to Copeland, Koller and Murrin (2000), managing consultants for research undertaken by McKinsey – management is constantly searching for new capital to finance its latest investment, and this leads to continuous pressure to come up with strategies that give value to the invested capital. Since there is competition for capital and capital flows toward those investment projects that guarantee the highest return, the management of growing companies select strategies and investment projects on the basis of the differential between return and cost of capital.

Following the acceptance of the principle that management must aim toward the production of shareholder value, much has been written about the advantages and operating policies in order to obtain shareholder value (Rappaport, 1998; Hennel, Warner, 1998; Cornelius, Davies, 1997). “Shareholder value is therefore defined as the difference between corporate value and debt, where corporate value is the sum of the future (or free) cash flows discounted at the WACC” (Black, Wright, Davies, 2001). “To maximize shareholder wealth, management must generate, evaluate, and select business strategies that will increase the corporate value” (Morin, Jarrel, 2001).

Most of researches studies have shown that the human factor makes organizations able to face markets in which they are competing and the competitive advantage has been the most important factor in changing the labour market and the people management (Pfeffer, 1999; Caudron, 1994; Armstrong, 2006; Kaplan, Norton 2004). For instance, Jac Fitz-Enz (2001), pioneer of human capital impact valuation, gave the bases for empiric

¹ Abstract and introduction are co-written by the authors. Sections 3, 5 are written by Pellicelli M. Sections 2, 4 and conclusions are written by Casalegno C.

support of theories that claim how workforce is strategic to obtain great financial results. In other words, organizations can measure and maximize the value of their investment in employees.

Previous researches (Casalegno, Pellicelli, 2008; Casalegno, Cerruti, Pellicelli, 2009) have demonstrated that companies with superior human capital practices can create substantially more shareholder value than companies with average human capital practices and that great human capital practices prevail, regardless of the economy; the same key practices that are associated with higher value show up in bull, bear and flat markets.

The aim of this paper is to investigate the effects of the best practices' adopted in this field on shareholders value and sustainability results, considering the human factor as the part of intellectual capital filled from the rising of the knowledge. It analysed the relationship between people management best practices and the relationship with shareholder value creation and sustainability results.

2 The people capital as intellectual capital chest and value driver asset

According to authors as De Cenzo and Robbins (1996), Armstrong (2006), it is possible to say that hierarchy has been substituted by networks in the last years and the best performers on markets show more flexible processes. The control-based management has been evolving in a more friendly approach in which the communication is the most important tool (Malone, 2004).

Barlett e Ghoshal (2002) try to identify changes managers should lead in this war of talent era. Above all is important to work on the hardest mind-set to alter, deeply embedded belief, that capital is the critical strategic resource to be managed and that senior managers' key responsibilities should centre around its acquisition, allocation and effective use. It is not to deny the need of the use of financial resources, but for most companies today capital is not the resource that constrains growth; human, not financial, capital must be the starting point and ongoing foundation of a successful strategy (Casalegno, Pellicelli, 2008). Kiessling and Harvey (2006) recognize that when a company is acquired, the amount of money paid for the company is normally some multiple of earnings. The assumption is that the purchase price is higher than the tangible assets of the company. Frequently, some percentage of the 'premium' paid by the acquiring company is for the top management team and/or key managers.

People detain human capital, intellectual capital; this is considered and valued by Fitz-Enz (2001) as a profit lever in the knowledge economy. People are knowledge lever (Bahra 2001); they represent that part of intellectual capital following the individuals when the employees leave. According to Fitz-Enz, this asset can and should be measured as a fundamental asset for achieving competitive advantage. This is a precious resource, a lever to create organization value.

Accordingly, human resources represent the first source for starting and promoting innovation. An innovation-oriented culture can be considered part of the Total Responsibility Management (Gorenak and Bobek, 2010), by leveraging on the part of intellectual capital is detained by people. This is fundamental even if for most of the time it is difficult for firms to care about the ‘human factor’, since they always have to think about costs reduction and employees are often perceived only as costs in small or medium realities (Pellicelli *et al.*, 2014). But if a firm wants to overcome the competition leveraging on technology and innovation, employees must be motivate so to feel themselves as part of the whole organisation. Indeed, competitive advantages are earned when it is possible to build a link between employees’ and company’s goals (Pellicelli *et al.*, 2014).

The sharing of common goals first, together with the values sharing concerning corporate social responsibility and ethics can be a mean of creating this positive connection (Casalegno, 2008) and a way for increasing employees’ satisfaction and commitment (Bevan and Wilmott, 2002).

As intangible asset, people and their management in firm can impact on firms’ value creation (Casalegno, Pellicelli, 2008; Casalegno, Cerruti and Pellicelli, 2009). If we consider Fitz-Enz (1978; 2001; 2010), for example, people and human capital inside the company must be measured: he talks about *human capital return on investments* (HCROI), the *human economic value added* (HEVA), the *human capital market value* (HCMV). We can talk about two levels of human capital; one refers to the single employee, while the second one is about the firm community and represents the whole organizational knowledge (Casalegno, Cerruti and Pellicelli, 2009). Again, Barber (2005) argues that capital-oriented measures are not valid to evaluate “people business”, because they cover weaknesses and show volatility where it does not exist. So he suggests a people-oriented equation which uses employee productivity instead of capital productivity

(ROI); he talks about the human capital economic profit which considers the employee productivity and the average cost per person, as well as the number of employed people.

3 New intangible frontiers: sustainability and shared value creation

The idea that corporations has a responsibility that extends beyond their shareholders is not new. Many companies in the 19th century built special housing for their employees in the belief that a well-housed employee was more productive than one living in a dump (The Economist, 2009). But it was in the early years of the 20th century that this idea started to be discussed to great extent and to be translated into concrete actions.

The debate, from the very beginning, arose between what was known as Anglo-Saxon shareholder capitalism, which portrays that companies should pursue exclusively the interests of their shareholders from one side, and stakeholder capitalism, which claims that companies are also responsible to their workers and communities from the other.

In past decades the economic interests of firms and production organizations of all kinds prevailed over any possible social disadvantages; the search for the creation of value was directed mainly at achieving short-term financial results, based on a near-sighted perspective that ignored the needs of clients and of the collectivity in general. However, stakeholders, in particular governments and local communities, have become aware of the problem of sustainability and now demand greater attention to the environment, economic growth and the condition of workers, while customers are increasingly more demanding in terms of quality and innovation.

In recent years firms have been subject to increasing pressure in terms of sustainability – defined as follows by the World Commission on Environment and Development (Brundtland Commission, 1987): “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” – as regards both current processes as well as those being developed.

There have thus followed many definitions of sustainability with regard to the economic sphere. We can mention several recurring aspects of the definition of this term (Vos, 2007):

1. it refers to a way of observing environmental problems in relation to the economy and society;

2. the interconnections are usually described as a triangle, a ‘three-legged stool’; or overlapping circles in a Venn diagram, where the three elements can be diversely described as the economy, environment and society or equity, ecology and the economy;

3. despite the fact the specific elements and their relevance can change, what distinguishes sustainability is the observation of the systemic connections and the idea that the constituent elements should be mutually sustaining and reinforcing;

4. the focus on intergenerational equity; that is, guaranteeing to future generations the same conditions available to the present generation;

5. a final aspect shared by the various definitions, and which differs from the traditional way of observing the environment, the economy and society, is the need to go beyond the mere compatibility of existing laws and regulations.

In order to increase the dissemination of sustainable objectives, numerous international, national, state and local government protocols and policies, as well as the ‘mission statements’ of corporations and NGOs, include a commitment to sustainable development.

Based on the guidelines of the “Brundtland Commission” (1987), the United Nations has defined a series of Millennium Development Goals (MDGs) to be achieved by 2015. These goals aim at economic development and the elimination of poverty, and the objectives include human rights, health, education and environmental questions. In this context the: “efficiencies of markets, combined with the resources and managerial expertise of large multinationals, are considered crucial success factors in achieving these goals” (Seelos and Mair, 2005).

In addition, the United Nations Secretary-General, Kofi Annan (2002), challenged business leaders to join an international initiative, the Global Compact, that would bring companies together with UN agencies, labor and civil society to embrace a set of shared values and principles in the areas of human rights and labor and environmental standards.

Along with this process to involve firms in promoting sustainable growth, and thanks in part to the publication of Elkington (1997), the Triple Bottom Line (TBL) has gained acceptance as a new instrument to measure company performance in line with three approaches: economic, environmental and social (Hubbard, 2009).

The positive aspect of the TBL is that it focuses the attention of companies not only on the economic value they achieve through their business activities, but also on the environmental and social value they produce or possibly destroy (Elkington, 2004).

This emphasis has led, at the international level, to a considerable effort to define the common standards for the drafting of sustainability reports and to identify performance indicators that could highlight the value created in the social and environmental areas as well. There have been a large number of proposed guidelines for sustainability reporting.

At present the most complete and adopted guidelines are the “Sustainability Reporting Guidelines on Economic, Environmental and Social Performance” (2000), published by the Global Reporting Initiative (GRI), a joint project promoted by research institutes, international bodies, environmental and social associations, business coalitions, and certification institutes.

The GRI guidelines indicate the main topics firms should particularly focus on in their sustainability reports and propose performance indicators to communicate the impact of business activity based on three areas:

- economic, which refers to general aspects regarding the sustainability of corporate business in the long run;
- social, which refers to the impact of corporate activity on the firm’s stakeholders;
- environmental, which includes the evaluation of the impact of processes, products and services on natural resources (air, water and soil), biodiversity and human health.

Thus today “there is wide consensus that the idea of sustainability figures as one of the leading models for societal development by indicating the direction in which societies ought to develop” (Christen and Schmidt, 2012).

Also Baumgartner and Ebner (2010) point out, management should pay more attention to several aspects that are indispensable for achieving business sustainability, such as: ‘innovation and technology’, in order to reduce environmental impacts from new products and from business activities; ‘collaboration’ with the various business partners (for example, suppliers, R&D institutions, universities); ‘knowledge management’, in order to implement the organizational knowledge base; ‘processes’ that must be planned and roles assigned in order to integrate sustainability into daily business life; ‘purchasing’, and thus relations with suppliers, in order to improve business sustainability; ‘sustainability reporting’, in order to evidence the results achieved.

Therefore, corporate policies for growth that respect environmental sustainability cannot be left to the discretion of entrepreneurs but must be guided and, where necessary, imposed. There are now specific regulations that oblige firms to provide information to the public regarding their actions in favour of sustainability. In particular, larger, publicly-

quoted firms are asked to increase their sustainability and to publish their results in the economic, environmental and social domains. The Communication on the EU Strategy for Sustainable Development (2001) invited all publicly-quoted companies with at least 500 staff to publish a “triple bottom line” in their annual reports to shareholders that measures their performance against economic, environmental and social criteria.

According to Nidumolu, Prahalad, and Rangaswami (2009): “In the future, only companies that make sustainability a goal will achieve competitive advantage. That means rethinking business models as well as products, technologies, and processes”.

The authors propose a five-stage process needed to emerge from the recession and make the firm sustainable:

Stage 1: Viewing Compliance as an Opportunity

Stage 2: Making Value Chains Sustainable

Stage 3: Designing Sustainable Products and Services

Stage 4: Developing New Business Models.

Porter and Kramer (2011), on the other hand, emphasize the importance of redefining the purpose of the corporation in order to orient it toward the creation of shared value. “The purpose of the corporation must be redefined as creating shared value, not just profit per se. This will drive the next wave of innovation and productivity growth in the global economy. It will also reshape capitalism and its relationship to society” (Porter & Kramer, 2011). Therefore, the authors propose a model illustrating three key ways that companies can take to create shared value opportunities: 1) reconceiving products and markets; 2) redefining productivity in the value chain; 3) enabling local cluster development.

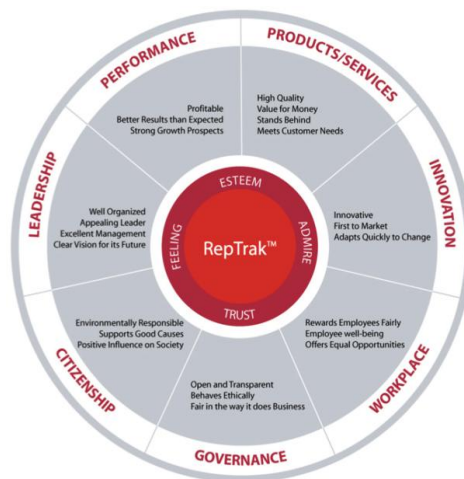
Thus firms should “look at decisions and opportunities through the lens of shared value. This will lead to new approaches that generate greater innovation and growth for companies—and also greater benefits for society” (Porter, Kramer, 2011).

4 Values, people, society and firm reputation

The importance and impact that the people management and corporate social responsibility have on the reputation and the sustainability of the company is also shown by the Reputation Institute¹, which annually publishes the ranking of firms, globally, have the highest degree of reputation. The Reputation Institute has over the years refined an

¹ *The Reputation Institute is a company specialized in management and strategic consulting. The topic in question is related to the company's reputation. This organization consists of members and offices in over thirty countries worldwide. Source: Romoli Venturi et al., 2014.*

instrument, the RepTrak, in order to give a measure to the business reputation. This tool is also useful for identifying areas of risk and reputational risk. The model analyses 23 indicators are grouped into seven dimensions that, according to the Reputation Institute, are precisely the dimensions of corporate reputation. This can result (Romoli Venturi *et al.*, 2014) considering at the same time the financial results and future projections (*Performance*), the degree of quality of firm's products and how they meet the needs of the target reference (*Goods/Services*), the degree of product and process innovation (*Innovation*), methods used in order to develop human resources skills and talents (*Workplace*), the degree of business transparency and related communications (*Governance*), company inclination to support causes related to the environment the firm itself is in (*Social Responsibility*), resources organization and the managerial ability to lead people in order to reach common goals (*leadership*). The result that comes from the joint analysis of these dimensions lead to the definition of the so called *Pulse*. Various firms' stakeholder are annually asked to answer an online survey in order to give, for every dimension, their perception in terms of sustainability. The sum of the seven dimension scores gives the *Pulse*.



Source: Reputation Institute, 2013.

Figure 1 – Reputation Institute RapTrak

Figure 1 shows the Reputation Institute model. Since the reputation is an important asset in order to create value (Reputation Institute documents show that customers are more prone to buy products of those firms on the top of the reputation ranking - 71% of

them – and more ready to suggest their products to other people), is interesting to understand that intangibles are, nowadays, representing the assets through them a firm can reach a useful degree of it.

Starting from the RapTrak model, the purpose of the present research is to empirically understand the kind of link can be present between people management and sustainability, since it has been already proven that people management, on one side, and sustainability (the kind of sustainability coming from social concerns, environmental and economical ones) on the other side can impact on value creation.

5 Research design and methodology

In order to understand the link between human capital productivity indexes and value creation, on one hand, and corporate social responsibility and value creation, on the other hand, a sample of European biggest companies (chosen by using Amadeus dataset) has been analysed. We considered the European largest public companies in terms of revenues (with a revenue turnover equal or major than 50 million euros) and we focused our attention on the first 10 (data available for the following companies: Royal Dutch Shell, BP, Volkswagen, E.On.Se, Eni, Daimler AG, Enel), in order to calculate for fiscal years 2012, 2011 and 2010:

- Costs of employees/operating revenue (%) and Human capital return on investments (HCROI) as significant indicators for human capital;

and their correlation with:

- Total shareholder return and Earning per share as significant shareholder value creation's performance indicators;
- Sustainability companies activities in terms of corporate sustainability results, with particular reference to the awards earned by the firms in the sample.

5.1 Human Capital performance indicators

In the empirical analysis we've considered the average Costs of employees / Operating revenue (%) for the years 2012-2011-2010 and the average HCROI for the years 2012-2011-2010.

Regarding the HCROI, the decision to consider this index, rather than the others Fitz-Enz indexes, has been taken because the formula is easily applicable to all analysed companies.

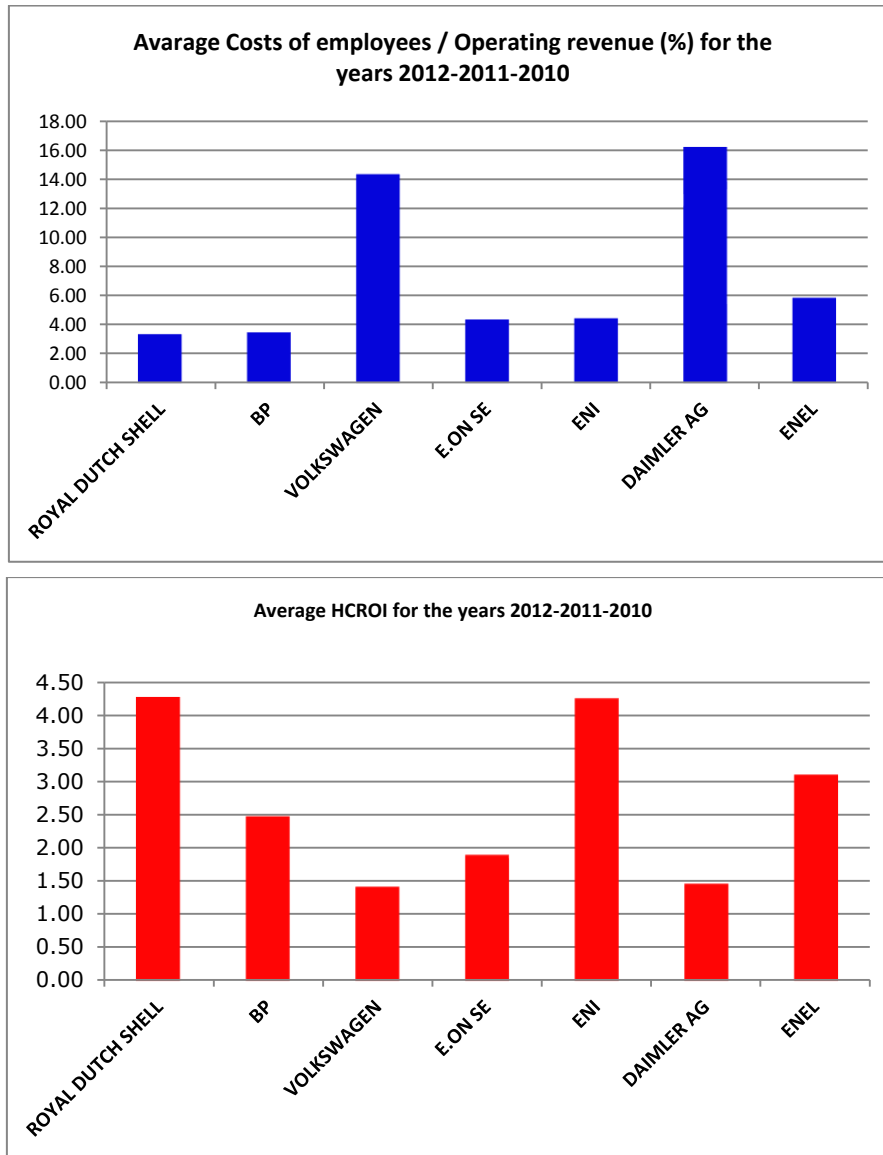


Figure 2 – Human Capital performance indicators

The other indexes considered by Fitz-Enz are based on the number of full-time employees (for example, the HEVA is reachable by using the formula: net operating profit after tax minus the cost of capital and the result is to be divided by the full time employees), but our data did not allowed us to figure out who among the employees in question, who was part-time and full-time. HCROI is calculated with the following the formula:

$$HCROI = \frac{\text{Revenues} - \text{Costs} + \text{employees costs}}{\text{employees costs}}$$

This performance indicator is easier to calculate. However, it is not significant in the event you need to compare different firms in which the number of employees is very different. In fact, as we can see in Figure 3, while the average Costs of employees / Operating Revenue (%) for the years 2012-2011-2010 is very high for Volkswagen and Daimler AG compared to other analyzed companies, HCROI turns out to be insignificant for Volkswagen and Daimler AG. In this case, the number of employees, for example considering the year 2012, are much higher than the other companies: they are respectively equal to 469.497 and 274.605 in 2012 against 87.000 for Royal Dutch Shell, BP for 85.700, 74.811 for E.On.Se, 75.206 for Eni, 74.610 for Enel.

5.2 Shareholder value performance indicators

Regarding shareholder value results we have to considerate that value creation is based on two fundamental postulates: 1) the objective of management is to maximize the return for the shareholders. Management is an “agent” whose task is to manage shareholder interests; 2) stock markets give a value to the company's shares based on investor expectations regarding the present value of the cash flow, which will be generated by the firm itself. A company creates value for investors in a certain period of time when the increase in the value of capital is greater than what the investor would have had with an alternative investment of equal risk.

In the empirical analysis we've considered two shareholder value performance indicators: Total shareholder return (TSR) and Earnings per Share (EPS).

Total shareholder return (TSR) determines how much shareholders have received over a certain period of time (dividends) plus the appreciation of share values. TSR is important because it expresses what is of most interest to investors. It is easy to calculate and interpret; it is not based on accounting data, and thus is not subject to distortions due to valuation criteria; and it is not affected by the size of the company. TSR is the sum of the increase in share prices and the distributed dividends over a given period of time (usually less than three years).

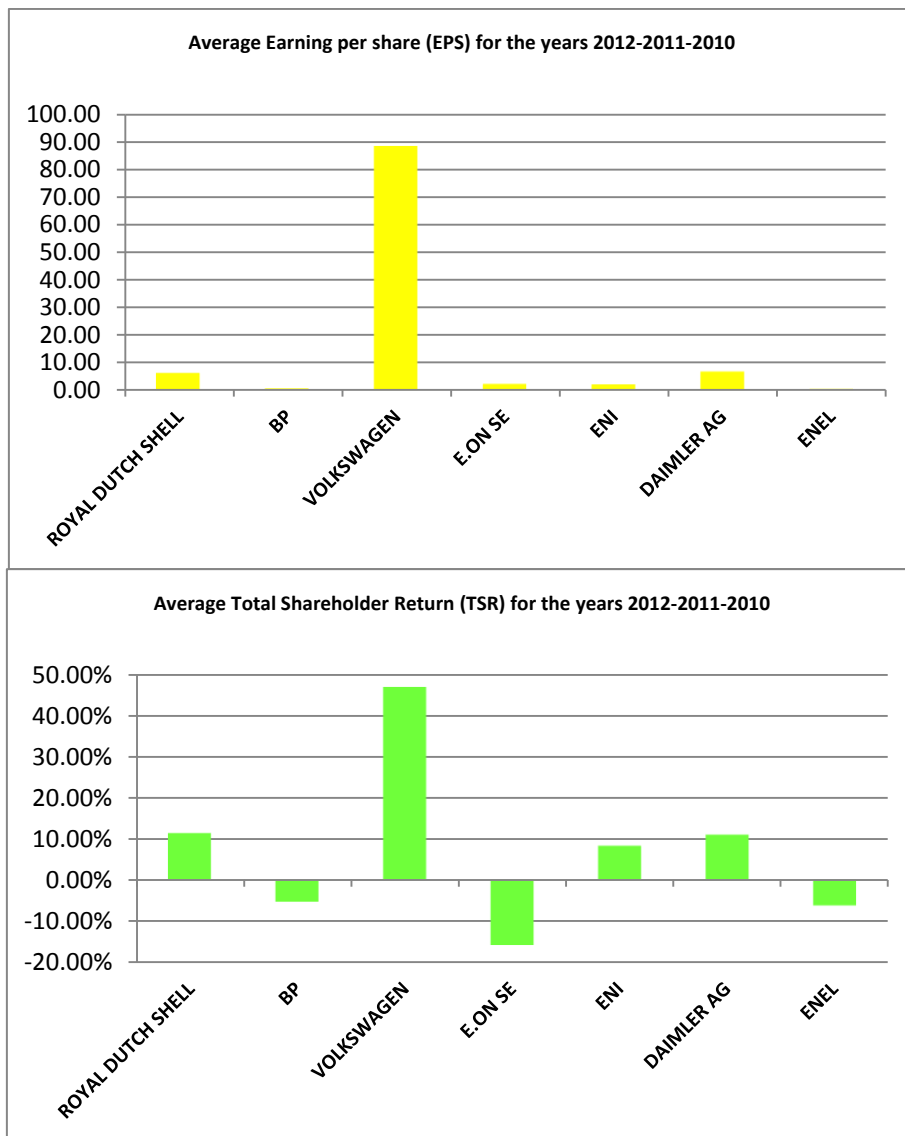


Figure 3 – Shareholder value performance indicators

The TSR formula, as presented by Cornelius e Davies (1997, p.113), is:

$$TSR = \frac{\text{Dividend per share} + (\text{Share price at period end} - \text{Original share price})}{\text{Share price at start of period}} \times 100$$

In the empirical analysis we've also considered EPS that is the most common index, although sometimes is less significant for evaluating results and the expectations of investors.

The results in terms of shareholder value creation of analysed sample are in line with the average Costs of employees / Operating Revenue (%) for the years 2012-2011-2010: Volkswagen and Daimler AG have in fact achieved the best results in terms of the average Total Shareholder Return (TSR) and the average earnings per share (EPS) for the years 2012-2011-2010.

5.3 Sustainability results

In order to highlight the results obtained in terms of sustainability we felt it appropriate to consider the rankings and awards received by the companies analyzed for the years beyond 2010.

From the conducted analysis we've found that all the firms in the sample have a sustainability report and are indexed in the most important Sustainability Index, as: ASPI Advanced Sustainability Performance Index, Dow Jones Sustainability Index (DJSI) World, ECPI Ethical Index, ESI Excellence, FTSE4Good, Dow Jones STOXX ® Global ESG Leaders indexes and are all actively engaged in social responsibility and the shared value creation.

From the analysis on the rankings and awards received, Volkswagen and Daimler AG are found to be the most active active. Eni has been awarded with CSR Online Awards Italy and is also very active in sustainability reporting.

Volkswagen has received the following significant rankings: Carbon Disclosure Project (93%); Oekom Research (Prime Status); Environmental Management (ranked 2nd); Reputation Institute DAX 30 (ranked 2nd) and the Following Awards: Ethics in Business Award in the category "Outstanding Corporation" (winner 2012); Automotive Award - Media & Publications in the category "Digital Media" (winner 2012); SAM Sustainability Awards (finalist 2012).

And Daimler AG was rated as "Prime Investment", receiving a very good (for the automotive industry) overall rating of B-. Daimler Also Scored impressively in the Carbon Disclosure Project rankings, receiving the highest rating in the categories of reporting, transparency and performance.

Also Daimler AG received very important awards, as: GreenIT Best Practice Award (2012 winner in the category "Green through IT"); EcoGlobe (winner 2012 in the category "Concept vehicles"); Automotive Environmental List (winner 2012 in the "Manufacturers" category of the VCD Automotive Environmental List); IAHE Sir

William Grove Award 2012 and received a lot of awards in the year 2011 for its environmental innovations.

So we can conclude that Volkswagen and Daimler AG have received important results also in terms of sustainability.

5.4 Human Capital investments and the correlation with value creation

From the results of the above analysis it is possible to highlight a positive correlation between investments in human capital and the creation of value, in terms of shareholder value creation and sustainability results. These results are evident for companies Volkswagen and Daimler AG, as we can see in the Figure 4.

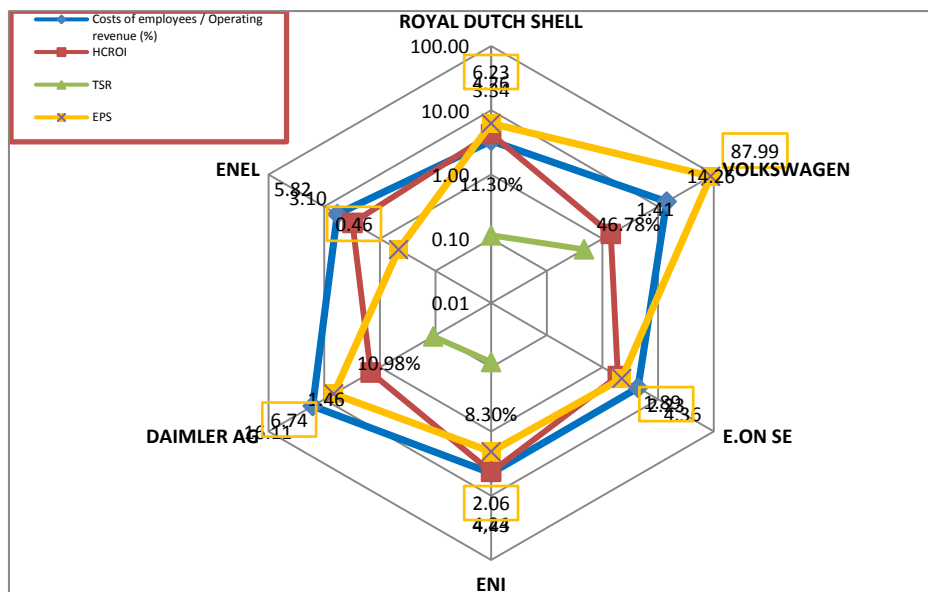


Figure 4 – Human Capital and the correlation with Shareholder value performance indicators

6 Key findings, managerial implications and conclusions

The results obtained have allowed us to establish not only that there is a strong link between the management of human resources within an enterprise and the creation of value, but that there is an equally strong bond between the results in terms of sustainability of the undertakings concerned and their market capitalization. Although the number of companies considered not to have statistical significance, the results also

indicate that there is a link between the proper management of human resources and corporate sustainability. The model is possible to define is represented below (figure 2). As is possible to underline, people can represent an interesting lever when we talk about responsibility; the more the internal communication works, the more employees are told about corporate goals and values the company itself wants to share with stakeholders, the more the employees themselves can be an effective tool to augment the communication and the sentiment around the concept of corporate social responsibility.

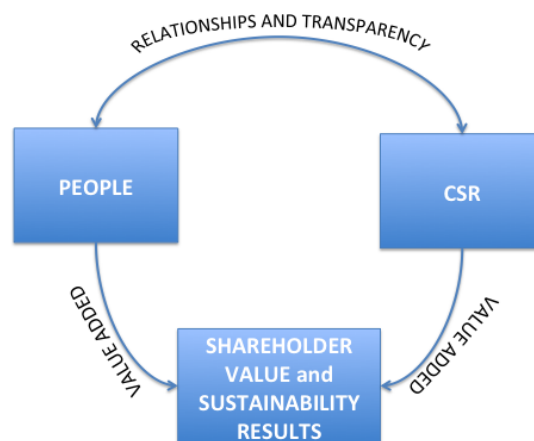


Figure 5 - The relationships model

Although the present study present limitations in terms of number of cases and indicators considered, the results clearly lead to the conclusion that greater interaction between managers and employees can be of impact not only on the creation of value, but the sustainability of the enterprise. Why human resources of a firm perceive a greater involvement of business activity that is necessary to set up a communication plan that considers not only how the company intends to communicate to the outside, but the values and goals that must be communicated to 'internal structure.

The communication plan can follow the following structure, planning borrowed from that relating to integrated marketing communication. Rules to consider can be defined following Duncan and Ouwersloot (2007) communication planning steps:

- Follow analysis results directions;
- Convert them in destination objectives. Main goals must be quantitative and valuable; they must be specific, on one hand, challenging, on the other hand;
- Develop strategies and use benchmarking to do that;
- Define the right budget for communication spending.

The last step is about the evaluation of communication strategy effects; even if we are talking about an internal kind of communication, since it represent an investment, it will be useful to understand quantitative effects of it in advance.

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An exploratory study on an Intellectual Capital eco-system

Linlin Cai *, Eric Tsui, Chi Fai Cheung

Department of Industrial and Systems Engineering
The Hong Kong Polytechnic University
University Hung Hom, Kowloon, Hong Kong

** Corresponding author*

Structred Abstract

Purpose – The purpose of this paper is to explore the fourth stage of IC sociology development, In which, the good quality of a person’s life and the a environment are added to economic development. In an organization, Human beings are treated as social citizens rather than simply organizational employees. However, the relevance of IC beyond the organizational dimension is still hidden as the lack of research techniques and practical application.

Design/methodology/approach – Institutional ethnography (IE), a sociological method of inquiry, is being used to explore employees’ everyday life in both internal and external organizations. With the use of IE as a methodological framework, the relevance of IC in the whole social system can be critically visualized. In the process of using IE, autoethnography is used as the entry point.

Originality/value – Through our research, the critical role IC plays in the 4th stage of IC sociology development is virtualized. The eco-system of IC is drawing organizations into the whole social system to share part of human beings’ life equally and suitably. The stage is coming in which organizations should balance employees’ role through leveraging good IC to fulfil the requirements of a healthy society.

Practical implications – The methodology used in our research creates path for the researchers to be involved in the actual life of employees and offers a real life application of IC at the individual, organizational and societal levels. Hence, the empirical evidence of IC research which originates from the actual experience is not just a “new language” of the research. Meanwhile, the skills needed for operating IE also demonstrates that potential for IC management lies in the practical world.

Keywords – Intellectual capital; Eco-system; Human beings; Institutional ethnography; Autoethnography;

Paper type –Practical Paper

1. Introduction

Since intellectual capital (IC) was first proposed by some visionary practitioners (Allee, 2000; Edvinsson, 1997), IC research has had 4 stages of development. The first stage accomplished the important mission of raising the awareness of IC in the knowledge era (Richard Petty & Guthrie, 2000). However, IC was misunderstood as there was a lack of empirical studies at that stage. The second stage of IC research mainly focused on the management, measurement and reporting IC (Bernard Marr, 2004). However, the problem of this stage was that IC research was mostly involving accounting issues and all kinds of IC frameworks, which in turn has weakened IC's relevance to management. The third stage of IC research began by the examined the role of IC in a critical way (Guthrie, Ricceri, & Dumay, 2012). Undoubtedly, IC is the key driver of value creation in the organization. However, not all aspects of IC can create values.

In recent years, more and more emphasis has been given to the importance of the products and services to customers (Dumay & Garanina, 2013). The disadvantage of the third stage IC research was that intellectual capital (IC) is only seen as a tool to develop strong organizations but, as a result, the sustainable development of the organization is often ignored (Dumay, 2013). The advent of the fourth stage of IC research which is described as IC eco-system attempts to redress this gap (Dumay, 2013; Edvinsson, 2013; Wasiluk, 2013). In this stage, the concept of an IC eco-system has been proposed. IC research is attached to the social eco-system in which good quality of human life and a healthy environment are added to the economic development. Human beings are treated as social citizens (Allee, 2000; Wasiluk, 2013) rather than simply organizational employees. However, the role of IC in the IC eco-system and the relevance of IC beyond the organizational dimension are still under-explored due to a lack of research techniques and practical applications of IC in relation to - eco-systems.

Having identified such a research gap, two research questions are proposed below,

RQ1. What is the role of IC in a social eco-system?

RQ2. What are ways to visualize an IC eco-system?

In this research, institutional ethnography (IE), a sociological method of inquiry, is used to explore employees' everyday lives in both internal and external organizations (Smith, 2006). With the use of IE as a methodological framework, the relevance of IC in the whole social system can be critically visualized (Breitkreuz & Williamson, 2012). In the process of using IE, autoethnography is used as the entry point (Taber, 2010). The

“web of life” (Allee, 2000) is mapped based on the IE frameworks;. It is found that IC is indeed playing a critical role in terms of coordinating these statuses. The eco-system of IC is weaving organizations into the whole social system to share part of human life equally and suitably. The stage is coming when organizations should change through leveraging IC to fulfill the requirements of a healthy society.

The methodology used in our research creates a path for researchers to be involved in the actual life of employees, and offers a real life application of IC at the individual, organizational and societal levels. Hence, the empirical evidence of IC research which originates from actual experiences (Smith, 2006) is merely the actual language of the daily life of employees. Thus, IC is never only stays at the academic Ivory Towers (Dumay, 2012). Meanwhile, the skills needed for operating IE also demonstrates that the potential for IC management is vested in the actual world.

2. Literature review

In the early stage of IC research, Petty and Guthrie (2000) expressed that “intellectual capital is implicated in recent economic, managerial, technological, and sociological developments in a manner previously unknown and largely unforeseen.” However, much IC research focuses on the economic (e.g. Abdolmohammadi, 2005; Kristandl & Bontis, 2007), managerial (e.g. Dumay & Roslender, 2013; Sveiby, 2010) as well as technological development (e.g. Lock Lee & Guthrie, 2010). On the other hand, IC implication on sociological developments has not received much attention in both the academic and practical worlds. Recently, Edvinsson (2013) and Dumay (2013) formally proposed the concept of an IC eco-system which hails the beginning of the stage of IC sociological development. In this stage, Edvinsson (2013) emphasized that human capital plays a vital role. Dumay (2013) illustrates that the good quality of human beings’ life and the healthy environment are added to the economic development. However, the empirical evidence offered motives us to explore what the system consists of and how it works. Firstly, we need to trace back to the path of IC sociological development even though this stream had not received much attention in the past.

It is encouraging that Allee (2000) studied IC from the perspective of how an employee can live a good life, which is different from the conventional top-down managerial perspective that is mainly concerned about how organizations can enable people to work at high efficiency. Allee (2000) stresses that enterprises and organizations need to depend

on social system in which people are seen as the social citizens. Thus, a sustainable enterprises and organizations depend on the good quality of life of its people. For example, people who work in the Silicon Valley companies leave their employer because they do not want to raise their children there as the living environment is not good reveal the importance of a social system in people's mind. However, this example shows only the "tip of the iceberg" of this complex system. But the data which Allee (2000) collected only from the annual reports cannot fully represent people's actual lives and requirements of a good quality of life.

Bontis and Fitz-Enz (2002) presented one of a few papers which pay special attention to human capital. They draw a causal map of human capital antecedents and consequents by integrating the results collected by using both quantitative and qualitative research methods. Bontis and Fitz-Enz (2002) state that this model "allows participating organizations and researchers to gauge the effectiveness of an organization's human capital capabilities." Meanwhile, Bontis and Fitz-Enz (2002) stress that this model also "allows practitioners and researchers to more efficiently allocate resources with regard to human capital management." However, this model is biased as it only covers the managerial perspectives of senior executives; the attributes which considering the common employee are ignored. What is more, the 15 latent constructs presented in the paper are all from academic papers rather than the actual life and requirements of people themselves.

It is encouraging that Roslender, Stevenson, and Kahn (2006) propose a the "employee-centered" perspective on intellectual capital based on adding the employee wellness to intellectual capital. From the perspective of how physical and psychological healthy issues affect the employee working status and organization development, the attributes of human capital which cover individual wellness are shown more comprehensively. Meanwhile, aiming at studying the new dimension of IC, Roslender et al. (2006) propose to develop metrics and deploy self-accounts to fulfil the purpose of communicating useful information to a variety of stakeholders. However, regardless of the rational methods being used, the purpose is confused, as Roslender et al. (2006) themselves argue that increasingly employers pay more attention to the employees' experience and expertise than the individual health issues. Therefore, the first step in studying should investigate the requirement and conditions of employee wellness rather

than to develop metrics to measure them. A new method is much needed which would help to understand the healthy situation of actual people.

Fritzsche (2012) investigates the implicit evaluations of IC in practical decision making by conducting interviews with experts from different multinational companies. He found that “despite a growing awareness of the necessity to bind promising employees to the company, talent management is still mainly concerned with filling concrete positions in the company according to specific job descriptions”. Unfortunately, the experts concerned did not pay attention to other attributes of human capital except the experience and expertise of employees. People there are just regarded as the “instruments”. This finding reminds us to reflect on practical management lacks the knowledge of IC sociological implication. Meanwhile, the academic world also needs to reflect that the IC sociological implication for the organization cannot be just a slogan and fashionable concept. How can we bridge the two worlds?

Wasiluk (2013)’s paper is one of the seminal papers in terms of studying IC sociological developments. In the paper, she illustrates that “IC and corporate sustainability (CS) have a mutually beneficial working relationship”. Hence, Wasiluk (2013) point out that the critical approach in studying IC should also reflect on the practice of CS in the organization. However, more empirical evidence is needed to bridge this gap. Meanwhile, Wasiluk (2013) highlight the vital importance of human capital. She specially proposes the “spiritual approach” which is focused on more than a human being’s technical expertise. However, the spiritual approach is not clearly illustrated in the paper. Besides, all the empirical evidence is from senior management. These views can only represent the “top-down” management perspective. The spiritual requirements of employees are still scanty. Furthermore, there is also the need for a methodology to guide the study of employees’ actual spiritual requirements.

To sum up, the IC ecosystem (Dumay, 2013; Edvinsson, 2013) proposed motivates us to uncover the mysterious veil of IC sociological developments. Through tracing back through the history of IC sociological development, it is revealed that some research has paid attention to this perspective, but the problem is that much of the current research up to now has not progressed beyond the stage of concept development (Allee, 2000; Roslender et al., 2006). For those where empirical data have been collected, they are dominated by top-down management methodology (Bontis & Fitz-Enz, 2002; Fritzsche, 2012; Wasiluk, 2013). Besides, those studies whose empirical data were collected in the

annual reports already have lost the relevance (Dumay & Cai, 2014). Thus we argued that there is an opportunity continuing to virtualize the IC eco-system by collecting empirical data from the actual experience of common employees. The next four sections describe one of the author's experiences in immersing herself in a real workplace and apply institutional ethnography to collect empirical data to explore IC's role in an eco-system.

3. Research site

The research site is the Information Technology Services (ITS) sector of a public organization in HK. The role of ITS is to facilitate, foster and support the organization's vision through providing the up-to-date, efficient and cost-effective information technology environment. In the research site, there are 5 sections consisting systems infrastructure services (SIS), network & communications services (NCS), user services (US), administrative applications services (AAS) as well as administrative & general services (AGS).. Under these sections, teams are formed based on the different nature of the projects.

The working time in the ITS varies across the service support areas. For example, a few staff have to come to work at 08:15 am for some special services/scheduled activities and they are on shift. This working model applies to staff who may have to leave after 10:30 pm. The organization specifies the normal working hours which will not violate the Hong Kong Employment Ordinance. It is however in operation staff may have a more flexible working time by arranging the working time according to their own work schedule. Sometimes, they could even work from home. The number of days of the staff's annual leave depends on the level of the position. Some special positions which have to cope with urgent work at mid-night are given compensation leave. Reporting line is assigned when they enter into this working environment.

4. Framework

An institutional ethnography is a research methodology that begins "in the actualities of the lives of some of those involved in the institutional process and focuses on how these actualities are embedded in social relations, both those of ruling and those of the economy" (Smith, 2005). Besides, Smith (2005) presented that IE "is a method of inquiry into the social that proposes to enlarge the scope of what was visible from that site, mapping the relations that connect one local site to another. Like a map, it aims to be

through and through indexical to the local sites of people's experience, making visible how we are connected into the extended social relations of ruling and economy and their intersections." Moreover, Smith (2005, p. 32) proposed that "institutional ethnographies produce a kind of knowledge that is made visible to activists or others directly involved the order they both participate in and confront". In this research, institutional ethnography (IE) provides a methodological framework to examine critically what the role - a company is playing in the daily life of employees and how IC in the work affect the links between the work and other social relations. Two key notions from institutional ethnography support this analysis (Breitkreuz & Williamson, 2012, p. 665): work (Smith, 1987, p. 165) and rule of relations (Smith, 2005, p. 10).

The notion of work (Smith, 1987, p. 165) "directs us to its anchorage in material conditions and means and that it is done in "real time"- all of which are consequential for how the individual can proceed." Breitkreuz and Williamson (2012) further illustrate that the "concept" of work "captures the day-to-day activities people engage in , the material conditions of their lives, and is conducted in "real time", referring to the details of the mundane practices of everyday life when they occur. " The reason that we highlight- the concept of work is that we would like to study the impact of "work" in the company on the actual experience of people's daily lives. The concept of work (Smith, 1987, p. 165) here which Smith (1987, p. 10) specially stressed that there is no boundary to the work that is related to actualities of daily life, which exactly weakens dominated role of the work in the conventional IC research. Thus, this new perspective can bring us into the wider domain of people's lives. This approach helps to reveal how the work affects the good quality of life.

Smith (2005, p. 10) referred to the rule of relations as "extraordinary yet ordinary complex of relations that are textually mediated, that connect us across space and time and organize our everyday lives-the corporations, government bureaucracies, academic and professional discourses, mass media, and the complex of relations that interconnect them. " The analytical interest here is how the IC that exists in the narratives (Dumay, 2009; Dumay & Cuganesan, 2011; Dumay & Roslender, 2013) in daily life is connected with these institutions. Thus, it is about how IC coordinates these people's statuses.

Smith (2005, p. 32) argues that "institutional ethnography begins by locating a standpoint in an institutional order that provides the guiding perspective from which that order will be explored. It begins with some issues, concerns, or problems that are real for

people and that situated in their relationship to an institutional order”. Therefore, this research utilizes autoethnography and narrative as methods to obtain entry-level IE data

5. Data collection

Firstly, the first author goes to the sector to work as a common employee to experience the same things that the common employee experience every day. The period is one week. The purpose of autoethnography is not to fully understand what the common employees really do, but, as mentioned in the framework, the purpose here is to get the IE entry point to critically explore what a common employees’ experience. Autoethnography shows one common employee’s web of life as shown in Table I. The topics and questions of interview originate from the web of life as shown in Table I. In the web of life, not only the first author serves as the common employee, but also a daughter, a girlfriend, a friend as well as a Christian. However, the web of life index is not a restraint for exploring interviews rather it just offers a point to open up the conversation and guarantees the relevance of conversation.

To guarantee the comprehensive perspective for the whole organization, 10 employees from the 5 different sections were selected through snowball sampling as shown in Table II. Among the 10 participants, there were 3 senior staff and 5 junior staff, respectively. The purpose of choosing the senior staffs was not to investigate how they managed teams but rather to investigate the actual experience of work and life as one of the employees. 7 males and 3 females are included. Two of the chosen staff need to take the “support mobile phone” once a month to provide 24 hours standby support in case of any problem in the IT services.

Table I Web of life index

Social relations	Good	Bad	IC related concept
Personal issues	<ul style="list-style-type: none"> • I like the kitchen which is integrated into the workplace • I gave up the Canteen in the same building. I went to another canteen • I have enough time to sleep 	<ul style="list-style-type: none"> • The air conditioner is too cold • I would like to take some fruit in the next meeting 	Workplace design
Family/ho	I have to change the time to	<ul style="list-style-type: none"> • My parents like my working 	Routine;

me	call my mum as morning is busier than before I can go back to change my clothes as the office is quite near to the place that I live	place now. • I don't have time to chat with boyfriend.	Goodwill; location of office
Boss	<ul style="list-style-type: none"> The manager treated me as an old friends. Feel very warm, as Manager remembers my habit 	• I feel a little nervous that my "boss" was looking for me as I was late for work due to paying bank bills; feel good to come to work on time. Can't be fully flexible.	Hierarchy, Culture
Colleague	My colleague invites me to join their badminton team One of the colleagues passes me a cup of water during the meeting, I am very happy.	<ul style="list-style-type: none"> Feel not good as my new colleague refuses to have lunch with me Feel not very happy after I wake up as there is no friend in the office. 	Culture
Friends	My colleague invites me to join their badminton team	• I don't have time to do lunch with my friends	Routine & Culture
Community	I am happy to join in the bible reading time in the morning	• I can't go to work so late every day.	Routine
Shopping, bank	I bought a laptop bag during my lunch time I go to the bank to pay the bill in the morning on my way to the office	• Feel not good to arrive back at the office too late.	Routine

Table II Investigation targets

Name	Position	Gender	Other attributes
K1	management staff	Male	
H	administration staff	Female	
R	management staff	Male	
P	support staff	Male	Alert call
E	support staff	Male	
K2	support staff	Male	
S	management staff	Female	
T	support staff	Male	
N	support staff	Female	
G	support staff	Male	Alert call

*Support phone is a kind of cell phone you need to take back home and wait for the urgent call during a 24 hours period.

6. Findings

6.1 IC plays a critical role in social eco-system.

Guthrie et al. (2012) emphasize that the third stage of IC research is still seeking critical views. Wasiluk (2013) further supports that “if the critical approach to practice is the way forward for the field of IC research, then people must also critically examine the rationale for studying the practice of corporate sustainability in organizations”. From the empirical data collected as shown in Table III, they clearly show that IC in the organization plays a critical role in offering good quality in an employee’s life.

A very interesting example is that the modern technology sometimes increases the working efficiency but sometimes, it can also be a kind of barriers that obstructs the enjoyment of life.

One employee said this,

“Actually, there is no broadband in my home (smile herself), you know, I am an IT staff, I don’t have the Internet in my home. But now you can still check the Email at home. It is fine if I receive a normal working email, but if I receive an urgent one, my quiet life in home is destroyed. (see more examples in Table III)”

Meanwhile, the critical perspective makes invisible IC visible. For instance, different employees have different requirements and views for the workplace location.

P said that *“One of the reasons to work here is that it is very convenient to go many places, like shopping”*. However, R said that *“the office is far from my home but the environment around my flat is good, of course, it is cheaper than the flat near to the office”*. K argued that *“it takes so much time on the way to office, so work at home will be better”*.

From these seemingly conflicting, the role of IC in the individual, enterprise as well as society level (Chatzkel, 2004; Edvinsson, 2013) is presented clearly. IC not only has the impact on the organization (Guthrie et al., 2012), but also has effect on the healthy development of the whole social system (Edvinsson, 2013)

6.2 IE can be used as a strategy making invisible visible

In this research, institutional ethnography (IE), a sociological method of inquiry, is first being used to explore the role IC plays in the employees’ everyday life in both internal and external organization (Smith, 2006). Interview is the main inquiry technique for the people’s daily life. In the process of using IE, autoethnography is used as the

entry point (Taber, 2010). This innovative design moderates the problem of conventional qualitative research methodology such as questionnaires (Alvesson & Deetz, 2000, pp. 55-56), which ignore the “specific case” and interview (Krippendorff, 2012) through which the interviewees may merely say what the investigators would like to hear. Meanwhile, this design bridges academic and practice by sharing the same experience.

Furthermore, this strategy can also facilitate the research more sustainably and deeply. For example, after the 2nd interview with R, the author shared that her hobby is playing badminton. Accidentally, R organizes the colleague’s badminton team. So R invited her to join in their Badminton gathering next week. Then she has the opportunity to explore more related to the actual experience of their life.

Another interesting example, E is a busy programmer. But after I shared with him about her research and, he said to me that:

“If you can speak Cantonese, I can tell you more. “

Obviously, if she can speak Cantonese, she can get more data.

K2 is quite stressed in the new team, as both of us are Christian, so we have some topics with common interest. At the end of interview, he said that:

“I am quite grateful for your listening to my stories. “

After she shared the travelling experience with H, She said that:

“I admire your travelling experience greatly, I also would like to travel, you know, I like travel very much, but I don’t have much annual leave.

Thus people know that, if there is more annual leave, H can have more opportunities to travel.

On the other hand, this strategy is a good strategy for IC management. Chatzkel (2004) argues that “continuing dialogue between practitioners and academics” is needed to help IC move through the crossroads of relevance. Dumay and Rooney (2011) and Dumay and Cuganesan (2011) proposed the function of narrative in terms of improving the relevance of IC. The autoethnography which weaves narrative helps the seniors to get the employees’ actual experience of IC in the organization. Then with the utilization of IE as a methodological framework, the relevance of IC in the whole social system can be critically visualized (Breitkreuz & Williamson, 2012).

At the end of research, the managers communicated with the author that,

“We hope can get some data from you to understand our employee’s working status and requirements, as they may like to talk with you about some issues, but they may not

like to talk with us. Even though, we don't have the hierarchy concept in our seniors' mind. We hope to listen to them and help them. "

Thus, it can be seen that the strategy of this research can also be used as a kind of IC management technique rather than merely a research strategy.

Table III Web of life index in ITS

Social relations	Good	Bad	IC related concept
Personal issues	<ul style="list-style-type: none"> I can eat breakfast in the canteen in the same building There are very good equipment you can use to play sports 	<ul style="list-style-type: none"> The pantry is dirty, as everyone can enter and use it. As too many people use pantry in the morning, I have to come to the office a little earlier. The air-conditioner is too cold The coffee machine is for customers not for us (staff). 	Workplace design
Family/home	<ul style="list-style-type: none"> The office is near to my home The office is far from my home but the environment is nice Both my sister and I study IT; sometimes we discuss work in home; we can help each other The technology is so easy that you can check email at home 	<ul style="list-style-type: none"> The office is far from my home There is no Broadband in my home as I don't want to work at home The technology is so easy that you can check email at home but it will affect my relaxed lifestyle if I receive a urgent work email I hope I can work at home when my family is ill. It takes so much time to travel to office, so work at home is better 	Location of office, skills, technology
Boss	<ul style="list-style-type: none"> The big boss comes to me directly to help resolve the problems, it is a little strange to me but I feel good. 	<ul style="list-style-type: none"> The boss does not know how long the work will take, so they just issue the order and then my life become stressed Their supervisor don't allow chatting in the office 	Hierarchy, Culture

Colleague	<ul style="list-style-type: none"> • I eat lunch with my colleague and chat with them • I can talk with my colleagues 	<ul style="list-style-type: none"> • I have no friends in the office • The system is not designed by me, so sometimes it brings trouble for me. • Sometimes, my colleagues talk with me, so the efficiency is low. 	Culture
Friends	<ul style="list-style-type: none"> • I have time to eat lunch with my friend 	<ul style="list-style-type: none"> • I have no friends in the office 	Routine & Culture
Community	<ul style="list-style-type: none"> • I go to travel with my friend in the church by using my leave. • The opera class help me to reduce my stress so that I can come back to encourage my employees. 	<ul style="list-style-type: none"> • I am too busy to attend the church on weekends 	Routine
Shopping, bank	<ul style="list-style-type: none"> • One of the reasons to work here is that it is very convenient to go many places, like shopping, etc. 	<ul style="list-style-type: none"> • The house around is very expensive 	Location of office

7. Conclusions

In this study, an IC eco-system is virtualized to some extent from the perspective of sociology. Through using IE as the research framework, the empirical data of IC eco-system are collected. The web of life, mapped by combining the “work” and “rules of relations”, presents the critical function of IC in terms of living a good life in the social eco-system stage. The good quality of life is also described to some extent. Among several roles in daily life, it is interesting to see that the role of an “employee” is merely one of many other roles a human being often assumes. Such roles may be parents, children, spouse/girl/boyfriends, roommates etc. It is seen that a good employee in no way guarantees “goodness” of other roles. Thus, good quality of life cannot be guaranteed by any single facet. Therefore, IC management in the organization cannot merely focus on how to cultivate the good employees, or the good quality of employee’s life cannot be guaranteed.

Meanwhile, in the implementation of this strategy, on the one hand, the practitioners can use the autoethnography to understand themselves, and the web of life constructed also can be put into the management practice. Researchers, on the other hand, can get a good opportunity to enter into the field to see the actual experience of investigating targets. Thus, this is also a good strategy to bridge the research and practice.

However, the research methodology first introduced into IC research still needs to be further refined. Furthermore, real time and comprehensive visualization of the eco-system are also needed to appraise IC holistically and continually by consolidating and analyzing the collected empirical evidence.

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Towards a General Performance and Impact Measurement System of the Technological Districts (TDs): Implications for the Decision-makers

Antonio Lerro *

Department of Engineering, University of Roma 3
Via della Vasca Navale 79, 00176 Roma (Italy)
Department of Mathematics, Computer Sciences and Economics
University of Basilicata, Viale dell'Ateneo Lucano
85100 Potenza (Italy)

Francesca A. Jacobone

Department of Engineering, University of Roma 3
Via della Vasca Navale 79, 00176 Roma (Italy)

** Corresponding author*

Structured Abstract

Purpose – This paper presents the first results of an ongoing research project aimed to define a general model to identify and assess performance and impacts of the Technological Districts (TDs). In particular, the idea is to provide a methodological framework, a system of indicators and a set of related tools able to drive the evaluation, the management and the reporting of the performance and the impacts of the TDs. The logic of the work is to define a model that may be objective, rigorous and able to become standard according to scientific, operative and methodological perspectives.

Design/methodology/approach – At strategic level, the adoption of an integrated and multidimensional approach has been used for the elaboration of the general model. In particular, the model of the Strategy Map (Kaplan and Norton, 2000) has been coherently declined for a TD; the dimensions of performance and a set of scorecards have been defined and then integrated systemically in the unique and coordinated framework of the Strategy Map. Specifically, great attention has been paid to avoid confusion on contents and methods as well as avoiding overlapping of economic, financial, managerial performance and impact dimensions that often have characterized the academic and policy literature.

Originality/value - This paper contributes at theoretical and practical level to improve the managerial and policy methods and tools to identify, assess, manage and report the performance and the impact of the TDs. Till now, in fact, it is possible to trace a lot of “cold fusions” about frameworks, aspects, dimensions, metrics, often very different among them and difficult to integrate and to become a general modeling. The originality and the value of the paper resides then in its attempt to improve and to let more shared

and transparent the informative quality on which the TDs are called to operate and report to the stakeholders, in particular regulators and public organizations.

Practical implications – The definition of this general model has also the objective to support the elaboration of a structured set of managerial and policy implications able to drive respectively the management in the strategy formulation and implementation, as well as in the actions for the performance improvement, and the decision-makers in the elaboration of effective policies of development and correct evaluation of the impact of the TDs on the different places.

Keywords – Technological Districts; Performance; Impact; Models.

Paper type – Academic Research Paper

1. Introduction

During the last decade, the Technological Districts (TDs) have gained more and more importance as elements of economic development and innovation strategies of the European Union (EU) and relatives Member States (Lerro and Jacobone, 2013).

However, after years of TDs' promotion and support, the performance, the effects and the impacts of the TDs still require a specific attention. In fact, both policymakers and programme owners on one side and TDs' meta-management structures and TDs' stakeholders are increasingly searching shared models and tools on identifying and assessing how the desired effects and impacts have to be achieved and what kind of policy and managerial actions have to be elaborated and implemented to lead to more effective and efficient outcomes.

Unfortunately, the novelty of the form of TDs and the high attention and pressure they have received has determined a sort of "measurement mania" of their activities but not linked to a strategic approach about the assessment and the evaluation of their performance and impact. Measurement mania is the obsessive creation of measures for everything, usually resulting in such a confusing picture. It is often driven by the mantra "what gets measured gets managed". As a result, everything gets measured and determines the tyranny of measures and targets as obsessive compulsive disorder for decision-makers and consequently for TDs' meta-management structures and TDs' stakeholders. Often, these dynamics creates conflicts and confusion and may create dysfunctional behaviours to reach inappropriate objectives and targets: it is common the case of asking measures and other information that have no relevance to those who need to provide or use them.

Having a strategic approach to the performance measurement and management may help to avoid this kind of problem and drive in a better way the TDs' stakeholders to maximize the effects and the impacts of their actions and resources.

According to Kaplan and Norton (2000), this paper is about strategy mapping elaboration and application to the TDs aimed to represent the logic and operative meta-model for their performance and impact evaluation.

Strategy mapping provides a clear line of sight into how TDs stakeholders' activities and tasks are linked to the overall objectives of the TD, enabling them to work in a coordinated, collaborative fashion toward the TD's desired goals. The map provides a visual and a logical representation of the TD's critical objective and the crucial relationships among them that drive organizational performance.

2. Why strategy maps? General structure and mechanisms

The strategy maps show how organizations and systems of organizations at private, no profit, and political level plan to convert their various assets into desired outcomes and then assess performance and impact deriving from the execution of their strategic planning. (Kaplan and Norton, 2000). In general terms, the template of a strategy map provides a common framework and language that enables an organization to describe and illustrate clearly its objectives, initiatives, and targets; the system of dimensions, indicators and measures used to assess its performance; and the linkages that are the foundations for strategic direction (Kaplan and Norton, 2000).

The best way to build strategy maps is from the top down, starting with the destination and then charting the routes that will lead there. Corporate executives should first review their mission statement and their core-values. With that information, managers can develop a strategic vision, or what the company wants to become. This vision should create a clear picture of the company's overall goal. A strategy must then define the logic of how to arrive at that destination (Figure 1).

Building a strategy map typically starts with a financial strategy for increasing shareholder value (no profit, governments units and systems of organizations often place their customers, stakeholders or constituents – not the financials – at the top of their strategy maps). Usually, companies have two basic levers for their financial strategy: revenue growth and productivity. The former generally is about how to maximize revenue

from new markets, new products, new customers, and increasing value to existing customers. The productivity strategy also usually has two parts: improve the company's cost structure by reducing direct and indirect expenses, and use assets more efficiently by reducing the working and fixed capital needed to support a given level of business.

Accordingly, attention is paid then to the customer perspective. It is widely recognized that the core of any business strategy is the customer value proposition, which describes the unique mix of product and service attributes, customers relationships and corporate image that a company offers. The value proposition is crucial because it helps an organization connect its internal processes to improved outcomes with its customers.

Once an organization has a clear picture of its customer and financial perspectives, it can then determine the means by which it will achieve the differentiated value proposition for customers and the productivity improvements to reach its financial objectives. The internal process perspective captures these critical organizational activities, which may fall into sub-level processes to reach operational excellence, by improving supply chains management, costs, quality and cycle time of internal processes, asset utilization and capacity management.

Finally, the strategy map has the learning and growth perspective, which defines the core competencies and skills, the technologies, the know-how at the basis of an organization's strategy. These objectives enable a company to align its intellectual capital with its strategy.

Summarizing, strategy maps help organizations view their strategies in a cohesive, integrated and systemic way. A strategy implies the movement of an organization from its present position to a desirable but uncertain future position. Because the organization has never been to this future place, the pathway to it consists of a series of linked hypotheses. A strategy map specifies these cause-and-effect relationships, which makes them explicit and testable (Kaplan and Norton, 2000).

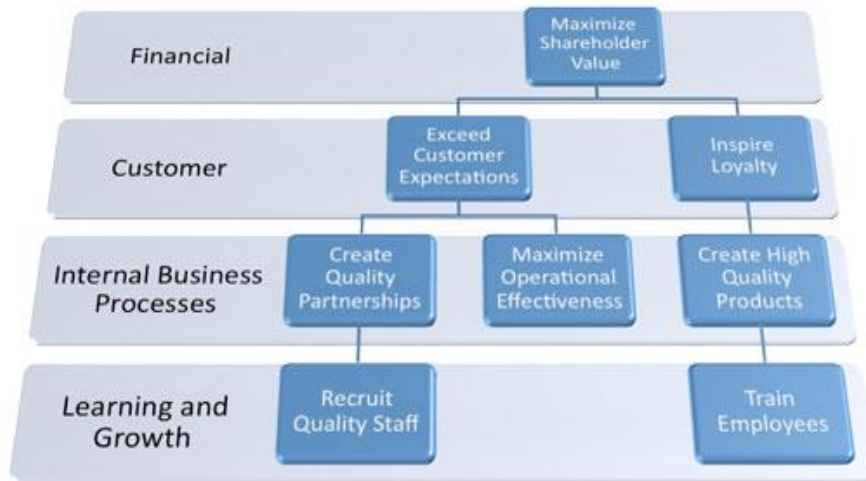


Figure 1. A general scheme of the Strategy Map at company level

3. Defining a Strategy Map and a Performance Measurement and Management System for assessing Technological Districts

Although the emphasis on knowledge and science-based resources has strongly contributed to create a wide acknowledgement of the strategic role of the TDs for the development paths at national and local level, there is still a need for a better understanding about the impact activated by the TDs as well as the assessment of the TDs performance. As Bonaccorsi and Nesci (2006) outline, engineering and orchestrating the creation and the development of TDs is not an easy task to undertake. First of all, there is the open issue of characterizing properly a firm as technology-driven (Grinstein and Goldman, 2006). Moreover, besides a strong attention to the economic and productive aspects, it also requires a new understanding and perspective about the identification, the role and the networks of the stakeholders, the governance structure and the managerial approaches aimed to identify and assess TDs performance as well as their impact on territorial development paths. All this in order to better define, implement and re-frame policies, programs and projects for the TDs aimed to effectively support the development dynamics. Despite this importance, models, frameworks, approaches, tools and indicators aimed to properly identify and assess strategic and operative dimensions of the TDs are still missing. The following subsections aim to fill these gaps.

3.1 TD's performance measurement and management models: the state-of-the-art

The issue about how an organization identifies a set of measures that reflects the performance it is trying to achieve is a common theme in the economic and managerial literature. Numerous frameworks have been proposed according to which organizations should follow in order to design and implement performance measurement systems (Kaplan and Norton, 1996; Neely, 2002; Neely et al., 2002 and many others). The objective of such frameworks is to help organizations to define a set of measures that reflects their objectives and assess their performance appropriately (see Neely, 2002 for a review). However, it is possible to state that the same attention and the same effectiveness in elaborating and applying strategic performance management and measurement systems has not been paid about organizational systems more complex to model and assess, such as clusters, innovative networks, technological districts and *similia*. This is probably linked to the nature and the specific features characterizing these complex organizations – i.e. the role of the stakeholders involved (big companies, Small and Medium Enterprises (SMEs), Universities and research centers, public institutions, governments and policy agents, banks and investors, local communities), the role of the governance model, the political constraints, the issues about the Intellectual Property Rights (IPRs), the ways to access to funding - that let more difficult the applicability of managerial models, techniques and tools create and traditionally and successfully applied on profit companies.

In the last years, in particular in the EU and in the Italian context, there have been different attempts to elaborate and propose models and scorecards to identify assess and report TDs' performance (EU Innovation Scoreboard, the EU Regional Innovation Scoreboard, the European Report on Science & Technology Indicators, ESCA). For example, the German Institute for Innovation and Technology (2011) as part of the VDI/VDE Innovation +Technik GmbH, in the context of the project "*Expertise on developing a common evaluation/benchmarking system for all Hamburg clusters*" has elaborated a Cluster and Network Evaluation Model, Indicators groups and traits of methodologies for the evaluation of clusters and networks. It addresses specifically three different "subjects of evaluation" such as cluster policy, cluster management, and cluster actors, and is based on the consolidated assumption that there is a link between input,

produced activities directly linked to the measure (output) and intended results that occur within the target group (outcome).

The Italian Agency for the Diffusion of the Technologies for Innovation (2012) in its report “Indicatori di risultato intermedi per misurare la performance di Distretti Tecnologici e Poli di Innovazione – valutazione di impatto: metodi ed esperienze” provides an analysis of the methodological stages to develop a system of indicators to assess TDs’ performance as well as a synthetic picture of an economic and managerial model grounding the set of the indicators. Moreover, various regional institutions in Italy – within their industrial policy planning - have tried to elaborate, develop and apply grids and scorecards aimed to assess TDs’ performance; particular attention has been paid on the TDs based at administrative level in their territorial borders: for example, in the last years, the Regional Agency for Technologies and Innovation of the Puglia Region (ARTI Puglia) has been strongly involved in these issues.

Although these appreciable attempts, the issues still presents different weaknesses and challenges to be addressed. Many institutions have built grids, or even scorecards, not strategy maps able to effectively model the TDs nature, properties, and specific objectives to be reached and assessed through the performance system. Moreover, it is possible to trace a sort of confusion on contents and methods as well a recurring overlapping of economic, financial, managerial performance and impact indicators characterizing a TD. Another limitation occurs when institutions have built key performance indicators (KPI) scorecards. For example, they reveal several missing components: no stakeholder requirements-oriented measures, common use of single process metrics often focused on initiatives and not on outcomes and impacts, no defined role for organizational competences and intellectual assets, a strange omission of the identification and the measurement of relevant meta-organizational processes. In actuality, KPI scorecards seem more a confuse collection of measures, a checklist, or perhaps elements in a “scheme” useful for political affairs rather than tools to collect relevant data to support decision-making activities. In other words, they do not describe strategic plan and often do not reflect the working mechanisms of the TDs and therefore in different cases KPI can be a dangerous illusion to assess TDs’ performance. Moreover, the different policy and normative constraints according to which TDs normally work – for example ways to access to funding, constituency, weight of the public actors in the governance models,

problems related to the IPRs – are not considered properly according to the effects they generate in practice.

The main challenge, then, is to elaborate and use a general model able to incorporate strategy and performance measurement and management systems but declined coherently in accordance to the particular characteristics of the TDs. In particular, the idea grounding this paper is to provide a general model, a methodological framework, a scheme to define a system of indicators and a set of tools able to drive the evaluation, the management and the reporting of the performance and the impacts of the TDs. The logic of the work is to define a model that may be objective, rigorous and able to become standard according to scientific, operative and methodological perspectives.

3.2 Aims and properties grounding the elaboration of a new model for the strategic performance measurement and management of the TD: the methodological background

At methodological level, the elaboration of a new model for the strategic performance measurement and management of the TD has been driven by the following considerations:

- *Applicability and validity for the evaluation of any TD:* the modeling has to be applicable to any TD and had to integrate potential heterogeneity regarding criteria such as industry sector, size, age, governance structure, places, etc. The aim is to find a balance between the need of any single TD to have specific and context-related value/performance dimensions and indicators and common overall value/performance and indicators applicable to any TD;
- *Clarity of the contents:* the model has to pay great attention to avoid confusion on contents and methods as well as avoiding overlapping of economic, financial, managerial performance and impact dimensions that often have characterized the academic and policy literature about the performance and impact measurement systems of the TDs;
- *Model design:* the model has to be able to collect, elaborate and report both quantitative and qualitative data and information; in case relevant information cannot be integrated in the general model, to avoid confusion and overlapping of

different issues, these information had to be provided in separate but related frameworks and schemes;

- *Decision-making orientation:* the model has to be a decision-making tool supporting managerial, policy and political choices. It should be also a self-evaluating and learning tool able to drive performance improvement paths;
- *Integration, modularity and scalability:* the model has to lever the strengths and the relevant contents of the previous existing models, scorecards and grids already provided by literature and practice, but it has to integrate them in a more effective, rigorous and TD-oriented meta-model. It has to be thought according to modules letting a scalability of the level, intensity and extension of the analysis;
- *Usability and efforts:* the model has to avoid not useful and redundant questioning and has to consider always the decision-making orientation. The effort both for the actors involved in collecting data and receivers of the data have to be reduced to a minimum. The search of a right balance between the interest in revealing the “full picture” of the phenomena and the related efforts on times, costs and resources has to be strongly considered;
- *Commitment and involvement of the stakeholders:* the model has to forecast open and transparent processes to achieve desired validity of results and acceptance of the stakeholders involved. Thus, stakeholders groups should be included in the process of elaboration and sharing of the model;

3.3 The Strategy Map applied to a TD: the theoretical background

According to the nature and the characteristics of the TDs as well as their specific needs of performance assessment, the model of the Strategy Map (Kaplan and Norton, 2000) has been selected and adopted as the conceptual model driving the strategic performance measurement and management system and related indicators for the evaluation of the TDs.

The fundamental assumptions grounding the adoption of the Strategy Map for a TD can be summarized as in the following (Figure 2). In order to maximize its impact, TD has to achieve and maintain high performance. Improving TD’s internal performance equal an increase in the value generated for the key stakeholders of the TD. The generated

value is the result of TD's ability to manage its key internal and external processes and functions. The effectiveness and the efficiency of performing internal and external processes are based on TD's competencies and particularly on the core competencies of the TD's key-stakeholders. The quality, effectiveness and efficiency of the TD's competencies are based on the knowledge assets of the stakeholders of the TD (the group of the knowledge assets are commonly synthesized in the notion of Intellectual Capital).

It is important to underline that the identification of the stakeholders' requirements and the value generated for them is a critical step in institutionalizing strategy and performance orientation at TD level, since the way to intend performance and value creation and the level of priority to which any single stakeholder is interested to develop and gain benefits can be very different (Lerro and Jacobone, 2013). For this reason, it is necessary to integrate and coordinate the single actions and decisions of the stakeholders through different kinds of policy actions aimed to balance potential disequilibria. Policy-makers' decisions and actions play a fundamental role. They are increasingly called to a pro-active role in order to really contribute to achieve TD's targets and performance improvement through the definition, the support, the implementation and the control of political choices in function of the stakeholders' aims as well as of the whole national and regional industrial and research policies.

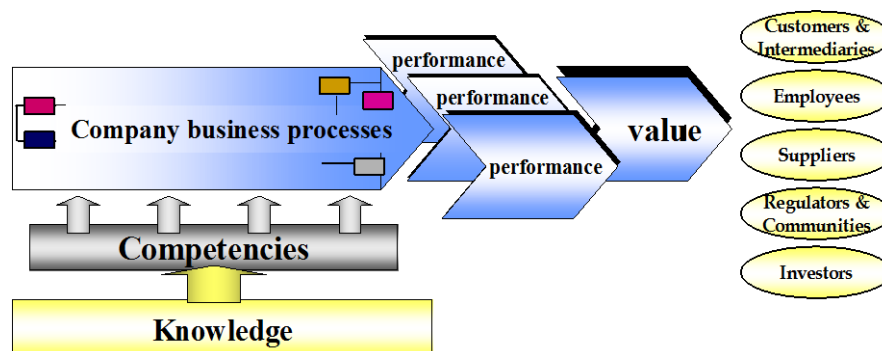


Figure 2. Basic theoretical scheme grounding the adoption of a Strategy Map for a TD

According to the previous basic theoretical scheme, a Strategy Map for the TDs has been elaborated. The model is finalized to analyse how TD's components, independently, complementarily and interactively, may or may not enhance the value creation capacity of

the TD. A better understanding of the cause-effect relationships between the TD's components has to drive the elaboration of the performance measurement and management system of the TD.

As depicted in Figure 3, the Strategy Map applied to a TD is composed by four levels of analysis. Following a top down logic, they are I) Stakeholder Value and Performance, II) Organization Processes, III) Organization Competences, and IV) Organization Intellectual Capital (Figure 3).

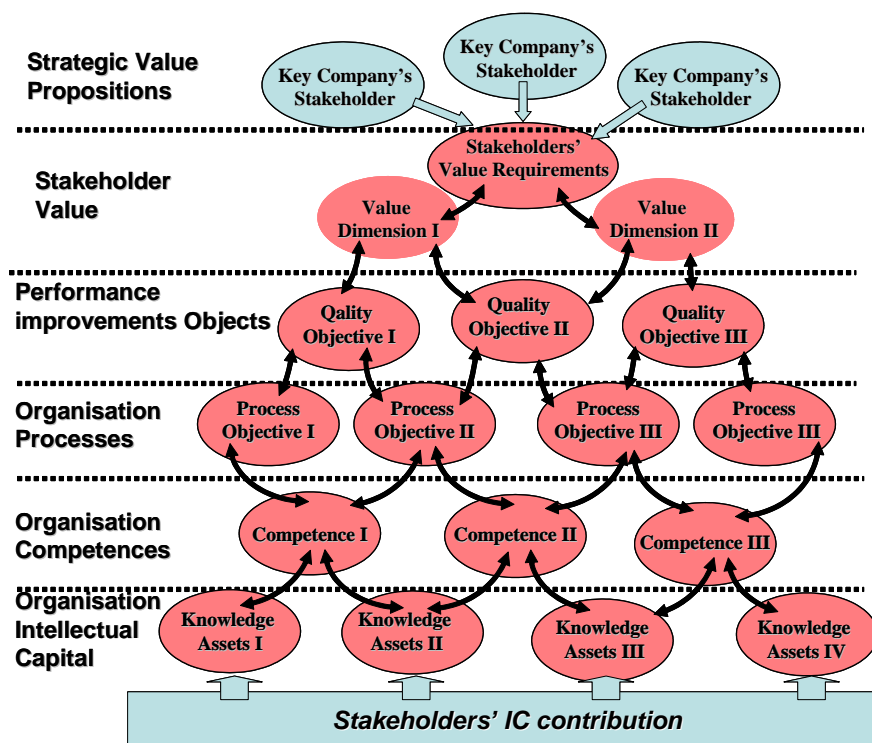


Figure 3. A Strategy Map applied to a TD

The choice to adopt the Strategy Map as conceptual framework for defining specific TDs performance indicators is motivated by different managerial and operative reasons. In general terms, it seems to emerge as the “best” model addressing the needs presented in the previous sections being able to fill the different gaps identified both in literature and practice.

First of all, the Strategy Map permits to link effectively strategic vision and performance measurement. Moreover, it is a flexible model that may be easily used in different context of application thanks to the possibility and the easiness to decline its general perspectives.

Moreover, it considers not only the financial figures of the performance, but it considers a wider approach, adopting a stakeholder centric view of performance measurement and management according to the notion of value. This could be particular relevant for a TD in which, as highlighted before, stakeholders act as constituent and fundamental element. Finally, the structure of the Strategy Map fits optimally to the real operative activities of the TDs as well as it permits to effectively and directly define TDs' performance indicators, enabling all measures to be mapped on to it so that gaps in measurement can be identified. All these reasons determined the opportunity and the convenience to adopt the Strategy Map as model grounding the performance measurement and management system of a TD.

However, in order to make it operative, i.e. to be used as a real performance measurement and management tool, its different level of analysis and related performance dimensions need to be populated with a set of indicators in order to build an informative base to design, communicate, implement and review policies and actions aimed to check, develop and manage TDs activities. This determines that the Strategy Map, in order to be practically applied as assessment tool for the TDs, has to be integrated with a dedicated measurement system, i.e. a systemic body of metrics to perform a qualitative and a quantitative evaluation. Accordingly, a related Balanced Scorecard can be effectively used (Figure 4.). However, despite the different attempts to provide a common informative base for the assessment of the TDs, there is still a lack of consensus about the measures to be adopted for assessing the TDs. This is a particular important issue, since the definition of a list of standard measures can benefit both the assessment of the TDs at national level, and the benchmarking evaluation at international level.

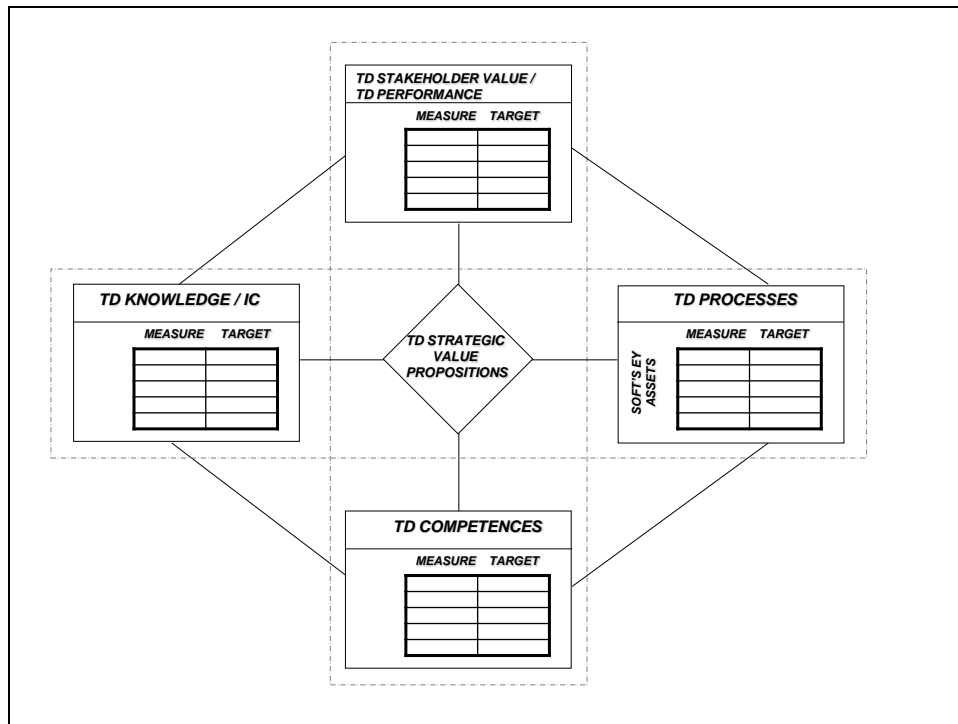


Figure 4. A Balanced Scorecard applied to a TD

3.4 The Strategy Map applied to a TD: a first case example

A main aim of this paper is to contribute to an improved and more transparent understanding about TDs' strategic performance measurement and management. According to the theoretical background as well as to the practical needs, a first case example of a Strategy Map for the TDs is presented. The main issues of each level of analysis of the Strategy Map are introduced as follows:

Level: Impact

- Maximizing the positive impact at industrial, socio-economic and employment level, both on the territorial system and on the sectors referred to the TD;
- Accelerating the structural processes for the growth of the national and regional economic systems;

- Supporting the strategic programs about research, technological development and innovation aligned and coherent with the strategic agendas at European Union (i.e. Horizon 2020) and global level;

Level: Stakeholder value

- Big companies: exploiting technological assets and IPRs within projects of development and collaboration with SMEs and research centers; optimizing patents' portfolio, capitalizing no-core patents; reinforcing their supply chains with excellent SMEs;
- SMEs: addressing markets for their technological assets; achieving critical level of funds to finance R&D activities; overcoming their limited capacity of market and technological intelligence; improving their attitude to buy technologies and patents;
- Research Centers/Universities: delivering quickly their inventions and innovation to the market; improving their capacity of technological transfer; overcoming the lack of processes and systems of asset management; reinforcing applied research; accessing to financial resources;
- Banks/Investors: allocating funds on companies and technologies more promising; sustaining development and performance of their customers; innovating their portfolio of financial services;
- Public institutions: protecting and extending employment; allocating public resources to more promising sectors; developing territorial system;
- Meta-management structure of the TD: supporting economic and not economic performance of the members of the TD; accessing to financial resources to manage operatively the TD;

Level: Performance

- Quality of the industrial research;
- Quality of the technological transfer;
- Accelerating the innovative dynamics in the TD's sector and the transferring of the outputs to the market;
- Promoting and sustaining the creation of new companies technology-driven (start-up; spin-off);

- Optimization of the public financial resources and capacity of attraction of financial capitals and private investors;

Level: Processes

- Elaborating and providing innovative, value-added and high quality services, both for TD's members or not; Effectiveness and timing of the new services development and management;
- Enhancing the relationships among research, companies, banks and investors, and territorial system; Extension, effectiveness and timing of the networking processes management;
- Stimulating participation, coordination and the kick-off of initiatives and projects at national and international level in the specific sectors of the TD; Effectiveness and efficiency of the projects management (from call to close);
- Promoting connections of all the players and actors operating in the supply chains of the specific sector of the TD; Extension and effectiveness of the supply chains management;
- Effectiveness of the TD's governance model;
- Extension, effectiveness and timing of the internationalization processes management;
- Effectiveness and benefits provided by TD's operative support to the national and regional politics and policies about industrial and research issues;
- Extension, effectiveness and timing of the research activities developed by the TD;

Level: Competences

- Capacity of managing the specific network of the TD - at operative, technical, scientific and policy level;
- Capacity of collaborating with other relevant national and international TDs;
- Capacity of managing applied and industrial research at project, prototyping and operative level;
- High competences on project management and technological marketing;

- High competences at technical and organizational level of the meta-management structure of the TD;
- High competences about industry intelligence, market research, technology intelligence, competitive intelligence, valuation, valorization strategy, monetization and financing, performance monitoring about intangible and intellectual property assets;

Level: Knowledge/Intellectual Capital

- High-skilled human resources among the TD's stakeholders/capacity to attract talents;
- Quality of the training activities provided by the TD;
- Endowment and use of knowledge management tools (databases; social networks; ecc.);
- Specific know-how of the TD;
- Endowment and use of R&D tangible and intangible infrastructures;
- Access to relevant industry-oriented and research-oriented dataset;
- Creation, development and exploitation of a TD's "brand";
- Reputation and business ethic; TD's culture;

4. Conclusions

This paper has presented the first results of an ongoing research project aimed to define a general model to identify and assess performance and impacts of the Technological Districts (TDs). In particular, the model of the Strategy Map (Kaplan and Norton, 2000) has been coherently declined for a TD. Specifically, great attention has been paid to avoid confusion on contents and methods as well as avoiding overlapping of economic, financial, managerial performance and impact dimensions that often have characterized the academic and policy literature.

This paper contributes at theoretical and practical level to improve the managerial and policy methods and tools to identify, assess, manage and report the performance and the impact of the TDs. Till now, in fact, it has been possible to trace a lot of "cold fusions" about frameworks, aspects, dimensions, metrics, often very different among them and

difficult to integrate and to become a general modeling. The originality and the value of the paper resides then in its attempt to improve and to let more shared and transparent the informative quality on which the TDs are called to operate and report to the stakeholders, in particular regulators and public organizations. Of course, it is possible that the paper pays a sort of disadvantage of the first moving about multifaceted issues on which a complex and strong debate at academic, political and policy level is still working. So, we recognize some limitations of this study in order to drive further research on the issues, at academic and practical level. Among them, particularly important in the future researches will be the definition and the selection of the detailed indicators to operationalize the different level of analysis identified in the Strategy Map declined for a TD.

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Towards a Smarter Work? Unpacking Complementarities between ICT Adoption, Human Resource Practices and Office Layout

Elisabetta Raguseo^{*}, Paolo Neirotti, Emilio Paolucci

Department of Management and Production Engineering
Politecnico di Torino, Corso Duca degli Abruzzi, 24 – 10129, Turin

Luca Gastaldi, Mariano Corso

Department of Management, Economics and Industrial Engineering
Politecnico di Milano, Via Lambruschini, 4b (Building 26b) – 20156,
Milan (Italy)

Antonella Martini

Department of Electrical Systems and Automation
University of Pisa, Via Diotisalvi, 2 – 56126, Pisa (Italy)

** Corresponding author*

Structured Abstract

Purpose - This paper investigates Smart Working (SW), a set of modern and non-conventional organisational models that are characterised by high flexibility in the choice of the working spaces, time and tools, and that provides all employees of a organisation with the best working conditions to accomplish their tasks. Specifically, the paper aims to: (i) identify whether firms adopt different SW models: (ii) explore complementarities between the elements that can lead to choose a SW model, and (iii) figure out whether contingent variables matters in the implementation of a particular SW model.

Design/methodology/approach - This study is based on a continuative research initiative promoted since 2012 by the School of Management of Politecnico di Milano, i.e. the Smart Working Observatory. In order to achieve the paper goal, during 2013 we have run a survey delivered to 100 HR directors of medium and large Italian organizations to collect empirical evidence on SW phenomenon, and accomplished multiple, embedded case studies to better explain the findings achieved in the quantitative analysis.

Originality/value - The paper aims to look inside the black box of SW, by unpacking the elements that can generate complementarities between the adoption of digital tools, workplace and work practice innovation.

Practical implications - Managers who aim to fully benefit of SW practices should not only invest in the enabling digital technologies, but also make the complementary trans-

formations in organisational policies and workspace settings, according the contingent conditions under which they operate.

Keywords - Smart Working, ICT, Physical Workplace, Work behaviour, Performance.

Paper type - Academic Research Paper

1 Introduction

The methods and the tools through which work practices are accomplished have changed dramatically in the last decade (Hamel, 2012). Successful organizations are increasingly characterized by the ability to abandon now inappropriate working configurations (Birkinshaw et al., 2008) to support new organizational principles, such as emerging collaboration (Vlaar et al., 2008), autonomy in the choices of work settings (Leonardi and Balley, 2008), talent enhancement, responsibility and widespread innovation (Hamel, 2007).

According to Birkinshaw (2010), if, on the one hand, organizations tend to manifest inertial behaviours in dealing with this paradigm shift, on the other hand, they are consistently looking for elements to balance new business targets with the evolving needs of their employees (Leonardi, 2011). In fact, the generation of value within the business domain is no longer linked only to insightful business models (Gunther McGrath, 2013), but also to how employees actually create, perceive, realize, defend and evolve these business models in day-by-day activities especially in highly turbulent competitive environments (Brown and Eisenhardt, 1998).

Actually, most of the innovation potential of employees remain unexpressed due to inappropriate organisational models (Oksanen and Stähle, 2013), and an increasing number of firms are rethinking these organizational models, referring to the emerging ones with the term ‘Smart Working’ (SW) (Plantronics, 2014). Specifically, a SW corresponds to non-conventional organizational models that are characterized by higher flexibility and autonomy in the choice of working spaces, time and tools, and that provides all employees of an organization with the best working conditions to accomplish their tasks.

Thanks to the development and diffusion of digital technologies, along with the increasingly pervasive dissemination of powerful and easy-to-use mobile devices, firms can be supported in the progressive implementation of a SW model (Ahuja et al., 2007). However, digital levers could be necessary but not sufficient in realising the innovation potential associated to SW. Based on these considerations, this paper aims to look inside

the black box of SW, by unpacking the elements that can generate complementarities between the adoption of digital tools and innovations of organizational models. Specifically, the purpose of this paper is threefold: (i) identifying the different SW configurations adopted by firms; (ii) exploring complementarities between the elements affecting these configurations; (iii) figuring out whether contingent variables matters in the implementation of a SW model

The paper is structured as follow. In paragraph 2, we discuss the theoretical background. In paragraph 3, we show the research methodology and the data measures used to collect and analyse empirical facts on SW phenomenon. In paragraph 4 we discuss the key findings of the quantitative and qualitative analyses. Finally, we conclude the paper with empirical and theoretical implications of the findings and directions for future research that it could be interesting to pursue.

2 Theoretical Background

The development and diffusion of digital technologies (especially those supporting communication, collaboration and social network creation), along with the increasingly pervasive dissemination of powerful and easy-to-use mobile devices, can support organizations in developing a SW system (Ahuja et al., 2007). While recent literature has analysed how IT has made work more portable and ubiquitous (e.g., Yoo et al., 2010), there is not yet a comprehensive understanding and empirical evidence of the existence, if any, of complementarities between elements on which firms should focus in case want to adopt a SW organizational model.

According to a preliminary analysis of the organizational, IT and managerial literature (Mann, 2012), the three elements that can constitute a SW model are: (i) the usage of ICT-based solutions (*ICT element*); (ii) the innovations in the human resource practices and in the organizational model (*HR element*); and (iii) the reconfiguration of the workplace and of the office layout (*layout element*) (

Figure 1 – *Elements of a SW organizational model*
)

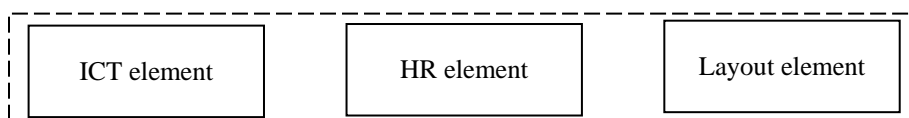


Figure 1 – *Elements of a SW organizational model*

These three elements can allow firms to adopt a SW model for different reasons. First, IT solutions, especially the collaborative ones, allow groups to share more easily files, information and ideas (Chudoba et al., 2005). In such a way, all employees can interact in real time in a flexible and effective way by contributing to a SW environment. Second, changes in the HR practices can be introduced when a new organizational model is chosen, as SW is. Specifically, change management actions for managing the organizational models chosen can be applied by the organizations (Cameron and Green, 2012), such as training programmes for the middle and top management, training for the end users, new communication plans, new management by objectives processes systems, projects of cultural change, or processes' reorganization. Third, recent works emphasize the importance of promotion strategies in spatial reconfiguration of the office layout (e.g. Smith et al., 2013). In this way, employees can increase their productivity and can manage better their work-life balance. Therefore, particular office reconfigurations may lead to innovative ways of collaborating with others and thus simplifying the development of a SW model.

3 Methodology

This study is based on a continuative research initiative promoted since 2012 by the School of Management of Politecnico di Milano, i.e. the Smart Working Observatory, which is focused not only on analysing the SW phenomenon as well as its impacts on organizations' performance, but also on supporting organizations in the progressive implementation of SW models. Refer to Gastaldi and Corso (2014) for an overall description of the Observatory, its results and how it accomplishes its activities.

In order to achieve the goals of this paper, we have triangulated quantitative and qualitative analyses (Jick, 1979). The former is based on a survey run among Italian companies and AIDA Bureau van Dijk database, which contains financial data of Italian firms. The latter has been developed through multiple, embedded case studies oriented in better explaining the findings achieved in the quantitative analysis. In the following paragraph we will describe the methodological choices that have shaped the research process.

3.1 Quantitative Analysis

The quantitative analysis occurred in two steps. First, descriptive statistics and a cluster analysis were computed to examine the diffusion patterns of the three elements taken into exam, and to delineate the main configurations used by firms in terms of SW. In the

second step, ANOVA analysis and Kruskal-Wallis non-parametric tests were used to understand the contingent conditions under which SW configurations are chosen by firms.

The survey has been delivered through an electronic platform to a convenient sample of 100 HR directors of medium and large Italian firms. On data gathered, a cluster analysis was conducted in order to investigate the complementarities between the three elements that can characterize a SW strategy.

We complemented the data gathered through the questionnaires with data contained in the AIDA Bureau van Dijk database, which includes financial data of Italian firms, for evaluating through ANOVA analyses the contingent conditions and the organizational performance that characterize firms that choose a particular SW practice, provides the definition, variable construction, and sources for all of the three elements used in this research. As can be observed, they were operationalized using the survey responses.

Table 1 – Measure of the three elements

Elements	Variable Construction/ Definition	Measure	Reference	Data source
Layout element	Adoption of initiatives of redesigning of the physical workspace for creating environments more flexible and oriented to the workers collaboration	From 0 (none initiatives) to 2 (multiple initiatives)	Elsbach and Bechky (2007)	Survey
	Extent to which employees telework	From 0 (none employee) to 2 (all employees)	Martínez-Sánchez et al. (2007)	Survey
ICT element	Extent to which employees use IT personal devices (pc, tablet, etc.)	From 0 (none employee) to 2 (all employees)	Martínez-Sánchez et al. (2007)	Survey
	Extent to which employees use external IT services (skype, twitter, linkedin,...) at any-time from anyplace	From 0 (none employee) to 2 (all employees)	Martínez-Sánchez et al. (2007)	Survey
HR element	Extent to which employees can manage in a flexible way their working hours	From 0 (none employee) to 2 (all employees)	Coenen and Kok (2014)	Survey
	Percentage of employees for which the company uses a MBO system for evaluating their KPI	From 0 (none employee) to 6 (all employees)	Coenen and Kok (2014)	Survey
	Change management actions for managing the organizational models chosen: 1) Training for the middle and top management, 2) Training for the end users, 3) Communication plans, 4) New MBO systems, 5) Projects of cultural change, 6) Processes' reorganization	From 0 (adoption of any change management action) to 6 (adoption of all the change management actions)	Coenen and Kok (2014)	Survey

We assisted the data collection effort with the AIDA Bureau van Dijk database. We use this database in order to figure out contingent variables that may influence the decision of adopting a particular SW model. Their operationalization is shown in

3.3 Qualitative Analysis

We performed four case studies on the Italian branches of International organisation, which were similar in terms of C-level's willingness to invest in SW, but adopted different implementation strategies.

As suggested by Eisenhardt (1989), we have relied on several data sources: face-to-face interviews, phone conversations, follow-up emails, and archival data such as internal documents, press releases, websites, and news articles. In order to maximise the benefits from these sources of evidence, and better deal with reliability issues, two of the three principles suggested by Yin (2003) have been followed: the triangulation of data sources, and their organisation in an electronic and navigable case study database.

The primary data source was 49 semi-structured interviews conducted over seven months (from April 2013 to October 2013) with the HR director of the firms, at least one of the C-levels, and - through a snowball technique (Patton, 2002) - other knowledgeable informants involved in SW implementation process. Within each firm, authors continued recruiting informants until additional interviews failed to dispute existing, or reveal new, categories or relationships that is, until theoretical saturation (Strauss and Corbin, 1990) was achieved. Table 3 proposes the organisations involved in the case studies as well as the interviews accomplished.

Table 3 – Organisations involved in the qualitative analysis

Org.*	Industry	Employees	Interviews**			Total
			HR manager	C-levels	Others	
A	Public administration	3,407	2	2	5	9
B	Food and beverage	3,764	5	8	2	15
C	Brewing	961	4	2	6	12
D	Food packaging and processing	824	6	2	5	13

* Pseudonyms are used to protect the anonymity of the organisational and their members
 ** Each interview lasted approximately 1.5 hours

Potential informant bias has been addressed in several ways. First, the interviews collected both real-time and retrospective longitudinal data in several waves over seven months. According to Ozcan and Eisenhardt (2009) these kinds of data collection are ideal because retrospective data enable efficient collection of more observations (thus

enabling better grounding), while real-time data mitigate retrospective bias (Leonard-Barton, 1990). Second, anonymity has been promised to companies and informants. According to Eisenhardt (1989) this decision encourages candour. Third, the interviews have been complemented with wide-ranging archival and observational data, as suggested by Bingham and Eisenhardt (2011). Fourth, open-ended questioning has been used to give the informants wide scope to relate the concept as they chose. According to Koriat et al. (2000), this helps in addressing potential informant bias. Fifth, informants not only from multiple levels of hierarchy, but also with different perspectives have been considered during the interviews (Ozcan and Eisenhardt, 2009). Finally, interview techniques like courtroom questioning, event tracking, and nondirective questioning (Martin and Eisenhardt, 2010) have been used to yield accurate information (Huber and Power, 1985).

Following recommendations regarding multiple cases theory-building (Eisenhardt and Graebner, 2007), within and cross-case analyses have been performed with no a priori hypotheses. The authors cycled among the emergent theory, case data, and literature to further refine abstraction levels, construct measures, and theoretical relationships (Eisenhardt, 1989). To converge on a parsimonious set of constructs, authors focused (and will present) only on the most robust findings (Andriopoulos and Lewis, 2009).

Table 2 – *Variables operationalisation*

Variable	Operationalization	Data source
Industry types	Firms are classified into public administration, retail industry, bank sector, engineering industry, food industry, ICT sector, other industries.	Survey
Size	Number of employees	AIDA
Capital intensity	Ratio between the property plants and equipment and the number of employees	AIDA
Human capital	Ratio between the total labour cost and the number of employees	AIDA
Year of foundation	Year of foundation	AIDA
VA/employees	Ratio between the value added and the number of employees	AIDA
EBITDA/employees	Ratio between EBITDA and number of employees	AIDA

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4 Findings

4.1 Configurations of SW practices: The cluster analysis

Descriptive statistics (Table 4) highlighted that firms invest more in ICT solutions (59% of companies surveyed) regard to the reconfiguration of the workplace and of the office layout (39% of companies surveyed). However, the majority of the organizations surveyed (the 67%) make innovations in the human resource practices and in the organizational model followed.

Table 4 – Descriptive statistics

Variable		Mean	Median	Dev. std.	Min.	Max.
Element	Layout	0.39	0	0.49	0	1
	ICT	0.59	1	0.49	0	1
	HR	0.67	1	0.47	0	1
Industry	PA	0.14	0	0.35	0	1
	Bank	0.13	0	0.34	0	1
	Engineering	0.08	0	0.27	0	1
	Food	0.06	0	0.24	0	1
	Retail	0.06	0	0.24	0	1
	ICT	0.06	0	0.24	0	1
	Other	0.47	0	0.50	0	1
Co nti	Human capital (k€)	54.76	57.00	16.84	10.00	88.00
	Capital intensity (k€)	762	128	2,980	1.00	21,319

Size	4,197	566	18,387	57	140,435
Year of foundation	1984	1996	29	1865	2010
VA/employees (k€)	80.15	77.00	34.28	15.00	165.00
EBITDA/employees (k€)	25.60	20.50	26.94	-62.00	104.00

The three binary variables¹ operationalizing the three elements that may determine a company to adopt SW practices were subject to a Hierarchical Cluster Analysis using Ward's method (Forst and Vogel, 1977), which produced a dendrogram². The dendrogram showed that within the sample there were four distinct approaches to SW, which are shown in Table 5. The existence of distinct approaches provided empirical evidence on the existence of complementarities between the elements investigated.

Table 5 – ANOVA results

Smart Worker		1. Inconsistent	2. Analogical	3. Digital	4. Complete	Total
Element	Layout	Low ³	High	Low	High	39%
	ICT	Low	Low	High	High	59%
	HR	Low	High	High	High	67%
Industry	PA	21.4%	15.4%	12.1%	7.7%	14%
	Bank	3.6%	38.5%	15.1%	7.7%	13%
	Engineering	7.1%	0%	12.1%	7.7%	8%
	Food	3.6%	7.7%	9.1%	3.8%	6%
	Retail	10.7%	7.7%	3.0%	3.8%	6%
	ICT	0%	7.7%	0%	19.2%	6%
Contingent var.	Human capital (k€)	44.76	55.83	57.80	60.16	54.76
	Capital intensity (k€)	2.079	192	443	166	762
	Size	566	1,579	274	606	566
	Year of foundation	1978	1974	1993	1981	1984
	VA/employees (k€)	66.76	70.80	89.40	85.11	80.15
	EBITDA/employees (k€)	22.00	17.20	31.60	24.67	25.60
Percentage of firms		28%	13%	33%	26%	100%

A first approach (*cluster 1*) consists of 28% of companies surveyed. We called these firms “inconsistent smart workers” as they do not invest significantly in any of the three elements investigated. This cluster is composed mainly by organizations that operate in the public administration and in the retail industry. These organizations have not high-

¹ Values in the scale higher to the median value were converted into a 1 and the others to 0.

² For further details please contact the authors.

³ “Low” means that the value of the element is under the mean of the sample, “high” otherwise.

level human capital and are capital intensive. Furthermore, the majority of them are older than the others are, and are characterized by low levels of productivity.

The second group (*cluster 2*) in terms of frequency in the sample consists of 13% of surveyed companies whose features are based on attributing importance to investments in innovations in the human resource practices and in the organizational model followed, and in the reconfiguration of the workplace and of the office layout. Since ICT element is not significantly used by this cluster, we labelled it as “analogical smart workers”. This cluster is mainly composed by organizations operating in banking and with medium qualified employees. These organizations are older than others, have more employees, are labour intensive, and have relatively low productivity levels,.

The bigger group (*cluster 3*) consists of 33% of organizations whose distinguishing trait is the limited importance for the reconfiguration of the workplace and of the office layout. For this reason, we labelled this group as “digital smart workers”. This cluster is composed mainly by organizations of the engineering and in the food industry. These organizations have medium-qualified human capital and are labour intensive. The majority of them is younger than others firms, have a medium size and are characterized by high levels of productivity.

Finally, a fourth approach to SW (*cluster 4*) consists of 26% of organizations that have invested in all the three elements investigated. Given the typology of investments made by these organizations, we labelled this group as “complete smart workers”. This cluster is composed mainly by organizations of the ICT industry that have hired qualified employees (high human capital levels). These companies are labour intensive, are characterized by medium dimensions, and have medium productivity levels.

4.2 Results of Qualitative Analysis

We have structured the results of the case studies according to the main reasons that led the different organisations to invest in SW (Table 6), and the specific configurations of the three elements characterising each SW model (Table 7). The rest of the paragraph will briefly describe the cases deepening the statements reported into the tables. A final sub-paragraph will report the considerations rose during the cross-case analysis.

Table 6 – Main reasons for investing in SW

Organisation*	A (Inconsistent SW)	B (Analogical SW)	C (Digital SW)	D (Complete SW)
Organisational efficiency	<u>Cost reduction</u>	<u>Rationalisation</u>	<u>Productivity</u>	Flexibility
Organisational effectiveness	Response rate	Quality improvement	<u>Collaboration</u>	Innovation
Employees engagement	Empowerment	<u>Creativity</u>	Sense of community	<u>Work-life balance</u>

* For each organisation we have underlined the main reasons explaining the investments in SW

4.2.1 Organisation A: Inconsistent Smart Worker

Organisation A is a public administration managing a big Italian Region. With 3,407 employees and different facilities spread throughout a large geographical territory, the C-levels of organisation A started thinking to SW principles with the main aims of reducing the commuting costs of their employees while increasing their functional integration and, thus, their effectiveness in answering citizen requests. The underlying objectives were not only to switch from silos-based to cohesive service delivery, but also to progressively empower all employees toward the usage of ICT as a lever through which disrupting the service processes.

Table 7 – Usage of the three elements in the cases

Organisation	A (Inconsistent SW)	B (Analogical SW)	C (Digital SW)	D (Complete SW)
Layout element	<ul style="list-style-type: none"> • No significant intervention made • Building constraints to be faced (old facilities not easily reconfigurable) 	<ul style="list-style-type: none"> • Development of a new building focused on fully exploiting a SW model • Concentration rooms, collaboration rooms and relax rooms 	<ul style="list-style-type: none"> • No significant intervention made • Building constraints to be faced (necessity of changing building in order to fully benefit from SW models) 	<ul style="list-style-type: none"> • Intelligent, modular building, which adapt to organisational needs • Building automation (light and temperature) • Acoustic isolation
ICT element	<ul style="list-style-type: none"> • No significant intervention made • Unified collaboration and communication as enabling investment 	<ul style="list-style-type: none"> • No significant intervention made • Unified collaboration and communication as enabling investment 	<ul style="list-style-type: none"> • Mobile workspace for all employees • Unified collaboration and communication • Cloud solutions • Social network within the firm 	<ul style="list-style-type: none"> • Full digitalization of archives and documents • Unified collaboration and communication • Mobile workspace and app for employees
HR element	<ul style="list-style-type: none"> • No significant intervention made • Assessment of the effectiveness of current model in balancing employees' needs with firms performance goals 	<ul style="list-style-type: none"> • Extension to all senior managers • Training • SW leadership program (engagement) • Clear definition of the SW priorities on which focusing 	<ul style="list-style-type: none"> • Preliminary pilots in ICT and marketing divisions • Quantification of the SW benefits • Extension to all other employees • Training 	<ul style="list-style-type: none"> • Extension to all employees (blue collars) • Full autonomy in choosing working times, places and tools • Self-certification of working hours

Organisation A started to invest in a unified communication and collaboration suite (instant messaging, presence and collaboration) as an enabling ICT-based investment to

achieve these potential benefits. However, the lack of a solid budget associated to strong financial constraints not only forced to focus on a (suboptimal) general-purpose suite, but also to ignore other complementary SW elements. In particular, the lack of training programmes explaining how to take advantage of the digital solution limited its extension from the convenient pilot units in which it has been tested to the whole organisation. Recognising this initial mistake, organisation A is now focused on assessing the effectiveness that the current organisational model has in balancing employees' needs with firms performance goals, and compare it to models used in other public administrations and firms. The results of this exercise will be used to define the next priorities to move organisation A along the continuum toward SW models.

4.2.2 Organisation B: Analogical Smart Worker

Organisation B is the Italian branch of a multinational food and beverage company that, in the last months of 2013, has moved all its employees into a new building structured into functional areas (concentration rooms, collaboration rooms, relax rooms, etc.). This change provided an opportunity to rethink the whole working model, with the aims of rationalising the cost of facilities (as well as their management), improving the quality of the internal decision-making processes and stimulate creativity in individuals.

During the construction of the new building, the organisation has extensively invested in training all senior managers regarding the levers and benefits related to SW. Once a clear idea of SW levers and benefits was disseminated, organisation B developed a leadership program to engage senior managers in the development of SW model and mature the capabilities necessary to efficiently and effectively accomplishing this task. A clear definition of specific SW priorities completed the programme of HR development, and allowed to fully exploit the new building once ready. One of the results of the prioritization of all SW efforts has been the choice of not making particular interventions in ICT domain. Two are the main reasons explaining this choice: (i) the organisation already had a supportive and mature digital infrastructure; (ii) managing also this element could compromise the effectiveness of the whole process of SW development (to many variables to be taken into account). Only unified collaboration and communication solutions has been considered an indispensable and enabling investment that cannot be neglected.

4.2.3 Organisation C: Digital Smart Worker

Organisation C is the Italian branch of a multinational brewing company that in July 2013 started developing a SW model with the objectives of increasing the productivity and the level of collaboration of its employees instilling a sense of community in them. Starting from the consideration that it was impossible to work on layout element, since current building structure impedes the rearrange of office layout allowing to fully benefits from SW principles, the C-levels of organisation C decided to start a SW initiative involving its HR and the ICT divisions. This initiative has been structured according to three phases: (i) evaluation of current organisational and individual needs; (ii) piloting of a SW model into controlled, supportive settings; (iii) quantification of SW benefits and extension of SW model to the whole organisation through a set of training sessions.

During this process, organisation C invested in the development of a digital environment complementing the HR strategy of letting people work whenever and wherever they wanted. Thus, in addition to some investments in unified communication and collaboration tools, a mobile workspace (constituted by a laptop, a smartphone and an internet connection) has been made available to all employees. Moreover, a set of cloud-based solutions has been developed to improve the performance, the reliability and the scalability of the applications used in day-by-day tasks. Finally, a corporate social network significantly increased the inter-organisational knowledge exchange.

The combination of HR and ICT elements allowed achieving significant results in compressed timeframes. For instance, organisation C registered a productivity growth from 20% to 30% regarding its marketing unit in just 3 months of experimentation. With these numbers, the promoters of SW initiative convinced the C-levels of organisation C to significantly invest into the development of a SW model.

4.2.4 Organisation D: Complete Smart Worker

Organisation D is the Italian branch of a multinational food packaging and processing company. Organisation D started thinking to SW in 2006 in order to increase the innovativeness of its employees and the flexibility in managing them. Underlying these objectives there was the necessity of retaining key human resources in a geographical territory full of other strong employer brands. Within these settings, and recognising the centrality of human resources in producing the competitive advantage of the firm, organisation D focused on increasing work-life balance.

One peculiarity of organisation D is that its HR director is also the ICT leader as well as the facility manager of the firm. This organisational configuration ensured high levels of interrelations and complementarities among the three SW elements. An intelligent and modular building has been developed to adapt to organisational need. Thus, if employees necessitate of a big conference room, open spaces are autonomously created by moving transparent walls and dynamically rearranging office layout. The light and the temperature within the building are centrally controlled in order to provide employees with the most conformable conditions to accomplish their tasks.

All archives and documents have been digitalised or moved to a separated warehouse. An internal logistic service brings the documents that employees need where and when they needs it. In this way the working place is highly simplified, and human resource can focus on one task at a time and boost both their efficiency and effectiveness. The organisation has developed a set of apps allowing to book a meeting room on the run, release it, check the queue at the canteen, etc. More generally, organisation D has created a mobile workspace allowing employees to work whenever and wherever they want.

These and many other benefits (corporate kindergarten, wellness areas, centralised commuting services, etc.) have been made to all employees - blue collars included. These last ones have not only a full autonomy in choosing their working times, places and devices, but also self-certificate their working hours and spontaneously coordinate in the different R&D projects within the firm. The end result is a reduction of the HR, IT and layout yearly costs by an order of 10%,

5 Discussion

This study allows highlighting some consideration regarding the objectives and the elements characterising SW models. The main reasons for which an organisation invests in SW tend to shape and being shaped by both the investments accomplished in SW elements. Inconsistent smart workers tend to see SW only a paradigm to reduce cost. Analogical smart workers tend to combine resources rationalisation with employees creativity. Digital smart workers focus on establishing collaboration and a sense of community among its employees. Complete smart workers tend to focus on work-life balance, and see the innovativeness and the flexibility of its assets as a by-product of a satisfied employee to be retained as a key resource.

Overall we demonstrate that there are complementarities between the elements that can characterize a SW model. At least two elements are developed in each SW configuration found. Quantitative and qualitative analyses show the centrality of HR element in the development of SW models. In particular, the cross-analysis of the four different implementation strategies of SW suggests that the development of pilots in controlled organisational niches, the quantification of the benefits associated to SW, the engagement of senior managers and employees trainings are central in the development of SW. Indeed, SW requires the concurrent presence of at least two elements, where HR element is always developed.

Regarding the layout element, it is important to note that most of current organisational facilities have different constraints that impedes to fully benefit from the potential of SW. Recognising that the organisational layout tend to shape working practices in a significant way, many organisation are deciding to start from green field, and “use” the development of new facilities as an opportunity to rethink organizational models in order to combine efficiency (e.g. less space used due to the usage of shared desks) with effectiveness (e.g. exploitation of room favouring collaboration among employees). In the quantitative analysis we found that younger firms do not make any particular investments in the layout element. This maybe is due to the fact that such companies adopt already flexible solutions that allow them to be “smart” and do not need do reconfigure their organizational facilities.

With a reference to the ICT element, the cases suggest that the unified communication and collaboration solutions seem to be a necessary but insufficient investment to develop a SW model. In order to concretise the SW potential, most advanced cases complements these investments with (at least) the development of a mobile workplace allowing: (i) employees to work also outside the firm facilities, and (i) firms to progressively develop flexible models of ICT governance opening up further SW opportunities. What is clear is that there are different stages of ICT maturity towards a SW model, and practitioners ask for models to help them prioritise their investments coherently to other SW elements. Further, looking survey results, they suggest that banks invest to a lower extent in ICT solutions probably given security problems that can arise in an extensive usage of them.

Future research needs to further investigate the development dynamics of SW configurations in order to understand the adoption timing of the three elements. Moreover, future studies will focus on studying SW adoption at a functional level in order to measure the relative performance.

6 Conclusion

In conclusion, the proposed study contributes to clarify that there is not a unique path for developing a SW, but there is a set of potential paths that have to be designed taking into account the characteristics of the firm investing in SW. In this study we show that there is a risk of not being able to implement SW if firms focus on all elements on all three domains. It is better to focus on a specific area and/or proceed through a gradual developmental process. While there is certainly more research on this topic, we believe that this study provides an important approach to how we conceptualize and operationalize SW concept.

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Sustainable Knowledge-based Strategies for Value Creation

Gianpaolo Iazzolino *

Department of Mechanical, Energy and Management Engineering
University of Calabria
Via Pietro Bucci 46/C, 87036 Rende (CS)

Domenico Laise

Department of Computer, Control and Management Engineering
University of Rome "La Sapienza"
Via Ariosto 25, 00185 Roma – Italy

* *Corresponding author*

Structured Abstract

Purpose – The main aim of this work is to place the value creation process within the *Sustainable Growth Strategies* framework.

The economic sustainability of a strategy at first requires value creation for all stakeholders, according to the *Stakeholder Value Theory*.

The economic sustainability of a strategy also requires it to be legitimized in terms of *Corporate Social Responsibility (CSR)*. In this context, *Intangible Assets* and *Knowledge Management* assume a special relevance.

The authors retain that the notion of *Value Added (VA)* and the accounting based on the *Value Added Income Statement*, adapted to a context of *Intellectual Capital*, is the best way to measure the value creation of a strategy that considers the *Corporate Social Responsibility*.

Design/methodology/approach – The paper uses the notion of Value Added (VA) (Pulic, 2000; 2004; 2008) to propose a methodology that is able to distinguish between industries that carry out sustainable strategies and industries that are unable to do it. The proposed methodology is based on the analysis of the Value Added and its components, starting from a reinterpretation of the concept of VAIC (Value Added Intellectual Coefficient) made up by the same authors of this paper. An empirical analysis based on the composition of the VA in ten Italian industries, by using an overall sample of 1,000 firms, has been carried out.

Findings – From results it emerges that:

1. in industries with not so sustainable strategies (traditional sectors) the weight of the Cost of Employees on the VA (human capital investments) is less than the other sectors (low human capital intensity). In these sectors the value creation strategy is mainly based on *dead knowledge*, embedded in machines (physical capital);

2. in industries with more sustainable strategies (non-traditional sectors: consulting, advertising, research, etc.) the economic value creation is mainly based on *live knowledge*, embedded in human resources (high human capital intensity). In these sectors we have lower productivity of work (VA/Human Capital) and higher employment.

Originality/value – The originality and the value of our methodological proposal can be appreciated by taking into account that in the literature there is no accounting-based methodology that is able to identify the firms with sustainable strategies within the set of all firms.

Practical implications – Our approach, based on the extension of Pulic's contribution, makes it possible to reduce the risk of myopic valuation of economic performance. Through our methodology it is possible to highlight the effects of sustainable strategies based on knowledge investments oriented towards the *Stakeholder Value Theory* and *Corporate Social Responsibility (CSR)*.

Keywords – Sustainable Value Creation, VAIC, Intellectual Capital, Corporate Social Responsibility, Performance measurement

Paper type – Academic Research Paper

1 Introduction

It is a quite shared opinion that knowledge-based strategies have a satisfactory degree of sustainability (Grant, 2010).

In this paper, for Sustainable Growth Strategies we mean those long-term behaviours aimed at legitimizing the social, environmental and economic expectations of the various stakeholders, both internal and external (Donaldson and Preston, 1995).

The main reason that distinguishes knowledge-based strategies as sustainable strategies derives from the fact that the modern firm is seen as an assembly of accumulated knowledge whose value derives from its utilization (*knowledge-based view of the firm*). Knowledge management is, therefore, one of the main resources to support sustainable competitive advantage (Edvinsson and Malone, 1997; Kaplan and Norton, 1992; Nonaka, 1994; Nonaka and Takeuchi, 1995; Sveiby, 1997; 2001).

Attention to the research of sustainable knowledge-based strategies also derives from growing interest in themes of *Corporate Social Responsibility (CSR)*. The behaviour of large firms has a profound effect on the economic and social context. For this reason they are called to operational accountability by different social and political subjects, *stakeholders*. The interaction between the themes of *Knowledge Management* and those

of *Corporate Social Responsibility* is pointed out in many studies of company strategies (Collins and Montgomery, 2005).

Now, the economic sustainability of a strategy needs above all the creation of economic value for all the stakeholders (*stakeholder value theory*). In fact, a strategy that fails to create value or that creates value only for few agents cannot be defined as sustainable from a social point of view.

Therefore, the problem of measuring value creation arises (Andriessen, 2004), for all the stakeholders, associated with the utilization of knowledge and *Intellectual Capital*. This problem is the specific subject of this paper.

The paper is organized as follows: in section 2, following the approach suggested by Pulic (2000; 2005; 2008), the reasons will be stated leading to the belief that Value Added (VA) is the best method to measure value creation for stakeholders associated with a strategy that takes into account *Corporate Social Responsibility*; in section 3 the concept of Value Added is used to describe the two main strategies of value creation, that of a “*Win-Win*” type, which is based on value creation for all the stakeholders, and the “*Win-Loss*” type, which is based on value creation only for the shareholder; in section 4 the two previously-mentioned strategies (*Win-Win*, *Win-Loss*) will be compared with working strategies that exploit “*dead knowledge*”, incorporated in machinery, and with strategies that employ “*live knowledge*”, incorporated in human resources; section 5 illustrates empirical analysis: the various value creation models will be applied to 10 industrial sectors each made up of 100 firms. The way that the categories elaborated by Pulic will be shown to be of use in interpreting the characteristics of the value creation strategies of the different sectors; finally, paragraph 6 contains the conclusions and a discussion of some aspects considered in the paper.

2 Stakeholder point of view and Value Added

In the traditional way of measuring the company performance of an organization the focus is mainly on value creation for the shareholder (*shareholder point of view*). But, as already seen, a strategy that is socially sustainable has to create value not only for the shareholder, but also for the other stakeholders and, in particular, for the employees.

A strategy that only considers the shareholder’s interests is a strategy that can only be satisfactory for a part of society. The idea underlying performance measurement in terms of satisfaction only from the point of view of the shareholder is based on the idea that by

maximising profit (NOPAT, EVA, Dividends, etc.) also social wellbeing is maximised. But it is immediately evident that the economic facts of the last twenty years, dominated by *shareholder value analysis*, have not brought social benefits for everyone, as promised. Mass unemployment a characteristic of the current world economy does not allow the affirmation that the application of the “philosophy” of *shareholder value analysis* has brought socially sustainable benefits.

The reason, as Pulic states (2000; 2004; 2008), is that value creation has not been correctly measured. Value from the social sustainability point of view cannot be measured only by EBITDA or by other measures such as EVA which are based, on final analysis, on NOPAT which is a variant of EBITDA (Iazzolino *et al.*, 2014).

If the measurement of value creation is based only on EBITDA then we should not be surprised that the strategies which emerge cannot be socially sustainable. The reason is obvious. Creating value for the shareholder does not mean creating value for all the stakeholders.

In fact, the EBITDA measures the value created for all capital investors (within which category there is also the shareholder) whereas value created for all the stakeholders is measured by Value Added. This is the fundamental criticism that Pulic (2000; 2004; 2008) levels at traditional value measurement. This concept will be better explained in the next section.

According to Pulic, in addition to value created for capital investors and for the shareholder, it is necessary also to consider value created for employees, which is measured by wages and salaries, that is by the capital invested in acquiring human resources. Value Added is, therefore, the adequate measure of value creation from a stakeholder point of view

3 Value Added and value creation for stakeholders

The short-sightedness of the traditional measures of value creation can be illustrated following the approach proposed by Pulic (2000; 2004, 2008).

From the point of view of society as a whole, value created is equal to :

$$VA = HC + SC \quad [1]$$

where:

VA = Value Added

HC= Human Capital (= Cost of Employees = wages and salaries)

SC = Structural Capital

Considering Pulic's definition, Structural Capital in fact coincides with EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization) (Iazzolino and Laise, 2013). Expressing EBITDA in terms of its components, it holds that:

SC = Structural Capital = EBITDA = Depreciation/Amortization + Interest expenses + Taxes + Net Income.

The latter definition stresses the fact that in EBITDA, less taxes, there are the remunerations of various capital investors, understood in the physical sense and in the financial sense (and therefore also shareholders).

Some elucidation is needed to link the equations [1] with the themes of Knowledge Management. Knowledge that creates value is incorporated in Human Capital (people). Pulic states that: "People are the main carriers of knowledge" (Pulic, 2008). If this observation is correct then expenditure on human resources has to be seen as an investment and not as a cost: "it is only reasonable to give this resource the status it deserves of investment and not cost anymore" (Pulic, 2008). But: "employees, who are treated as investment, are the beginning and the end of the new, knowledge-based, economy" (Pulic, 2008). The reason for investing in human resources is that they are "the main value creators of the contemporary economy" (Pulic, 2008).

Now, considering human resources as an investment and not just a cost, needs a change in managerial mentality. In fact, costs owing to their nature have to be cut and the traditional performance measurements are based on a logic of "cost cutting". To increase the Ebitda the cost of human resources is also cut. But, if human resources are the source of value creation then cutting them can be a "short-sighted" strategy in the long term. Maybe the saying: "the lower the cost, the higher the profit" can be fine for the cost of raw materials and energy costs, but not when it refers to human resources. The reason is obvious: human resources create value.

Using formula [1] the significance of fundamental strategies for value creation can be explained.

Equation [1] in terms of variations can be rewritten in the following way:

$$\Delta VA = \Delta HC + \Delta SC \quad [2]$$

Now, it is worth increasing investments in human resources ($\Delta HC > 0$) when an even greater increase on VA ($\Delta VA > \Delta HC$) can result from that investment. In that case in fact there is an increase in work productivity (VA/HC) and, therefore, there is also an increase in working profits ($\Delta SC > 0$). In Pulic's terminology this means that an investment in human resources makes HCE = VA/HC (Human Capital Efficiency) grow and therefore makes the efficiency of the structural capital grow that is the working profits with respect to the Value Added (SCE = SC/VA). In fact, the following relation holds (Iazzolino and Laise, 2013):

$$SCE = 1 - (1/HCE) \quad [3]$$

It is clear that if $\Delta HCE > 0$, then $\Delta SCE > 0$.

This is an example of socially sustainable strategy because it creates new value for the employees ($\Delta HC > 0$) and for capital investors ($\Delta SC > 0$). It could be said that such strategy is an example of "Win-Win" strategy that does not dissatisfy anyone, since it creates new value for everyone.

It is for this reason that it can be understood as a socially sustainable strategy. Using the metaphor of a "cake" (Pulic, 2004), it can be said that a *Win-Win* strategy does not dissatisfy anyone because there is an increase in the size of the cake (Value Added) and, therefore, an increase in the size of the "slice" apportioned to human resources (HC) and an increase in the size of the "slice" apportioned to capital investors (SC).

Therefore one should ask oneself: why is this *Win-Win* strategy not adopted by all firms?

The reason can be explained using, again, equation [2].

If one invests in human resources ($\Delta HC > 0$) which however have a low knowledge content and low professional qualifications, the growth of Value Added, as a result of investment, is insufficient, and in particular is lower than the investment effected ($\Delta VA < \Delta HC$). In this case there is a reduction in profits for capital investors ($\Delta SC < 0$). This is what happens in the majority of traditional sectors exposed to competition, where there are not the conditions to make the Value Added grow adequately.

The only strategy possible in these cases, to make profits grow, is that of reducing the workforce (destruction of the value quota of employees) through a growth in work productivity obtained by investing in *labour saving* plants. In these cases value growth for

capital investors ($\Delta SC > 0$) is obtained by the destruction of investment in human resources ($\Delta HC < 0$) by means of reducing employment. This is an example of occupational strategy of the “*Win-Loss*” type, since there is the creation of value only for capital investors.

But this *Win-Loss* strategy is not socially sustainable in the long term since it destroys jobs and income for employees.

4 Sustainable value creation and knowledge-based strategies

The two occupational strategies outlined in the preceding paragraphs (*Win-Win*; *Win-Loss*) can be better described by distinguishing two types of knowledge.

When investing in human resources trust is placed in “*live knowledge*”, which is incorporated in the employees, that is, in men. It is believed that only human beings are able to create new knowledge and, therefore, produce Value Added in such a way as to justify investment. Only qualified and educated human resources are, in fact, able to create patents, copyrights, know-how, etc. Moreover, only highly-trained human resources are able to increase the quality and quantity of intangible assets (organisational relations and relations with customers).

Value creation for all stakeholders therefore necessitates heavy investments in highly trained and skilled human resources. It is from this type of resource that comes value added suitable to make investment in HC convenient. It is necessary to increase the size of the cake ($\Delta VA > 0$) so that everyone can have a bigger slice ($\Delta HC > 0$, $\Delta SC > 0$). This is the way to create greater motivation, greater satisfaction and greater employee collaboration. This is the way for a *Win-Win* strategy.

The other more traditional strategy places its trust in “*dead knowledge*” incorporated in ever more perfected machinery whose use is “labour saving”. With this strategy operating profits can be increased (SC) also at parity of Value Added, that is profits can be increased destroying value for employees (HC).

This strategy presupposes a given cake ($\Delta VA \cong 0$) and is based on the reduction of the slice of the cake that goes to the employees ($\Delta HC < 0$) to increase the size of the slice that goes to capital investors ($\Delta SC > 0$). If the Value Added is given, then its distribution among employees and capital investors becomes “*a game with a zero sum*”. It is as already stated *Win-Loss* strategy. The problem with this strategy is that it is less socially sustainable. In fact, growing structural unemployment can transform itself into non-

negligible social conflict. For this reason a strategy based on live knowledge (human resources) is the only feasible way in social terms. But, as Pulic states, a change of mentality at the managerial level is needed to be able to carry it out.

It is necessary to understand what is the fundamental driver of value creation. That is, it is necessary to place human resources at the centre of management and understand that the following factors are of crucial importance.

1) first and foremost, it is necessary to aim at innovation, which is able to continuously increase the knowledge content of products and services. Continuous innovation is nothing other than new knowledge for the growth of value added.

2) secondly, it is necessary to develop and increase employee skills with the aim to develop value added of products and services.

It is necessary, definitively, to abandon the idea that profits are low because the costs are high and think instead that profits are low because the Value Added is low. But growth strategies of Value Added come through the development of knowledge incorporated in human resources.

It is necessary to start from the presupposition that profits can also be made in non-traditional (*labour intensive*) sectors in which the division of Value Added is more balanced due to a greater weight of capital invested in human resources (HC/VA). These are sectors where the profits for capital investors (SC/VA) are lower, since they are obtained through the creation of value also for employees.

The research we carried out, detailed in the next section, confirms the feasibility of the strategies of value creation of the Win-Win type that are based on consistent investments in highly qualified human resources.

5 The empirical analysis: value creation models in different Italian industries

An empirical analysis on a sample of firms belonging to different Italian industrial sectors was carried out, with the aim of finding an empirical validation of Pulic's thesis. The data used in the empirical research were taken from the AIDA Bureau Van Dijk Database.

In particular, 10 industrial sectors were analysed:

1. Legal and accounting activities (ATECO M69);
2. Manufacture of wearing apparel (ATECO C14);

3. Manufacture of computer, electronic and optical products (ATECO C26);
4. Manufacture of chemicals and chemical products (ATECO C20);
5. Electricity, gas, steam and air conditioning supply (ATECO D35);
6. Manufacture of food products (ATECO C10);
7. Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials (ATECO C16);
8. Computer programming, consultancy and related activities (ATECO J62);
9. Advertising and market research (ATECO M73);
10. Employment activities (ATECO N78).

The first 100 firms in each section were chosen, in decreasing order of turnover, which could provide available balance sheet data for the last 8 years. Overall, the sample is made up of a total of 1000 firms.

No.	Industry	Numbers
1	Legal and accounting activities	100
2	Manufacture of wearing apparel	100
3	Manufacture of computer, electronic and optical products	100
4	Manufacture of chemicals and chemical products	100
5	Electricity, gas, steam and air conditioning supply	100
6	Manufacture of food products	100
7	Manufacture of wood	100
8	Computer programming, consultancy and related activities	100
9	Advertising and market research	100
10	Employment activities	100
	TOTAL	1000

Tab. 1 Sectors and number of firms

The average values of the components of Value Added were calculated for each sector, considering the time interval relative to the last three years available (2010, 2011 and 2012).

The sectors considered were then subdivided into two wide classes.

Class I Traditional Industries (T)

- 1) Manufacture of wearing apparel
- 2) Manufacture of food products

- 3) Manufacture of chemicals and chemical products
- 4) Electricity, gas, steam and air conditioning supply
- 5) Manufacture of wood

Class II) Non-Traditional Industries (NT)

- 6) Computer programming, consultancy and related activities
- 7) Advertising and market research
- 8) Employment activities
- 9) Legal and accounting activities
- 10) Manufacture of computer, electronic and optical products

The results of the survey, in Pulic's codification, are reported in Tab.2.

Sectors	HC/VA (a)	SC/VA (b)	VA/HC (c)
Traditional			
1. Manufacture of wearing apparel	0.50	0.50	2
2. Manufacture of food products	0.52	0.48	1.92
3. Manufacture of chemicals and chemical products	0.46	0.54	2.17
4. Electricity, gas, steam and air conditioning supply	0.20	0.80	5
5. Manufacture of wood	0.60	0.40	2.5
Non-traditional			
6. Computer programming, consultancy and related activities	0.64	0.36	1.56
7. Advertising and market research	0.55	0.45	1.81
8. Employment activities	0.63	0.37	1.58
9. Legal and accounting activities	0.72	0.28	1.38
10. Manufacture of computer, electronic and optical products	0.58	0.42	1.72

Tab.2. Performance per sector

As can be clearly seen from Tab. 2 two very different situations emerge. In the traditional sectors the entity of investments in human resources (HC) with respect to VA is on average lower compared with the non-traditional sectors. This datum is unsurprising since in traditional sectors the weight of Capital is greater compared with the weight of human resources (human capital). In the course of time, in fact, in traditional sectors technological progress has triggered *labour saving* processes that have made the use of

human resources obsolete. This also explains the diversity among the sectors in terms of operating profits on VA (SC/VA). In traditional sectors the greater work productivity (VA/HC) and the lower cost of work on the VA (HC/VA) is translated into in greater operating profits on the VA (SC/VA).

With the aim of better highlighting the main sectorial differences the data of Tab.2 have been recalculated in terms of average quantities and are reported in Table 3.

Sectors	Average Cost of Employees % (HC/VA) _{av}	Average EBITDA % (SC/VA) _{av}	Average work productivity (VA/HC) _{av}
TRADITIONAL (T) (1-5)	45.6%	54.4%	2.7
NON-TRADITIONAL (NT) (6-10)	62.4%	37.6%	1.6

Tab.3 Average performance per sector

The data reported in Tab. 3 highlight that in traditional sectors a kind of value creation strategy of the “*Win-Loss*” type has been carried out. In fact, in these sectors the weight of investments in human capital (HC/VA) is low and, moreover, is much less than that of non-traditional sectors.

In fact:

$$(HC/VA)_T = 45.6\% < 62.4\% = (HC/VA)_{NT}$$

Most probably, in traditional sectors a logic prevails that has favoured, in the first place, value creation for capital investors. That is, a logic has asserted itself that places the interests of the employees the background, who have become superfluous. In all probability value creation in traditional sectors has come about investing in “*dead knowledge*” incorporated in ever more sophisticated machinery of the “*labour saving*” type. Human resources are seen as *a cost to cut* by introducing automation and robotics that have increased the work productivity and have reduced the requirements for human resources.

This strategy of a “*Win-Loss*” type also emerges from the data relative to work productivity (VA/HC). As can be seen from the data in Tab.3, the work productivity in traditional sectors is higher than that achieved in non-traditional sectors. In fact:

$$(VA/HC)_T = 2.7 > 1.6 = (VA/HC)_{NT}$$

this, as already seen, explains the “*labour saving*” effects of the strategy carried out by the traditional sectors.

The traditional sectors achieve better performances also from the point of view of operating profits on the VA. In fact it results:

$$(SC/VA)_T = 54.4\% < 37.6\% = (SC/VA)_{NT}$$

But greater profits are paid for by employees in terms of higher unemployment, which is the downside of greater operating profits.

In non-traditional sectors the opposite of what happens in traditional sectors is found. In fact, in non-traditional sectors value creation comes through investing more in “*live knowledge*” incorporated in human resources. This is a more *labour intensive* strategy, that is, it is of the “*Win-Win*” type. This greater attention to human resources is also reflected at the level of operating profits (% on VA) of the non-traditional sectors, which are inferior to those of the traditional sectors.

Overall, from the data of the empirical analysis two very different strategic profiles emerge. In the traditional sectors there is a distribution of Value Added that favours operating profits (and therefore capital investors) and penalises human capital creating structural unemployment. Vice versa, the strategy of the non-traditional sectors is characterised by a distribution of Value Added that is favourable to human capital. This is a socially more equitable strategy, since it is compatible with greater employment of human resources. In this sense it can be said that it is also socially more sustainable.

6 Conclusions

This paper has examined the conditions necessary to set up a sustainable value creation strategy in social terms, utilising the conceptual categories introduced in the literature by Pulic (2000; 2004; 2008).

Some concluding remarks could be useful to point out better some aspects of the theme examined.

Knowledge is certainly a notably competitive weapon since it is the most important driver for value creation for all stakeholders, measured by Value Added. Pulic's idea is, therefore, sharable.

In Pulic, however, there is no specification of the cultural context of industrial relations able to sustain a *Win-Win* strategy . In many industrial systems the idea still prevails that profits can be gained on through *Win-Loss* type strategies. In these philosophies, the "machine" (dead knowledge) is seen as the best ally of the shareholders in the conflict between capital investors and employees. While this "managerial philosophy" remains dominant it will be difficult to set up a *Win-Win* employment strategy in the field, which provides for heavy investments in human resources with a wealth of knowledge. This is perhaps the main contradiction of modern industrial systems.

The strategies of the last few decades, based only on the point of view of the shareholder, have created value, but only for a part of society. For the other part of society and for young people in particular, these strategies have created unemployment. In other words, the increased operating profit has been paid, by other stakeholders, by increased unemployment.

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Complexity leadership theory approach for advancing sustainable knowledge sharing among organisations

Mirva Hyypiä *, Satu Parjanen

Lahti School of Innovation
Lappeenranta University of Technology
Saimaankatu 11, FI-15140 Lahti

** Corresponding author*

Structured Abstract

Purpose – Companies are trying to respond to the increasing uncertainty and complexity in various ways. Development of open innovation and networking have already been well documented; they are based on the notion that tackling challenges in contemporary business environments demands a recognition of a shift in competitive factors from the company and industry level towards co-operation of companies and other stakeholders linked together through knowledge flows and shared value creation processes. This study aims to find how knowledge sharing for the collaborative organizations in the co-operation between health care professionals and sport counsellors can be supported by complexity leadership theory.

Design/methodology/approach – The empirical context in this study is from the ongoing MOTION! project which aims to develop the exercise and well-being industry, and create new collaboration models for co-operation between the private, public and third sectors. Case study is a preferred strategy when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context. In this study two development sessions from 2012 and a survey conducted in the beginning of 2013 are mainly used to answer the research problem.

Originality/value – Current leadership theories do not sufficiently address the needs of complex business environments. First of all, before successful leadership models can be applied in practice, leadership needs to shift from the industrial age to the knowledge era. Many leadership models still view leadership solely through the perspective of linear process thinking. In addition, there is not enough knowledge or experience in applying these newer models in practice, particularly, in the co-operation between health care professionals and sport counsellors from sport departments or third sector organisations.

Practical implications – This study suggests that the complexity leadership theory represent applicable model to advancing sustainable knowledge sharing for the collaborative organisations. An implementable method for organizations may be assembled by assimilating different roles of complexity leadership into development practices featuring diverse activities and interaction channels. As MOTION! project wise, Physical activity pharmacy online platform was co-created. This is a good example of co-operation enhancing knowledge flows and co-creating value creation processes in

offering private sector companies an opportunity to offer their services at all levels of the health and exercise service chain and to find new service and product concepts.

Keywords – complexity leadership theory, knowledge sharing, co-operation, health care, sports

Paper type – Academic Research Paper

1 Introduction

The paradigm of complexity and uncertainty challenges existing theories of leadership and organizational management. (Lichtenstein et al., 2006; Uhl-Bien and Marion, 2008; Snowden and Boone, 2007) More holistic views are emerging in the field of leadership: more affirmative forms of leadership are being proposed in the literature, and increasingly leadership is being disseminated and shared throughout organizations. Furthermore, leadership is being viewed as a complex, emergent dynamic within organizations. Generally speaking, the field of complexity leadership demands more substantive research. (Avolio, Walumbwa and Weber, 2009; Dooley and Lichtenstein, 2008)

According to Nonaka, Toyama and Konno (2000), existing economics and organizational theories lack a general understanding of knowledge and how knowledge-creating processes are created and managed in contemporary organizations and business environments. (Aasen and Johannessen, 2009) Hence, Nonaka et al. (2000) claim that the knowledge management that academics and businesspeople refer to is often actually information management. Bessant and Tidd (2007) emphasize, however, that complex interaction is all about knowledge; the ways it flows and is linked as well as exploited to make innovation and emergence happen (Hyypiä, 2013).

Knowledge flow and transfer has been an active research area over the years (e.g. Nonaka, 1994; Nonaka and Konno, 1998; Spencer, 2000; Borgatti and Cross, 2003; Szulanski and Jensen, 2006) According to Mu, Peng and Love (2008): “knowledge flow comprises the set of processes, events, and activities through which data, information, and knowledge are transferred from one entity to another. The end results are knowledge capture, creation, retention, and application”. Moreover, suggested by Chesbrough (2003) companies can and should use external as well as internal ideas to advance their technology, and integrate external sources into a company’s innovation process to increase possible sources of innovation (Mu, Peng & Love, 2008).

Making sense of changing environments produces more insight when it takes place through sharing extremely divergent knowledge and competencies. In today's world, the knowledge creation as a function distinct from knowledge use is no longer sufficient. Furthermore, knowledge is context specific (Kurtz and Snowden, 2003), dependent on a particular time and space. In this instance, space refers not only to physical place; it also means virtual space (technology) and mental space (shared ideas). Without being put into context, data is just information, not knowledge. Information becomes knowledge when it is interpreted by individuals and given a context and anchored in the beliefs and commitments of individuals (Nonaka et al., 2000).

Thus, the primary goal of this study is to find how knowledge sharing for the collaborative organizations in the co-operation between health care professionals and sport counsellors can be supported by complexity leadership theory. In addition, the characteristics of CLT and its leadership roles (adaptive, enabling and administrative) and its applicable to practice are studied.

2 Complexity leadership theory

Despite the fact that complexity leadership theories are fairly young, the field of complexity science is not new (Panzar, 2009; Avolio et al., 2009). It has been argued that the possibilities of complexity science are not sufficiently acknowledged in the management or organisational sciences – that complexity thinking has been adopted only at the theoretical level. (Demers, 2007; Brown 2011)

The complexity perspective is a relatively new arrival to the field of leadership studies. (Panzar, 2009; Avolio et al., 2009). Yet over the past decade, a group of researchers have focused on reframing and advancing this field through the application of complexity science and approached it from a variety of directions (Panzar, 2009): dissipative processes management (McIntosh and McLean, 1999), generative leadership (Goldstein, Hazy, and Lichtenstein, 2010; Hazy, Goldstein, and Lichtenstein, 2007; Surie and Hazy, 2006), leadership as meta-capability (Hazy, 2005; 2007), adaptive leadership (Lichtenstein et al., 2006), complex responsive processes (Stacey, Griffin and Shaw, 2000; Stacey, 2003) and complexity leadership theory (Marion & Uhl-Bien, 2001; Uhl-Bien et al., 2007; Hyypiä, 2013).

“Complexity Leadership Theory is about setting up organizations to enable adaptive responses to challenges through network-based problem solving. It offers a tool for

knowledge-producing organizations and subsystems dealing with rapidly changing, complex problems. It also is useful for systems dealing with less complex problems but for whom creativity is desired? (Uhl-Bien et al., 2007, 304).

In the current knowledge era, leadership should be framed as a complex interactive dynamic from which adaptive outputs, for instance innovation and learning, emerge. This conceptual framework includes three key leadership functions: adaptive, administrative, and enabling, the last of which reflects a dynamic relationship between the bureaucratic, administrative functions of the organisation and the emergent, informal dynamics of complex adaptive systems. (Marion & Uhl-Bien, 2001; Uhl-bien and Marion, 2008; Uhl-Bien et al. 2007; Rotmans and Loorbach, 2009; Hyypiä, 2013)

The theory of complex adaptive systems (CAS) is a cornerstone of complexity leadership science. CAS is a key element of analysis in both complexity science and complexity leadership theory (Brown, 2011). It aims to explain the functioning of systems characterised by open, evolutionary aggregates (Kauffman, 1993), neural-like networks (Bak, 1996), interactions, and interdependent agents who are cooperatively tied together and share a common goal, purpose or outlook. (Cilliers, 1998; Marion, 1999; Uhl-Bien et al., 2007). Arising naturally in social systems, a CAS is able to learn and adapt rapidly as well as solve problems in a creative manner. In components of CAS, events and ideas collide with each other in an unpredictable way, with change emerging from this reasonably organic, dynamic interactive process (Uhl-Bien et al., 2007; Carley and Hill, 2001; Goodwin, 1994; Levy, 1992). Complexity theorists, such as Stacey (1995), Levinthal (1997), Uhl-Bien et al. (2007) and Kurtz and Snowden (2003), essentially frame organisations as complex adaptive systems that are composed of heterogeneous agents interacting and affecting each other, thereby generating novel behaviour for the whole system (Marion & Uhl-Bien, 2001).

As proposed by Uhl-Bien et al. (2007) and Kurtz and Snowden (2003), among others, it is more beneficial for the development of organisational development processes or change in general that an organisation increase its complexity to match that of its environment (Holland, 1995), rather than trying to simplify its initial structures. Yet CAS is not a valid theory for explaining human behaviour and organisations, as it assumes agents (humans) are similar and systems are deterministic. Humans may always think differently about things or change their minds (Stacey, 2003; Hyypiä, 2013).

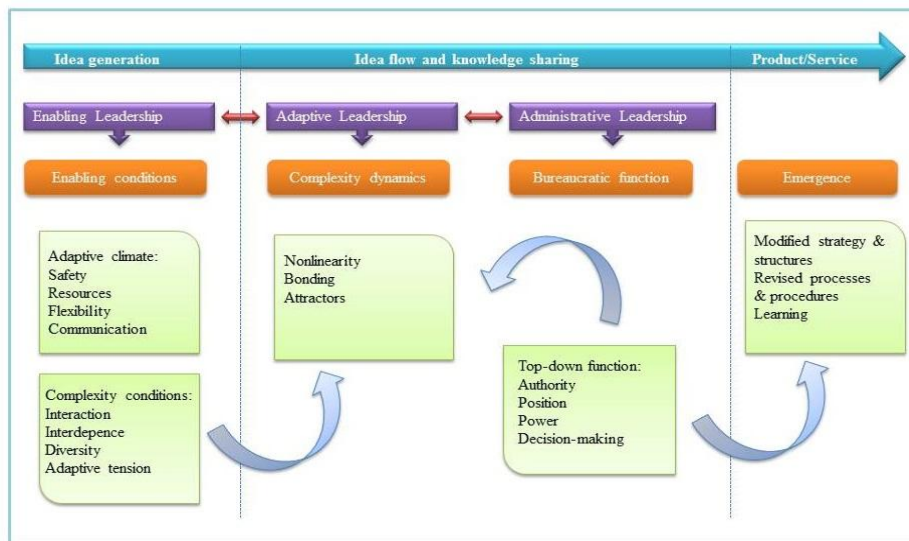


Figure 1. Complexity leadership theory and the key elements of the development process (Marion, 2010)

In the CLT framework, enabling leadership enhances effective complex dynamics by fostering and manoeuvring the mechanisms and contexts that catalyse adaptive leadership, as well as allow for the appearance of adaptive behaviour. In reality, however, enabling leadership can be found anywhere, because it manages the intertwining of administrative leadership (formal managerial systems) and adaptive leadership (organisational conditions). In addition, enabling leadership is able to foster complex networks through interaction, interdependency and adding adaptive tension (Prigogine, 1997), aimed at motivating and coordinating interactive, complex dynamics. (Uhl-Bien et al., 2007; Plowman et al., 2007).

Adaptive leadership is clarified within the framework of CLT as an emergent, interactive dynamic producing an adaptive outcome in a social system (Uhl-Bien et al., 2007). Adaptation is a dynamic process of shared influence (Goldstein, 2008). All creatures act on their environments, and their environments, in turn, act on them. Adaptive leadership describes an active form of leadership, not a passive effort taken purely to adjust to circumstances as found. Biology teaches us that relationships between living entities are circular and interactive (Kauffman, 1993). Organisations are also living systems, being composed not just of capital goods and technology, but of people. Organisations are capable of intelligent, purposeful collective action, actions taken to

influence their environments in desired directions. Like all living organisms, organisations are able to learn, adapt and grow. (Uhl-Bien et al., 2007; Rotmans & Loorbach, 2009; Hyypiä, 2013)

3 Research design

3.1 The methodology

In order to explore how knowledge sharing in the co-operation between health care professionals and sport counsellors can be supported by complexity leadership theory, case study approach was applied. This study uses case study as research strategy. As a research strategy, case study is used in many situations to contribute to our knowledge of individual, group, organizational, social and related phenomena (Stake, 2005; Yin, 2009; Erikson and Koistinen, 2005). However, case study is only one strategy among several others of doing research. Others include, for example, experiments, surveys and historical research. In this study the type of research question, the fact that the investigators have only little control over actual events and the focus of the study as a contemporary phenomenon favoured the decision to use case study as a research strategy. According to Yin (2009), a case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between the phenomenon and the context are not clearly evident. A case study strategy is also preferred when the researcher seeks answers to how and why questions.

Case study is also known as a triangulated research strategy, which means using different types of material, theories, methods and investigators in the same study. The present study utilises the triangulation of data and investigators in order to understand the complex phenomenon and to increase the quality of the study. The case study is also suitable for this study as complexity leadership theory as a concept have been studied only little and the purpose is to add understanding of the selected case.

Particularly the two development sessions, were planned in close co-operation with university, health care professionals and experts of sports. The results are analysed in co-operation with other researchers and the results are reviewed by the case organisation and experts.

3.2 The empirical context

The need for health enhancing sports activities has increased dramatically in the past decade. A resident who does not get enough exercise for his/her health, who is overweight and who is in poor physical condition is at a higher risk of falling ill and thereby creating social welfare and health care expenditure for the local authority. Physical activity is fundamental in improving people's physical and mental health. It reduces risks of many diseases. Thus, different kinds of developments both in public and private sector are needed to encourage physical activity (Parjanen & Hyypiä, 2014).

The case builds on the on-going MOTION! project which aims to develop the exercise and well-being industry, and create new collaboration models for co-operation between the private, public and third sectors. The project's key measures are creating the exercise clinic service platform and piloting it together with the public, private and third sectors, ensuring the quality of services provided by the exercise industry in the health and exercise service chain, developing well-being entrepreneurship by using cluster operational models, developing new business models for the well-being industry through innovation and strengthening collaboration between sectors through networks.

Physical activity referral schemes aim to identify inactive adults in the primary care setting. The primary care professional refers the patient to a third party service, with this service taking responsibility for prescribing and monitoring an exercise program tailored to the needs of the client. To enhance physical activity counselling and referral process the MOTION!-project is establishing an online physical activity pharmacy. Physical activity pharmacy platform will provide a toolbox to support physical activity counselling and referral. It will also offer private sector companies an opportunity to offer their services at all levels of the health and exercise service chain and to find new service and product concepts (Parjanen & Hyypiä, 2014).

3.3 The data

The empirical data of this study consists of two development sessions for nurses and physiotherapists and a survey.

The purpose of the survey was to increase understanding of the current situation as well as the required development areas in the public sector physical activity promotion. The survey was conducted in the beginning of 2013 via Webropol; online survey and analysis software. The surveys included questions like what kind of abilities there are

related to sports counselling at your health centre, what kind of experiences you have about sport counselling processes, what kind of experiences you have about sport counselling with customers, is there need for further training or education about the issue and what issues should be taken into consideration in developing sport counselling processes.

The open and multiple choice questions for the survey were formulated in co-operation with a researcher, a representative from the case organisation and with the external sport counsellor. The online questionnaire consisted of multiple choice questions using a rating scale from 1 to 5 (strongly agree, agree, neutral, disagree and strongly disagree), adapted from the Likert scale. The survey questionnaire was sent to 127 representatives of employees in primary health care organisations in different municipality by email and its response rate was 30,7. The respondents of the survey were doctors, nurses, public health nurses, physiotherapists, practical nurses and memory nurses.

The analysis of the data was focused on complexity, co-operation, knowledge sharing and areas for beneficial improvements in physical activity counselling. The inquiry of the data was based on the content analysis, for example, evaluating appearance of mutual themes, adversarial feedback, experiences and suggestions for improvements. Additionally, differences and similarities between open and multiple choice questions were evaluated.

In 2012, two similar sessions for nurses and physiotherapists were organised and the amount of participants was altogether 16. The sessions consisted of tasks related to, for example, the role of health promotion counselling and physical activity referral, how to motivate inactive people, what kind of tools as well as practises are needed to facilitate sport counselling processes. Session methods were pair and group working as well as general discussions.

During the sessions the role of the researcher was to observe. The data analysis from the sessions is focused on listing opportunities and threats in physical activity counselling based on the written material and notes from the sessions. In addition, data from the survey and sessions was compared in order to find differences and similarities between the gathered data. It should be noticed that data were not only gathered for the purpose of this study. Instead, the data were collected for both development and research purposes.

4 Findings

4.1 Knowledge sharing

In general, the results of this study indicate that co-operation between different organisations and professionals are considered significant, and health promotion counselling and physical activity referral are beneficial tools in order to enhance people's physical and mental health. On the other hand, respondents pointed out that many opportunities for the public sector physical activity promotion are yet to be recognised. Based on the results of the study, it should be noticed that different organisations and professionals were in different phases of the development processes.

In order to enhance explicit knowledge sharing about developing sport counselling processes among health care professionals and sport counsellors, tacit knowledge and experience based information is required. The results of this study highlighted the fact that interaction and communication channels are crucial in co-operation between different sectors. Aiming towards collective interaction from diverse viewpoints, proper arenas for encounters are essential. These co-created arenas are able to support knowledge creation and sharing but also these would be useful on diminishing social distance between professionals in public, private and third sectors.

4.2 Co-operation

In the public sector physical activity promotion was considered as a collaboration of many experts from different fields of operation. The co-operation is done between health care professionals and sport counsellors from sport departments or third sector organisations. However, according to the questionnaire every fourth health care professional did not take a stand whether s/he cooperates with sport counsellor. Also in the workshops there was a clear wish that co-operation between sport counselling and physiotherapy should be tighten. One respondent said that "co-operation between sports counsellors and health care professionals is one of the most important issues" in successful physical activity counselling.

On the contrary, it could be pondered about the opportunities and tools that employees are available to in practical co-operating between different sectors. Additionally, it should be recognised how these accessible tools and practices meet the needs of public sector physical activity promotion.

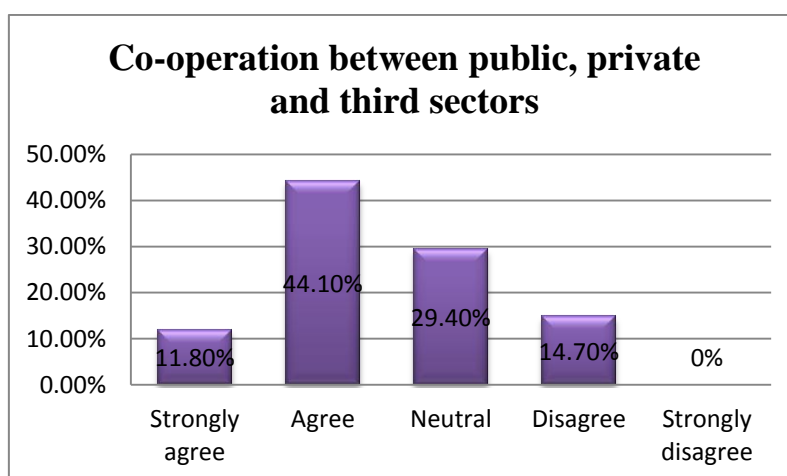


Table 1. Perceptions of the practical co-operation among different sectors

In this sense, development processes should be focused on enhancing users' experiences and communication possibilities between developer and customers, i.e. inactive people, via participatory methods. Surprisingly, however, the data of this study revealed no significant importance for taking customer along in co-creating health promotion counselling and physical activity referral.

One respondent stated that "We need more co-operation! No more meetings or bureaucracy in improving health promotion counselling and physical activity referral.. instead, developing practices in the way that we are able to share information and knowledge via phone and web-based tools."

4.3 Complexity and development challenges

In this study several challenges are identified that may hinder the development potential. Some of these challenges were found inside the organisation related to, for example, how employees interact with each others. There were also challenges between different organisations related to differences in expertise, misunderstandings and lacking knowledge sharing practices. In practice, drawing the lines between the different challenges may be very difficult, but identifying and discussing them is useful both in theoretical and practical sense.

68 % of respondents perceived that customers are now aware enough of the public sector physical activity promotion. For example, have of the respondents felt that health promotion counselling and physical activity referral requires novel tools, particularly

virtual ones. In addition, results of the study reflected that customers may perceive the public sector physical activity promotion rather uneasy as they are unfamiliar with the concept. Though, according to the survey in general, talking about health and exercise with customers was considered easy. But based on the results of the open question from the survey as well as data from different sessions, talking about the physical activity promotion was perceived rather challenging.

In daily practices, the public sector physical activity promotion competes with the counselling of diets and rehabs as one of the respondent stated “.. sometimes I feel that time is running out before I would have an opportunity to suggest health promotion counselling and physical activity referral”.

4.4 Complexity Leadership theory

The development of health enhancing sports is situated, context-specific and takes place in very practical environments like in primary care organisations, private companies or third sector organisations.

Administrative leadership i.e. condition that plans and coordinates bureaucratic functions in an organisation was reflected in the research data. For example, there were also lacks of knowledge how to bring up physical activity with the client or how to discuss about the need of physical activity promotion inside the organisation. For example, many health care professionals considered that they would like to have more conversation about the role of physical activity counselling and referral in health promotion. This was considered as a responsibility of the management. One respondent explained that organisation “should give a clear presentation about why physical activity counselling is important in the organisation and how it should be given”. It was also considered important to increase the knowledge of local councillors about the effects of health enhancing sport as a preventive method. In real-life context, however, complex processes are multi-layered and several actions and behaviours are happening simultaneously.

In order to enhance interaction and communication between health care professionals and sport counsellors from sport departments or third sector organisations, encounters via development sessions was required. The idea was to bring together a group of diverse people i.e. the participants of the different sector and facilitate them to develop the practices in which they interact in their daily work life. By enabling forums to tackle

different perspectives and experiences together, directors and managers were able to use their leadership as a process and let participants solve problems creatively together without top-down emphasis on it. Furthermore, encouraging employees to share ideas and suggestions to improve existing organisational systems indicates *enabling leadership* behaviour.

In this study, development sessions, as an arena, can be reflected as a main condition for *adaptive leadership*, since the basic idea was to improve knowledge sharing through co-operation between different sectors with dynamic interaction. In other words, participants do not represent formal organisational and professional roles during idea generation. In addition, meetings with the case organisation were handled successfully by the case organisation and experts analysing results and development processes in co-creative manner and planning action steps on how to proceed in the future jointly.

Conversely, many respondents found that there are many things that should be developed further between social and health care sector and sport department. For example, many considered that responsibilities and duties are unclear. Also the sport counsellors felt that the health care professionals do not know enough about their expertise.

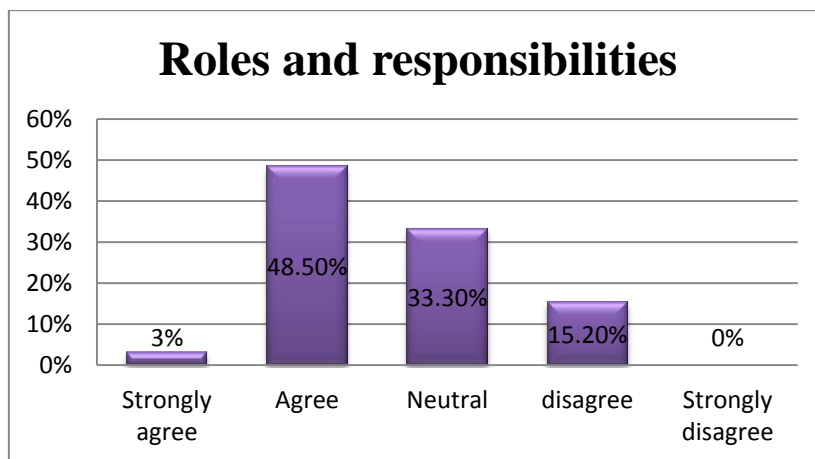


Table 2. Perceptions of the defined roles and responsibilities in co-operative organisations

All development processes involves resistance to some extent. It could be very interesting focus on future development conditions based on the attitudes of employees and co-operation partners that especially seem to view development in the physical activity promotion most negatively. The focus of development processes or change

evolves to match of its environment and therefore, critical viewpoints are able to provide valuable information what kind of resistance might be come across.

5 Discussion and implications

Aim of this study is to explore how knowledge sharing for the collaborative organizations in the co-operation between health care professionals and sport counsellors can be supported by complexity leadership theory (CLT) and how the CLT and its leadership roles (adaptive, enabling and administrative) can be recognized as well as applied to practice.

Complexity leadership theory (CLT) is the study of the generation and emergence of complex dynamics within an organisation. It explores the nature of interaction and adaptation in complex interacting systems and the influence of such things as emergence, innovation and suitability. Due to this, this study is focused more on complex dynamics – i.e. multiple interactions, nonlinearities and non-deterministic behaviour – than on exploring complex adaptive systems as such in development processes.

The results of this study indicate that social characters of interaction, for example, reliability and expertise of colleagues, collectivity and mutual goals, have significance influence. In this sense, formal and informal gatherings are crucial such as coffee breaks or teambuilding days. Modifying the shared and common goals and ability to identify roles and responsibilities together, communication between diverse viewpoints and sectors are essential. Through knowledge sharing an increased understanding of the complexity and hindered challenges in organisation and its environment can be better achieved.

According to Snowden (2005), in the complex context, diverse methods have the opportunity to reduce costs and foster rapid responses in organisations. To achieve emergence or innovations in the activities of organisations and various forms of co-operation, enabling and supporting continuous interaction and integrated knowledge flows is of crucial importance. Furthermore, according to Bessant & Tidd (2007), complex interaction is all about knowledge and the ways it flows and is linked and exploited to make emergence and development happen. On the other hand, interaction and knowledge co-creation among diverse individuals requires patience and time for reflection (Snowden & Boone, 2007).

Recognition of diverse environments, their various contexts and roles in the activities of and collaboration between organisations and their interest groups is ever-more important to achieving better interaction in which strategic or formal statuses or structures may be bypassed. In the development process, it is not necessarily the leader who is in possession of essential knowledge; thus, it is the role of leadership to offer methods and arenas where different actors may generate advances.

External knowledge and ideas can only be recognised; accessed and assimilated when organisations develop new practices and change their organisational structure to facilitate development processes. According to the evaluation workshop in prime care organisation “the cross-sectoral work has increased in the organisation”. This has been possible, because the focus of development has been defined, the own role in co-operation has been clarified and understanding of the need for co-operation throughout the case organisation. It was also seen that the cross-sectoral collaboration has “changed the organisational culture”

6 Conclusions

Reframing and advancing leadership is always a topical theme. The complexity leadership theory is a relatively new view in the field of leadership theory but it has generated an important perspective that facilitates the understanding of complex organizational behaviour. In addition, bringing a complexity perspective to the study of leadership reveals dynamics and forces present within and across organizations that no other approach to leadership offers (Brown, 2011). Global challenges, complexity and continuous uncertainty demand development of leadership approaches, employees and multi-organization co-operation. Current leadership theories do not sufficiently address the needs of complex business environments, particularly in the co-operation between health care professionals and sport counsellors. First of all, before successful leadership models can be applied in practice, leadership needs to shift from the industrial age to the knowledge era. Many leadership models still view leadership solely through the perspective of linear process thinking. In addition, there is not enough knowledge or experience in applying this conceptual framework in practice, particularly in the co-operation between health care professionals and sport counsellors.

The results of this study suggest that the complexity leadership theory represent applicable model to advancing sustainable knowledge sharing for the collaborative

organizations. An implementable method for organizations may be assembled by assimilating different roles of complexity leadership into development practices featuring diverse activities and interaction channels. As MOTION! project wise, Physical activity pharmacy online platform was co-created. This is a good example of co-operation public, private and third sectors enhancing knowledge flows and co-creating value creation processes in offering private sector companies an opportunity to offer their services at all levels of the health and exercise service chain and to find new service and product concepts.

The CLT was chosen for this study because it approaches leadership as being embedded in a complex interplay of numerous interacting forces. It is not just about the influential acts of an individual, the leader. (Uhl-bien et al., 2007; Avolio et al., 2009) However, it is important to acknowledge that not all leadership activities entail a complexity leadership approach. (Snowden & Boone, 2007; Brown, 2011) As a matter fact, in some contexts, such an approach is unnecessarily multi-faceted and not useful when traditional managerial and leadership practices are sufficient. (Snowden & Boone, 2007; Uhl-Bien et al., 2007; Brown, 2011; Bass & Bass, 2008; Bass & Riggio, 2006)

The results of this study are subject to some limitations. The research was conducted in Finland. It might prove fruitful to investigate a wider range of industries and include case studies from abroad in future research. In addition, comparisons between different industries and nationalities could provide additional perspectives for leadership, development processes and complexity studies.

The main contribution of this study relates to applying the rather conceptual model in practice. Empirical evidence on the relevance of different leadership roles in development processes in public, private and third sector is another valuable contribution. Finally, the study sheds light on the significance of combining complexity science with leadership and emergence theories in research.

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Knowledge-intensive Entrepreneurship in Innovation Ecosystems: towards the conceptual model of a Regional Entrepreneurial Learning Center

Aldo Romano,

University of Salento
Ed. IBIL – Campus Ecotekne , Via per Monteroni sn,
73100 Lecce (Italy)

Giuseppina Passiante, Pasquale Del Vecchio*

Department of Innovation - University of Salento
Ed. IBIL – Campus Ecotekne – Via per Monteroni sn
73100 Lecce (Italy)

** Corresponding author*

Structured Abstract

Purpose - The paper presents a thematic conceptualization of a Regional Entrepreneurial Learning Center, conceived as a catalyst of the knowledge-intensive entrepreneurship in the regions and a strategic asset for their growth in the scenario of the entrepreneurial economy (Thurik, 2008; Audresch and Thurik, 2001). Incardinated on the Knowledge Triangle and aimed to enhance, primarily, the social and economic valorization of the Key Enabling Technologies, the Center will promote the synergic integration between the universities, primary actors in the process of the knowledge creation, the companies, that allow the socio-economic valorization of the knowledge available through the innovation and entrepreneurial processes, and the governmental institutions, supporting their knowledge exchanges and knowledge valorization processes. Coherently with the emerging nature of the knowledge-intensive entrepreneurship as entrepreneurial learning process and inspired by the current debate on the innovation ecosystems, the Center will promote the development of continuous and dynamic entrepreneurial learning processes to create a young knowledge intensive entrepreneurs, the evolution of the Universities towards an entrepreneurial configuration, and to accelerate the diffusion of entrepreneurial behaviors and culture in all the regional organizations and institutions.

Design/methodology/approach - The study is based on a constructive and qualitative review of the academic and policy-based existent literature on the issues related to the meaning and dynamics characterizing the knowledge economy as entrepreneurial economy, the knowledge-intensive entrepreneurship as technology-driven entrepreneurship, the entrepreneurial learning processes as main dimension of the entrepreneurship in the knowledge scenario. The theoretical background previously recalled addresses the conceptualization of the Regional Entrepreneurial Learning Center proposed by providing useful insights for determining its mission, processes, and strategies as well as to comprehend its meaning as booster of knowledge-intensive entrepreneurship and source comparative advantage in the regions.

Originality/value - The paper presents elements of originality under different perspectives. In particular, a first valuable element springs from its contribution to the current debate on the knowledge intensive entrepreneurship as core process for the social and economic growth of the regions starting from the valorization of the knowledge and the Key Enabling Technologies. The focus on the dynamic perspective of the entrepreneurial learning process is a further valuable contribution at the scientific debate on the comprehension of the meaning and instances of the behavioral implications on the entrepreneurship and its implications on the effectiveness of the process of knowledge creation, absorption and diffusion in innovation ecosystems.

Practical implications - The practical implications provided by the paper are identifiable into the main areas in which the Center will focus on. In operating as catalyst for the diffusion of knowledge intensive entrepreneurship in the regions, the Center will impact on the growth of the knowledge intensive entrepreneurship in the young people, and the diffusion of entrepreneurial culture and behaviors within the organizations, institutions and Universities. Such practical implications result coherent with the objectives of the European Agenda for the Smart Specialization and the several initiatives launched for overcoming the European Paradox of low innovation capability.

Keywords – Knowledge-intensive Entrepreneurship, Entrepreneurial Learning Process, Innovation Ecosystem, Intelligent Growth

Paper type – Academic Research Paper

Introduction

The paper aims to present the conceptual model of a Regional Entrepreneurial Learning Center as strategic mean for the diffusion of knowledge intensive entrepreneurship and driver for the social and economic valorization of the Key Enabling Technologies (KETs).

Starting from the interpretation of the knowledge economy as entrepreneurial economy, through the “structuralist-evolutionary model”, based on the Schumpeterian research streams (Arthur, 2009, 1999; Lypsey, et al., 1998; Schumpeter, 1934), and the comprehension of the main shifts characterizing the transition from the managed to the entrepreneurial economy (Audretsch and Thurik, 2001), the paper focuses on the knowledge-intensive entrepreneurship as driver for the growth of individuals, organizations and regions.

The knowledge-intensive entrepreneurship arises in the study as a not linear process and a radical foundation of the entrepreneurial process as entrepreneurial learning process (Minniti and Bygrave, 2001) is so implied by its knowledge-intensive and technology driven nature.

Framed in the above premises, the Regional Entrepreneurial Learning Center is presented as source of comparative advantage in the regions and expression of a knowledge-intensive regional partnership composed by the knowledge producers (universities), knowledge users (companies) and institutions, and giving priority to both the anticipatory and action learning strategies.

The conceptual model of the Center, discussed in the paper in terms of mission, processes, expected results, is described as booster for the activation of entrepreneurial learning processes aimed to create a mass of young knowledge intensive entrepreneurs, to accelerate the evolution of Universities towards an entrepreneurial configuration, to diffuse entrepreneurial behaviors in the regional organizations and institutions.

In coherence with the objectives of the European Agenda for Smart Specialization and the several initiatives launched for reinforcing the innovation capacities of the European Regions, the meaning of the Center as source of comparative advantage is, so, debated in the paper with its several practical implications.

The paper is structured as follows: the first paragraph is devoted to the analysis of the current social and economic scenario of the knowledge economy interpreted as entrepreneurial economy, and to the identification of the knowledge intensive entrepreneurship as one of the most relevant structural changes implied by the large diffusion of the KETs. In the second paragraph, the comprehension of the meaning of knowledge-intensive entrepreneurship is afforded through the comparison between the traditional entrepreneurship and the knowledge-intensive one, in terms of market-driven and technology-driven entrepreneurship, linear and not linear entrepreneurial ideation processes, till to derive the importance of an entrepreneurial learning theory. In the third paragraph, the conceptual model of the Regional Entrepreneurial Learning Center is detailed in terms of mission, goals, processes and strategies, with the aim to deepen its main distinguishable features and the areas of actions. In the last paragraph, the meaning of Center as source of regional comparative advantage is debated, in order to derive implications for the agenda of scientists and policy makers.

1. The knowledge intensive economy as entrepreneurial economy

In the XXI century, the social and economic systems are interested by several structural changes due at the impact of technological knowledge.

According to the “structuralist-evolutionary model”, based on the Schumpeterian research streams (Arthur, 2009, 1999; Lypsey, et al., 1998; Schumpeter, 1934), the economy can be conceived as an expression of the General Purpose Technologies or Key Enabling Technologies (KETs). This means that economy changes constantly over time as far as the technologies evolve, and arises ultimately out of the phenomena that create technology. The process of technology evolution impacts and transforms “the economic structure from within, incessantly destroying the old one, incessantly creating a new one” (Arthur, 2009; Schumpeter, 1934).

Actually KETs, identified into Micro-nano electronics, Nanotechnology, Advanced Materials, Photonics, Industrial Biotechnologies and Advanced Manufacturing Technologies, are the main forces behind the structural changes. These technologies are knowledge intensive, and are determining rapid innovation cycles and highly skilled employment demand. They enable innovation in goods, services and processes. KETs feed into many different industrial value chains and sectors, in heterogeneous ways. They are multidisciplinary, with a trend towards convergence and integration. Due to their transversal nature, KETs catalyze the strengthening and modernizing of the industrial base, as well as drive the development of entirely new knowledge intensive industries.

KETs are determining structural changes in all the components of the economic system: physical capital, human capital, organization of production facilities, labor practices, managerial and financial organization of firms, geographical allocation of industries, industrial concentration, infrastructures, private-sectors financial institutions and financial instruments (Lipsey, et al. 1998). The level and the scale of these changes, which differ greatly from one technology to another, can produce some evolutionary effects. The main can be identified into the renewing of traditional sectors, through higher value added activities and new market niches; differentiating technologically from existing specialization into related fields; starting new economic activities, through radical technological changes and breakthrough innovations; and taking advantage of new forms of innovation, such as open and user-centric innovation, social innovation and service innovation.

The knowledge intensive nature of the aforementioned enabling technologies, as causes of the structural changes, are characterizing the economy as a knowledge intensive economy.

A large variety of recent studies and researches has contributed at the comprehension of the main features characterizing the knowledge intensive economy. In particular, two different types of economy's models have been proposed: the model based on the intensive use of the material resources, natural and not renewable, and so characterized by the law of decreasing returns, and the model of the knowledge intensive economy, where knowledge represents the strategic asset for the production and competitiveness, as a renewable and an appropriable resource based on the law of the increasing returns.

The first model, predominant in the XX century, has been codified as managed economy, while the second, more representative of the current scenario, as entrepreneurial economy (Audretsch and Thurik, 2001).

The analysis of Audretsch and Thurik (2001) has identified a set of tradeoffs between managerial and entrepreneurial economies.

In the managerial economy, the dominant factors of production are labor and capital; in the entrepreneurial economy, the determining factor of production is knowledge, not only in terms of technical and scientific software, but also as an input that includes aspects such as creativity, skills to communicate, emotional intelligence. Indeed, in the entrepreneurial economy, the competitive advantage is driven by innovative activity, and knowledge spillovers are an important source of this activity.

The managerial economy is mainly focused on continuity, i.e. on incremental innovation, compatible with existing core competencies and technological trajectories of the firm or the industry. The entrepreneurial economy of the twenty-first century is, instead, focused on radical innovation, standing beyond the boundaries of the core competence and the technological trajectory of the firm or the industry.

In the managerial economy, unemployment can be reduced only at the cost of lower salaries. In the entrepreneurial economy, high employment can be combined with high wages, while a low wage does not necessarily imply high employment. Small firms in general, and new ventures in particular, are the engine not only of employment but also of productivity.

In the managerial economy, the external environment is characterized by stability, homogeneity and specialization. Turbulence, diversity and heterogeneity, instead, typify the external environment of the entrepreneurial economy.

In the managerial economy, firms are based on controls and transactions, competition is alternative to cooperation, economies of scale have a strategic role. In the

entrepreneurial economy firms are based on motivation, market exchanges, flexibility. Competition and cooperation are complementary.

In the managerial economy, public policy has an essentially constraining nature (antitrust policy, regulation and public ownership, concerns about excess profits and abuses in terms of market dominance). In the entrepreneurial economy, governmental policy aims at creating an environment suitable for supporting the success and sustainability of firms. The appropriate policy has to be the facilitator of international competitiveness, growth and employment, by creating links and networks, proposing incentives to firms and knowledge institutes, stimulating special and functional flexibility of labor, creating forms of social innovation.

The model of the managed economy revolves around the links between stability, specialization, homogeneity, scale, certainty and predictability on the one hand, and economic growth on the other. By contrast, the model of entrepreneurial economy focuses on the links between flexibility, turbulence, diversity, novelty, innovation, linkages and clustering on the hand and economic growth on the other (Thurik, 2008).

In synthesis, the entrepreneurial economy as knowledge intensive economy results to be driven by the innovation; the human capital represents, so, the strategic asset for its competitive growth in reason of the contribution of significant importance that it can provided to the processes of knowledge creation, diffusion and absorption.

A wide large spectrum of the working force competencies is involved into the valorization of the innovation. Such competencies are not limited to scientific and technological activities but interest also laboratories for producing, commercializing, marketing and managing human, financial and organizational resources.

The linkages between innovation and competencies of the human capital arises so as a necessary condition for the success in the entrepreneurial economy, this because the human capital with its competencies fosters innovation, by generating, through the research, new knowledge that is finalized towards radical innovation; adopting or adapting existing ideas and technologies and by this facilitating the processes of incremental innovation; reinforcing the social capital and the innovation networks; and diffusing the knowledge within the organizations and enhancing a process of knowledge absorption within the components of the human resources into the organizations (Romano, 2013).

A radical innovative profile of human capital is represented by the knowledge-intensive entrepreneur, or innovation driven entrepreneur, or technology driven entrepreneur. Because this entrepreneur is considered the driver, in the scenario of the knowledge economy, the study aims to comprehend how is it possible to create this strategic asset and which are the main processes to execute in order to achieve such goal. To answer at this question, it results, preliminarily, important to characterize the nature of the knowledge-intensive entrepreneurship and mainly of the processes that concurrent to create it. The paragraph that follows is devoted to exploit this question.

2. Characterizing and Creating Knowledge-intensive Entrepreneurship

It is important for the goal of this study to comprehend which are the elements characterizing the knowledge-intensive entrepreneur, considered as the driver of the competitive growth in the knowledge-intensive economy and mainly which are the processes concurrent to creating knowledge intensive entrepreneurship.

Recent studies and empirical researches highlighted and identified two different types of entrepreneurs: the entrepreneur who identifies a market need and explore a technology with which to exploit it (market-driven entrepreneur); and the entrepreneur who first identifies a technology and then explore a market need toward which it can be exploited (technology-driven entrepreneur). As Newbert et al. (2007) argued, the first operates to match a known demand with new technologies, the second, instead, an unknown demand with unknown technologies.

Market-driven entrepreneurs begin their entrepreneurial processes with the discovery of a market's necessity and then search for a mean to satisfy it. Technology-based entrepreneurs, instead, typically consider the identification of a market necessity as a secondary element in front of the technology development, and think about the commercialization only after the new science has been developed (Newbert et al., 2007).

In market-driven entrepreneurship, the entrepreneur identifies a market need and then explores a technology by which to satisfy it; in technology-driven entrepreneurship entrepreneur first identifies a technology and then explores a market need to be satisfied.

Technology driven entrepreneurs utilize complex and sophisticated social networks as sources of ideas, as well as to test, refine and validate trial ideas, exhibiting an

extraordinary domain specificity that allows him to filter ideas outside specific markets and technologies (Gemmell, et al., 2011).

The emergence of a new type of entrepreneurship, in the scenario of the knowledge-intensive economy, is confirmed by a recent study of Aulet and Murray (2013), published by the Kauffman Foundation. The study provides a comparison between the features characterizing the traditional SMEs with that one of the Innovation driven entrepreneurship.

The innovation-driven entrepreneurship is addressed towards global markets, even if at the beginning it can be limited to regional or niche segments of demand. It is the focus on innovation, intended as technology, product, process, or business model, to guarantee the strategy of expansion at global level and the success of the entry strategy in a new market.

Focusing on the profiles of the human capital enabling an innovation-driven entrepreneurial process, the study argues as they have generally higher level of education, and as usually innovation-driven start-ups are conceived and leaded by PhDs in technological and scientific fields.

The study provides, also, a deepen comparison between the two different typologies of entrepreneurship, as it is synthetized in the following table:

Table 1. Adapted from the Aulet. B., and Murray, F., (2013) “A Tale of Two Entrepreneurs: understanding differences in the types of Entrepreneurship in the Economy” – Kauffman Foundation.

	<i>Traditional SME Entrepreneurship</i>	<i>Innovation-driven Entrepreneurship</i>
Market	Local or regional	Global
Innovation	Not necessary	Fundamental
Type of Job	Non-tradable jobs	Tradable Jobs
Ownership	Familiar and little external capital	Distributed ownership and large external capital
Rate of growth	Linear	Exponential

In providing a clear identikit of the innovation-driven entrepreneur, the study highlights some implications for the governments to support the growth of such type of entrepreneurship, and that are called firstly to assume with entrepreneurial behaviors. The focus of the governments, in promoting and accompanying the arising of innovation driven entrepreneurship is suggested in the study also for the fundamental contribution it

can provide in the creation of new employment opportunities as well as for the socio-economic value it can create in the regions.

In this paper, the figure of entrepreneur emerging in the current social and economic scenario is, so, interpreted as knowledge-intensive entrepreneur, because the focus on the KETs, that are transforming the economic systems, have a knowledge-intensive nature.

Interpreting such entrepreneurship as driver for the growth in the knowledge intensive economy, the following research question arises: which are the processes enabling the generation of such knowledge intensive entrepreneurs?

The entrepreneurship disciplines don't currently possess sufficient conceptual frameworks to explain how an entrepreneur learns (Cope and Watts, 2000). For this reason, entrepreneurial learning has emerged as an important area of inquiry in relation to both the academic studies of entrepreneurship and the practical development of new entrepreneurs.

The literature of the entrepreneurial learning includes a variety of theoretical approaches focused on diverse aspects of the phenomenon; overall these approaches are divided into two main fields depending on their unit of analysis: those focusing on the figure of the entrepreneur and those focusing on the organizational context (Erdélyi, 2010). The first approaches are concerned with the personal learning experience and the cognitive capabilities of the "entrepreneurial individuals"; the latter on how entrepreneurship takes place as a collective activity and at various scales, from the single firm and its immediate network towards the national system of innovation. In brief, entrepreneurial learning is hidden considered as an individual activity or as a collective activity (Erdélyi, 2010).

The nature of our research question implies the identification of the entrepreneurial learning process as unit of analysis of our study, because learning is of increasing importance in knowledge intensive entrepreneurship, given the growing significance of science, technology, and innovation in new venture creation.

Indeed, knowledge-intensive entrepreneurship involves a learning process, an ability to cope with the problems and to learn from those problems; as a consequence the entrepreneurship is a process of learning and a theory of entrepreneurship requires a learning theory (Minniti and Bygrave, 2001).

Rae (2006) develops a conceptual framework for analyzing entrepreneurial learning for the emergent knowledge-intensive entrepreneurs. He highlights that there has been an

extensive writing on entrepreneurial education from which it can be concluded that while such education can provide cultural and personal support, knowledge and skills development about and for entrepreneurship, the “art of entrepreneurial practice” is learned better in the experiential based environments rather than in the educational environments. “This must lead to the exploration of learning as a situated and active experience rather than as a plurality of educational and theoretical processes”. In his triadic model about the entrepreneurial learning assumes relevance the contextual learning theme, which includes related experience and social relationship people learn intuitively and may develop the ability to recognize opportunities. “Contextual learning includes the development of skills, expert knowledge and social contacts from employment, experiences and know-how in industry. Much of the learning is functional, technical and problem solving funding up by discovering and experiential learning how things are done and established routines and practices that work in given situations. The influence of the contextual career experience on the entrepreneurial formation is often profound” (Rae, 2006).

Contextual learning has important implications for knowledge-intensive entrepreneurship because innovation, opportunities and entrepreneurial skills are developed through contextual learning and this cannot occur without participation.

And it is in this perspective, that the current debate on the innovation ecosystems, as differentiated, collaborative and knowledge-intensive set of actors, relationships, and institutions affecting the process of sustainable innovation of a region (Romano, et al., 2013; Asheim and Gertler, 2005) provides useful insights for comprehending the meaning of a collaborative process of learning, addressed in the paper.

According to the purposes of this paper, it is fundamental to identify which are the entrepreneurial ideation processes characterizing the contextual learning proposed by Rae (2006).

Recent empirical researches (Gemmell et al., 2011) highlight as the knowledge intensive entrepreneur presents the following characteristics: the usage of complex and sophisticated social networks to identify, test, refine and validate new ideas, the possess of an deepen knowledge of domain specify through the filter of ideas outside technologies and market, the experimentation and iteration of ideas rather than engagement in protracted conceptual analysis. Indeed, the authors identify the entrepreneurial ideation process as a not linear process articulated into 5 recursive phases, as in the figure 1:

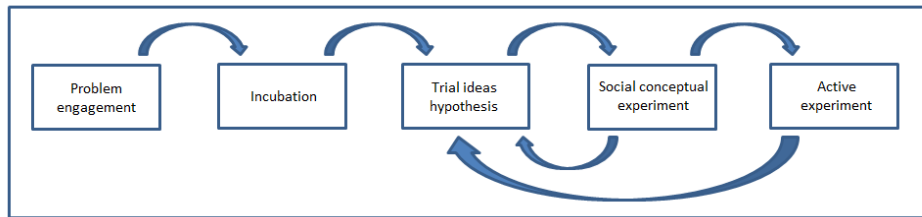


Fig.1 A Not Linear Entrepreneurial Ideation Process
(adapted from Gemzell et al. 2011)

This process Entrepreneurial ideation process describes how a potential entrepreneurial team incubates ideas in response to problems before generating a trial idea and hypothesis. This entrepreneurial ideation process contrasts with the linear process characterizing the traditional incubators, as in Figure 2 .



Fig.2 A Linear Entrepreneurial Ideation Process
(adapted from Gemzell et al. 2011)

From the virtuous combination of the nature of the contextual learning and the features of the entrepreneurial ideation processes, previously described, arises the proposal of the Regional Entrepreneurial Learning Center as comparative advantage of the regions in the scenario of the knowledge-intensive economy.

3. The Regional Entrepreneurial Learning Center

In the previous paragraphs, we highlighted the meaning of the accelerated evolutionary process of the economic systems towards the scenario of the knowledge-intensive economy, interpreted as entrepreneurial economy. The driver for accelerating such evolutionary process has been identified in the knowledge-intensive entrepreneurship, or technology-driven entrepreneurship, or innovation-driven entrepreneurship.

More in general, such acceleration calls for a more diffused entrepreneurial mindset in the organizations, public and private, as well as in the institutions. This with the aim to

facilitate the processes of structural change in all the components of the socio-economic systems, coherently with the “structuralist-evolutionary” model, and in consideration of the nature of the KETs.

Within the structural changes, the genetic mutation of the entrepreneurship, driver of the economic growth, arises as one of the most significant one, together with the overcoming of the linear processes characterizing the traditional business incubators. Such mutation results in the archetype of the knowledge-intensive entrepreneurship.

The nature and the specifics of the knowledge-intensive entrepreneurship imply, as seen, the *radical foundation of the entrepreneurial process* represented by the transition *towards the entrepreneurial learning process*.

And it is in this perspective that the unit of analysis, in our study, is identified into the processes and conditions enabling the activation of knowledge-intensive entrepreneurship in the regions.

Due at the knowledge-intensive and technology-driven nature of the entrepreneurship, this is the reason why, in the economy of the XXI century, some authors argue that the theory of entrepreneurship is identifiable into a learning theory (Cope, 2005; Minniti and Bygrave, 2001).

In order to sustain the acceleration of the structural changes implied by the KETs, the paper proposes the strategic role of the Regional Entrepreneurial Learning Centers (RELC) focused on the activation of entrepreneurial learning processes to:

- create young knowledge intensive entrepreneurs, involved in the socio-economic exploitation of the KETs,
- accelerate the evolutionary path of the Universities towards a entrepreneurial university model, taking into account their strategic role in the competitive scenario of the knowledge intensive economy,
- diffuse entrepreneurial behaviors in all the regional organizations and institutions.

RELC, as expression of a regional innovation ecosystems emerging from the organic cooperation between knowledge producers (universities and research institutions), knowledge users (companies operating in the market), and other institutions (financial and public), is incardinated on the knowledge triangle: “technological knowledge, innovation, learning” (EIT, 2012).

RELC, conceived as contextual learning theme (Rae, 2006) or as learning organization, gives priority to both the *anticipatory learning strategy* and the *action learning strategy*.

As well known, the anticipatory learning is a generative or creative process, aimed to learn by various anticipated futures.

This means that, in coherence with the focus on the entrepreneurial learning processes related to the socio-economic exploitation of KETs, people in the RELC will be involved in an *interactive and collective learning*, aimed to:

- explore the evolution of enabling technologies combined to determine the specifics of goods and services (product technology), the processes to create them (process technology), the forms in which the processes can be organized (organizational technologies), the concurrent processes to explore market opportunities (marketing technologies);
- include, through the active involvement in interactive processes, the impact of enabling technologies on production systems, trading, consumption, labor market, on the profiles of the human capital, socio-institutional and environmental issues;
- infer, starting from the nature of the changes, the new paradigms that characterize the knowledge intensive economy and rules that differ with respect to the economy and society of the twentieth century but, more importantly, understand what are the dynamics that characterize the trajectories of specialization strategy of the EU.

The action learning strategy connotes the entrepreneurial processes, activated by RELC, as *experiential entrepreneurial learning processes*. This means that people involved in RELC will be engaged into the solution of concrete problems, projects, challenges, questions, with a growing social relevance.

In this way, the action learning strategy is built on the whole cycle of learning: learning and creating knowledge through concrete experience, by observing and reflecting on this experience, by creating formalization from this experience, by testing the implications of these generalizations, through new experience and starting the process from the beginning (Kolb, 1984).

Therefore, through the *action learning*, people involved will entry in contact with industries, universities and research institutions and other formal and informal networks through which individual experiences are related, compared and shared.

Through related experience and social relationship, people learn intuitively and may develop the ability to recognize opportunities and to understand how to transform such opportunities in socio-economic value.

The practice of the *action learning* strategy, by RELC, will offer to people involved to:

- acquire knowledge and competencies to connect knowledge with practical experience on issues relating to the dynamics of growth of regions to innovate and the rules that govern the knowledge economy;
- initiate, design and execute dynamic projects for the development of Entrepreneurship and Innovative smart specialization of territories;
- act as agents of change in the territorial systems imagining creative solutions to afford complex challenges of social and environmental considerations;
- combine the technological opportunities with the complex social and environmental challenges, perceiving the meaning of radical innovations.

In giving priority to both the anticipatory learning strategy and action learning strategy, the conceptual model of the Center as learning organization presents element of coherence with a plurality of initiatives have been recently launched, not only in US but also in other European Countries. Such initiatives arise, mainly, in the schools of engineering rather than in the business schools, considering the nature of the technology-driven entrepreneurship in the scenario of the knowledge-intensive economy.

4. RELC as source of regional comparative advantage: implications for the agenda of scientists and policy makers

The coherence of the RELC's conceptual model with a growing number of initiatives of entrepreneurial education at international level as well as its areas of interventions identified into the young knowledge intensive entrepreneurs, the entrepreneurial universities and the large diffused entrepreneurial culture allow to understand as RELC is characterized as strategic asset and source of comparative advantage of the regions, for their successful positioning in the knowledge-intensive economy.

This because, RELC aims to operate as facilitator of the overcoming of the European Paradox of the excellence in the scientific and technological research but low capabilities of innovation.

As well known, the regional economic performances are not just determinate by new knowledge creation, but also by the abilities and willingness of innovative entrepreneurs to develop new products, processes based on a technological knowledge (Audretsch, et al., 2008).

The knowledge-intensive entrepreneurs are so identified as central actors for transforming the new knowledge into socio-economic value for the regions.

Policies focusing only on the promotion of processes of knowledge generation are not sufficient to produce higher regional economic performances; policy makers have to work on processes aimed to create entrepreneurial capital for sustaining the exploitation of the knowledge created into new products and translating innovation from the laboratories into economic performances (Audretsch, et al., 2008).

As known, this mismatch between knowledge creation and knowledge exploitation, has been named European Paradox. In order to overcome this paradox, the UE has recently launched (EU COM 955688) the “Entrepreneurship 2020 Action Plan - Reigniting the Entrepreneurial Spirit in Europe”.

The Action Plan starts from the following stylized facts:

- Europe needs more entrepreneurs, in order to bring back sustainable growth and higher level of employment;
- Knowledge intensive entrepreneurship is identified as core process for the economic growth and job creation, in reason of its contribution to the creation of new companies and jobs, to the openness at new markets, the nurturing of new skills and capabilities.
- The new companies are fundamental for guaranteeing the level of employment that without the jobs from them will be negative.
- It is important to recognize or aware on the entrepreneurial endeavor. The culture of celebrating successful entrepreneurs as models to create jobs and incomes is still absent.
- Europe needs a cultural change to understand the strategic role of entrepreneurship as engine for the growth.

The Action Plan proposes interventions into the three main areas:

- Entrepreneurial education and training to support growth and business creation;
- Strengthening framework conditions for entrepreneurs by removing existing structural barriers and supporting them in crucial phases of the business lifecycle.
- Dynamiting the culture of entrepreneurship in Europe, nurturing the new generation of entrepreneurs.

A particular focus is reserved to the entrepreneurship as key competence to embed into all the curricula, at primary, secondary, vocational, higher and adult levels of education, before the end of 2015.

This complex emerging demand of change highlights the strategic role of RELC, conceived as booster of the intelligent growth and so as source of comparative advantage for the regional systems involved in the actuation of the Smart Specialization European Strategy. This because the main impacts of RELC on the regional systems are identified in terms of creation of a mass of young knowledge-intensive entrepreneurs, encouragement at the genetic mutation of the universities, as well as the genetic mutation of the incumbent enterprises towards assets and processes charactering the learning organizations.

The crucial role of the Universities in the knowledge-intensive economy and their involvement in the dynamic operations of the Center will provide positive feedbacks for accelerating the evolutionary path of the Universities towards an entrepreneurial configuration (Gibb. 2005).

At this purpose, Universities are, so, called to become more entrepreneurial, coherently with the framework developed by the UE with OECD. The framework helps interested universities to assess themselves and to improve their capabilities with tailor made learning modules.

The entrepreneurial behaviors of the Universities can be identified into their capability to:

- promote their connectivity with regional growth, fielding actions consistent with the processes and dynamics that characterize the sustainable knowledge society on a global scale;
- contribute to the development of human capital in the regions, attracting young talents and enhancing the mobility of researchers and students to industries and research centers, national and international;

- promote innovative entrepreneurship and the development of economic activity and growth, through the creation of enterprises by students and researchers and the development of learning networks with existing businesses, even on a global scale;
- promote the integration of principles of innovative Entrepreneurship in the curricula under-graduate, graduate and post-graduate;
- operate as agents of entrepreneurship by creating spin-outs with which to transform the results of research into innovation in the products and / or services;
- support regional innovation through research in collaboration with industry to facilitate the development of knowledge;
- reduce the various forms of social exclusion, through the provision of a program of “life-long learning” for cultural development and retraining.

The progressive growth of the number of knowledge-intensive entrepreneurs and the rapid evolution of the university system towards entrepreneurial model induced by RELC will contribute to diffuse the entrepreneurial culture in the regional societies and to increase the competitiveness of the regional economic systems.

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The *MinK* Framework: Investigating Individual Knowledge Indicators

Mohamed AF Ragab *

3S Group - College of Business,
Dublin Institute of Technology (DIT),
Aungier Street, Dublin 2, Ireland.

Amr Arisha

School of Marketing, College of Business,
Dublin Institute of Technology (DIT), Ireland.

** Corresponding author*

Structured Abstract

Purpose – Effective knowledge management (KM) entails knowledge assessment capability to enable identification of knowledge assets and proper governance of value creation dynamics. Although some studies have attempted to use different methods to measure knowledge at the organisational level, few have addressed the individual knowledge holder. The purpose of this paper is to present a state-of-the-art framework, referred to as *MinK*, that enables organisations to measure individual knowledge in the business context using a novel diversity of indicators.

Design/methodology/approach – The model was developed based on a comprehensive conceptual framework. A pilot study composed of 20 semi-structured interviews elicited valuable feedback from practitioners and was followed by a validation phase in which an electronic questionnaire is used to survey a large sample of senior managers.

Originality/value – This paper contributes to the literature by presenting an innovative integrated individual knowledge measurement framework, and proposing a theoretical framework for the pivotal role of individuals in the organisational knowledge environment.

Practical implications – The model provides managers with a valuable tool capable of identifying knowledge holders and supporting effective KM decision making to achieve optimal organisational performance. Results showed that the *MinK* framework was also well received by industry and accepted as a valid framework.

Keywords – Knowledge Management, Knowledge Measurement, Intellectual Capital, Stocks and Flows

1 Introduction

In a business environment characterised by dynamic market needs and fierce global competition, knowledge emerges as a vital strategic resource and an antecedent of sustainable competitive advantage in today's knowledge economy (Spender, 1996, Drucker, 1999). An exponential growth of the Knowledge Management (KM) domain was triggered by the realisation that value creation is no longer dependant on financial assets only, but rather on intangible ones whereby organisations need to strive to leverage and exploit their knowledge resources (Carmeli and Tishler, 2004, Serenko and Bontis, 2013). The capacity to manage any organisational dimension becomes quite a challenging endeavour without the ability to assess what is being managed (Marr et al., 2004). Effective KM entails knowledge measurement capability to enable proper governance of an organisation's value creation dynamics (Carlucci and Schiuma, 2006). Knowledge measurement supports managers in identifying 'hidden' knowledge assets (Edvinsson and Malone, 1997), evaluating the impact of KM initiatives (Liebowitz and Wright, 1999), and aligning strategic plans with available intellectual capital (Wiig, 1997, Zack, 1999).

Based on extensive literature review of existing knowledge measurement methodologies, three main approaches: financial, intellectual capital components, and performance were identified by Ragab and Arisha (2013a). The financial approach uses data from a company's financial records to provide a holistic assessment of intellectual capital (IC) in financial terms based on the notion of market over-valuation (Grossman, 2006). IC is usually computed as a result of the difference between a company's book value and its market value (Tobin, 1969, Stern et al., 1995). The IC components approach divides IC into a human component and an organisational component and attempts to assess each component using metrics (Edvinsson and Malone, 1997, Bontis et al., 1999b). On the other hand, the performance approach tends not to measure knowledge/IC, but rather its impact or effect on organisational performance (Ruggles, 1999, Shin, 2004).

The literature review in knowledge measurement shows that the majority of knowledge measurement frameworks are developed at an organisational level, with very little efforts directed into the assessment of individual knowledge holders within organisations (Kannan and Aulbur, 2004, Ragab and Arisha, 2013b). This critical gap is vital in attempting to effectively manage knowledge in isolation of 'the knowers who own it' as it overlooks the essential role of individuals in the organisational knowledge

environment (Fahey and Prusak, 1998). The proposed research is aiming to address this issue by focusing on individual employees and knowledge holders. It also proposes a novel framework referred to as ‘*MinK*’, an acronym for *Measuring Individual Knowledge*. *MinK* provides managers with the visibility required for effective decision-making in the allocation, exploitation and development of knowledge-holding individuals within their organisations.

2 Conceptual Framework

The objective of the initial phase in the development of an individual knowledge measurement model is to develop an overarching theoretical framework that depicts the pivotal role of individuals in a company’s knowledge environment. A number of KM theories were combined veritably in the conceptual framework to represent the theoretical foundation of *MinK*. An organisation is envisaged as the sum of its financial capital (monetary and physical assets) and its IC, both of which are exploited to improve organisational performance (Stewart, 1998) (Figure 1). IC could be divided into Structural Capital (SC) (i.e. knowledge held within the organisation’s supportive infrastructure, business processes, IT systems and customer relations), and Human Capital (HC) (i.e. knowledge held by employees). In the ‘stocks and flows’ theory, IC is seen as the stock of knowledge a company holds at a certain time, while KM is concerned with managing knowledge flows between individuals and the organisation (Bontis et al., 1999a, Al-Laham et al., 2011).

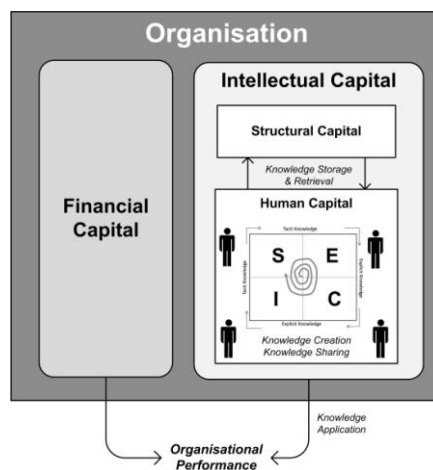


Figure 1: *MinK* Conceptual Framework

The dynamics of knowledge flows are governed by a number of knowledge processes starting by *knowledge creation*, followed by *knowledge sharing* and *knowledge storage & retrieval*, and ending by *knowledge application* (Alavi and Leidner, 2001, Mertins et al., 2003, Goldoni and Oliveira, 2010). The processes of knowledge creation and knowledge sharing within organisations are best represented by the renowned SECI model developed by Nonaka and Takeuchi (1995), which views the individual employee as the core of knowledge creation. They distinguish between explicit and tacit knowledge (Polanyi, 1967), then clearly state, “*At a fundamental level, knowledge is created by individuals ... an organisation cannot create knowledge without individuals.*” They define organisational knowledge creation as a process of elaborating and sharing tacit knowledge created by individuals by converting it into explicit knowledge through four simultaneous conversion modes. They are:

- *Socialisation (S)* – conversion of tacit knowledge into other forms of tacit knowledge through social interaction and dialogue with other individuals.
- *Externalisation (E)* – conversion of tacit knowledge into explicit knowledge through narratives and analogies to convey an individual’s conceptualisation to others.
- *Combination (C)* – conversion of explicit knowledge into other forms of explicit knowledge through codification and documentation.
- *Internalisation (I)* – conversion of explicit knowledge into tacit knowledge within an individual through learning and experience.

The SECI model therefore portrays the knowledge production process that creates knowledge stocks and the consequent knowledge flows resulting from the knowledge sharing process between individuals. Similarly, the process of storage and retrieval underpins the flow of knowledge between an individual and the organisation. Explicit knowledge is codified by individuals into organisational ‘knowledge items’ such as knowledge repositories, business processes and intellectual properties (Bolisani and Oltramari, 2012). On the other hand, new employees acquire knowledge through knowledge retrieval from such items creating reciprocal knowledge flows between human capital embedded in employees and structural capital that is owned by the company (Roos et al., 1998, Bontis, 2001).

The knowledge application process is the ultimate objective of knowledge management and measurement whereby knowledge is utilised in business decision making to enhance organisational performance and achieve competitive advantage. It could be described as the aggregation of individuals' knowledge to create value through conversion of inputs to outputs in the form of products and services (Grant, 1996).

3 The *MinK* Framework: Development and Structure

The journey of developing an individual knowledge measurement model began by questioning what makes certain individuals "knowledgeable"? It is found that an individual's knowledge manifests itself in her/his *attributes* and *actions*. Knowledgeable people have certain knowledge-related characteristics (attributes), and engage in certain knowledge activities (actions) such as creation, acquisition, learning, sharing and application. Accordingly, instead of measuring knowledge *itself*, characteristics that indicate that knowledge is present within an individual could be identified and assessed. The *MinK* framework is therefore built on the premise that assessing certain of an individual's attributes and actions would provide a good indication of their knowledge. This is achieved by adopting a component-based structure similar to IC models in which individual knowledge is broken down into components that reflect an individual's knowledge-related facets and each component is then measured individually using a set of metrics.

Recognising that it is onerous -if not impossible- to measure the totality of an individual's knowledge, the scope of assessment is directed towards one's knowledge in their business domain, the knowledge that is of value to their organisations. It is acknowledged that an individual may hold knowledge in other areas that are unrelated to their work but such knowledge is viewed as irrelevant and out of the scope of the proposed framework. The focus of this study is individual knowledge in a business context and identifies relevant knowledge as one that contributes to improving organisational performance (Baron, 2011).

3.1 Indicators and Metrics

The *MinK* Framework defines a list of *Individual Knowledge Indicators (IKI)* each of which implies that an individual holds certain knowledge that is valuable to their

organisation, or is active in acquiring, creating, sharing and applying such knowledge (Figure 2) (Ragab and Arisha, 2013c).

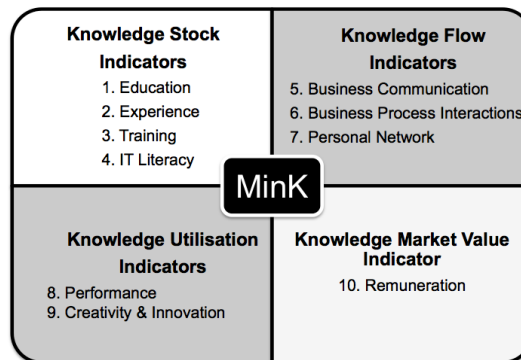


Figure 2: Individual Knowledge Indicators (IKIs)

The key four IKI groups are: Knowledge Stock, Knowledge Flow, Knowledge Utilisation, and Knowledge Market Value. Knowledge stock indicators are background measures which reflect the knowledge an individual has internalised through learning and experience. The assumption is that such indicators will measure *enabling attributes* that thrive an individual’s creation and exploitation of knowledge (Bolisani and Oltramari, 2012). Knowledge flow indicators are process measures that reflect an individual’s exposure to knowledge flows and their likely roles in accumulating knowledge stocks (Malhotra, 2003). The assumption here is that knowledgeable individuals would be highly engaged in knowledge acquisition and sharing activities through communication with their social networks, would contribute to the codification of knowledge into business processes, and would learn from existing ones. Knowledge utilisation indicators are indirect measures that evaluate the *effect* an individual’s knowledge has had on their work output. The assumption is that there is direct correlation between knowledge and its effects on performance and innovation (Bolisani and Oltramari, 2012). Knowledge market value indicators assess an individual’s knowledge using its market value by using remuneration as a measure. The assumption is that the market value of an individual (i.e. salary scale) could be used as a proxy indicator of their knowledge in the same manner the market value of an organisation is used to calculate its IC.

The next stage in the *MinK* framework was to develop metrics to measure each IKI. Metrics are measurement units, which may be direct counts, monetary values or percentages, when used to measure quantitative attributes, or numerical scale-based

ratings when used to quantify qualitative attributes. Accordingly, sets of metrics were proposed to evaluate each indicator (see Ragab and Arisha, 2013c).

3.2 Data Sources

To ensure the practicality of the solution, it is important to determine the sources of data the model requires about an individual to perform the assessment. It is noted that such data is of two types: *quantitative data* and *qualitative data*. The first type is used by such quantifiable metrics as the count of years of experience, hours spent in training, and the financial value of remuneration. This data is, to a great extent, objective and could be obtained from the individual's records in the company's Human Resources department then would be validated by the individual under assessment to ensure the information is up-to-date.

The second type of data includes ratings of parameters such as performance, innovation, and networking capacity and these have to be obtained mainly through qualitative assessments. Since such assessments involve one individual - usually the direct manager - evaluating another (the employee) they are challenged by subjectivity and bias diminishing their credibility. Managers may not be fully aware of employees' knowledge-related capabilities and may be influenced by other factors, such as personal relationships, when rating subordinates (Toegel and Conger, 2003). To overcome this challenge, a *360-degree* approach is proposed whereby individuals would be assessed by themselves, their peers, subordinates, managers and possibly external stakeholders. This approach has gained great interest from both managers and researchers due to its contribution in increasing objectivity of qualitative assessments and reducing bias, and has recently been introduced in the human capital domain (Peter et al., 2011).

3.3 Aggregation

Given the multiplicity of IKIs and metrics in the *MinK* framework, there is an urge to combine the different measures into a concise format that represents an individual's knowledge for reporting and benchmarking purposes. Consolidation would be achieved by aggregating the results of IKIs to produce an *Individual Knowledge Index*. This would require an *aggregation methodology* that incorporates a technique for the combination of indicator and metric results and assignment of weights that would reflect the relative importance of different parameters (Figure 3).

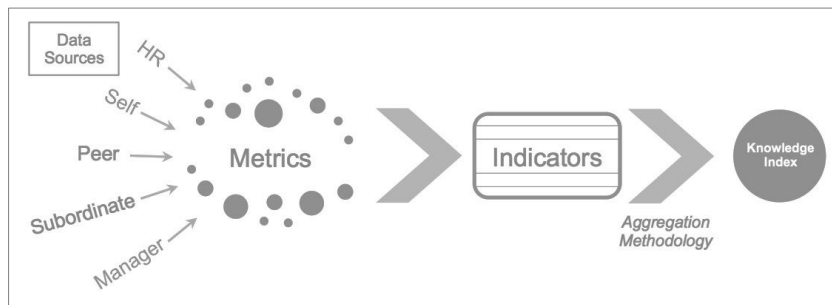


Figure 3: MinK Framework – Data Sources

4 Pilot Study

Before proceeding to the next phase of this research, it was necessary to examine the validity of the proposed framework and elicit the opinions of businesses. A pilot study was done through interviews of practitioners from a variety of organisations (e.g. leading multinationals, indigenous companies and Small/Medium Enterprises). Interviews were conducted with management level and deemed to be an effective method of revealing information about views and experiences (Dunn, 2000). Interviews were semi-structured to provide interviewees with the flexibility to elaborate on their understanding of individual knowledge and to allow the interviewer to alter the phrasing and sequence of questions to maintain conversational flow while ensuring that all scheduled issues were addressed. A total 20 interviews were completed and this sample size was considered appropriate for a pilot study. Managers represented corporations that operated in a number of industries namely consulting, IT, healthcare, education, pharmaceuticals, and food manufacturing. Interviews were conducted in person and by phone and typically lasted 30 - 45 minutes.

Interview responses were systematically analysed using an inductive and interpretive approach and coded for qualitative analysis. Codes were not pre-assigned and the coding scheme was developed as key themes emerged from the data (Glaser and Strauss, 1967, Iaquinto et al., 2011). At the beginning of interviews, participants were provided with brief background information about this research then were asked the first set of questions which aimed to examine the status of KM in their companies. Participants were then introduced to *MinK* and were asked to express their views about the model's methodology and components.

During initial discussions, it was apparent that all interviewees were aware of the concept of the ‘knowledge economy’ and KM as a business field. Most of their organisations implemented some sort of KM activity that ranged from ‘hard’ technology-based initiatives to ‘softer’ people-based ones. Most participants, however, expressed doubts about the effectiveness of their companies’ KM initiatives and felt that they still suffered from knowledge attrition. When asked whether their organisations attempted to measure knowledge, several interviewees discussed their performance appraisal systems, which revealed a mix-up between knowledge measurement and performance measurement. This was, however, not unexpected because it stemmed from the implied notion of ‘measuring knowledge through its effects’ and the assumption that the most knowledgeable employees are the best performers. When the distinction between knowledge assessment and performance appraisal was clarified and *MinK* was introduced, participants stated that their companies did not have a clear knowledge measurement system. Nevertheless, they expressed keen interest in the study and in the *MinK* framework. They believed it would enhance their KM capabilities and reduce the loss of valuable knowledge.

When asked to express their views on the model, managers found knowledge stock IKIs to be very relevant indicators of individual knowledge and noted that the same four parameters are used by most managers to evaluate individuals from their CVs during recruitment. When reviewing metrics, a number of participants disagreed to the use of number of hours and expenses as measures of training. They believed that the duration and cost of training are not necessarily valid indicators of the knowledge gained and that training should be evaluated based on outcomes and impact on business performance. This view was found to be confirmed by the training evaluation literature (Alliger and Janak, 1989, Alvarez et al., 2004, Pineda, 2010). Similarly, few managers commented that based on their experience, grades should not be used as measures of knowledge gained during education as in many cases an individual’s performance at work is not related to their academic performance. Although there is debate in the literature about the link between college and work, a number of researchers have agreed with practitioners that this correlation does not exist (Cohen, 1984, Waldman and Korbar, 2004).

While most of interviewees agreed with the three knowledge flow indicators, most of them were not convinced with the proposed metrics. They found that the recurring use of

counts as quantitative metrics provided misleading results and criticised such metrics for measuring the *quantity* and not the *quality* of their respective indicators. As one manager stated, “an employee receive hundreds of emails per day only for bureaucratic tasks that have nothing to do with his or her individual knowledge.” The general recommendation in this regard was to replace quantitative metrics by qualitative assessment. For example, instead of counting how many people an individual has in their personal network, the quality of their network and its relevance to the business would be assessed instead.

The approach of measuring individual knowledge via its market value was problematic to a number of managers who were critical of salary structures in their companies or in the job market at large. They questioned the link between knowledge and remuneration, because they believed there is a multiplicity of factors that determine a person’s salary, leading to the fact that knowledgeable employees are sometimes underpaid while less-knowledgeable ones are overpaid. Given their emphasis on the effect of knowledge on performance, all interviewees heavily endorsed knowledge utilisation IKIs as indicators of individual knowledge. Overall, most managers agreed that *MinK* would provide a good indication of individual knowledge if their suggestions for improvement were considered.

A number of participants concluded their interviews with few interesting and constructive comments. One manager questioned the generalisability of *MinK* and suggested that the model should incorporate the flexibility to adapt its indicators and metrics to different organisational profiles. This is similar to the approach adopted by Roos et al. (1998) in their work related to the *IC Index* framework where they recommended that IC indicators would be determined by the company’s top management based on its industry, size, age and strategy. The authors found this to be a valid point that should be studied. Moreover, few managers heavily emphasised their view that the value an organisation would derive from an individual’s knowledge is highly dependant on the individual’s attitude towards knowledge sharing. This factor - referred to by managers as *willingness, tendency, or motivation to share* - emerged as a key determinant of the value managers place on an employee’s knowledge. Researchers widely agree with this view as the vital importance of knowledge sharing motivation is undisputed in the KM literature (Vilma and Jussi, 2012, Witherspoon et al., 2013).

On a final note, another manager discussed the optimal frequency of individual knowledge measurement within organisations. He suggested that knowledge assessment should not be a one-time practice, but rather should be conducted in regular time intervals to enable organisations to monitor the development of their knowledge stocks. Recent research has also adopted this perspective. Lerro et al. (2012) state that knowledge asset evaluation should not be a “*snapshot*” because by time knowledge assets either evolve or lose their value. They recommend that measurement would be conducted systematically to enable tracking of “*evolution trajectories*” of knowledge assets.

The pilot study provided valuable practitioner insights and recommendations that were, in many cases, confirmed by the findings of recent academic research publications. In light of the interviews and discussions with KM experts, the *MinK* framework was subsequently modified and some of the recommendations were incorporated. The modified version of *MinK* is used in the ensuing validation stage.

5 Validation

5.1 Design and Data Collection

In order to validate the framework, a survey approach is adopted. It was found to be the most suitable method to collect data from a large geographically dispersed sample of respondents in a cost effective manner and to be analysed quantitatively (Saunders et al., 2009, Easterby-Smith et al., 2012). A structured questionnaire composed of 58 questions divided into four sections was designed as the data collection instrument. Before populating the questionnaire, a preliminary survey was carried out with a group of senior managers and KM experts. Positive feedback was obtained from this exercise, which helped in fine-tuning the questionnaire and adjusting some terminology to ensure clarity. Redundant and/or irrelevant questions were excluded to shorten the number of questions in the final version.

The first section of the questionnaire comprised multiple-choice questions about the demographics of the participant and the organisation including the company’s industry, size, age and location. In the second section, respondents were asked to indicate their level of agreement with a number of statements about KM in their organisations. Questions adopted a seven-point Likert scale ranging from 1=“Strongly disagree” to 7 = “Strongly agree” (Likert, 1932). The third section introduced *MinK*’s ten IKIs and

respondents were asked to rate the relevance of each indicator to individual knowledge using the same scale. A statement explaining each IKI was provided in the footer for further clarification. In the fourth section, respondents rated metrics that are proposed to measure each IKI then evaluated the effectiveness of the *MinK* framework holistically.

The sample of respondents consisted of managers in junior, middle and top positions from small and medium enterprises in addition to large corporations across a diversity of industries and excluded employees in non-managerial positions. To obtain reliable data, it was decided to choose organisations with 10 or more employees that have existed for more than five years and preference was given to leading multinationals. Smaller and younger companies were viewed as less likely to have a fully developed KM strategy and practice. Other criteria for selected managers included English language proficiency and researcher's access to their email addresses.

The questionnaire was conducted using the internet-based software *SurveyMonkey*. Formal emails were sent to more than 1000 managers inviting them to participate in the questionnaire. The invitation email provided a brief introduction to the research and its purpose and directed recipients to the web link of the survey. Respondents were offered to receive a summary of the research findings, if interested, as an incentive to complete the questionnaire. Follow-up e-mails were also sent at weekly intervals to increase the response rate. To eliminate concerns regarding confidentiality, respondents were informed that the questionnaire is completely anonymous since no personal information was required at any stage of the questionnaire. This meant that researchers had no means of linking a certain response to a specific email address to ensure anonymity.

The administration of the questionnaire took place in stages and responses were monitored to ensure the data collected had a minimum of errors and missing data. Incomplete responses are eliminated from results. After verification, data is organised in tabular form to be analysed using the Statistical Package for the Social Sciences (SPSS). Since data collection was still on-going during the writing of this paper, only sample results composed of 179 completed responses received to-date are presented in this article. The full set of results, the final response rate and an extensive statistical analysis of the data will be reported once the data collection phase has been completed.

5.2 Results

The characteristics of the organisations that contributed in the survey are demonstrated in the data sample (Table 1, Figures 4-5). Respondents are clearly from a diverse background of industries and mostly senior and middle managers where the proportion of top management so far is 39.1%. Almost half of the companies surveyed are large organizations having more than 1,000 employees and around 30% are medium size having between 100 and 1000 employees. The proportion of multinational enterprises amounted to 86%, while the rest (14%) were indigenous companies.

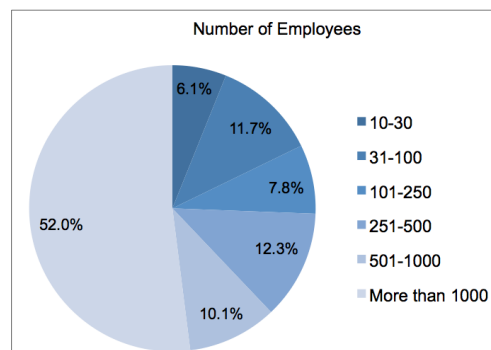


Figure 4: Profile of respondents – Company size

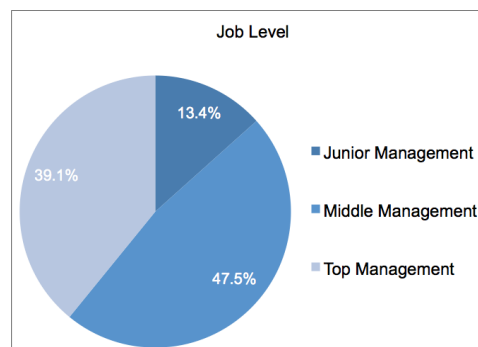


Figure 5: Profile of respondents – Job level

Table 1: Profile of respondent organisations

Industry	Frequency	Proportion (%)
Advertising & Marketing	8	4.5%
Agriculture	2	1.1%

Banking, Financial Services	11	6.1%
Consulting	6	3.4%
Education & Training	28	15.6%
Food & Beverage	13	7.3%
Government & Non-profit	8	4.6%
Healthcare	13	7.3%
Logistic & Warehousing	10	5.6%
Manufacturing	8	4.5%
Petroleum & Energy	10	5.6%
Pharmaceuticals	15	8.4%
Real Estate	3	1.7%
Retailing	10	5.6%
IT & Telecom	21	11.7%
Tourism & Travel	7	4.0%
Trading & Distribution	6	3.3%
Total	179	100%
Company Age		
5-10 years	20	11.2%
11-20 years	35	19.6%
21-35 years	40	22.3%
36-50 years	20	11.2%
50 - 100 years	23	12.9%
More than 100 years	41	22.9%
Total	179	100%

In the first section of the questionnaire, the value of individual knowledge was emphasised by the managers as results confirmed organisations believed most of their knowledge was held by individual employees and that such knowledge was directly correlated to their company's performance (Figure 6).

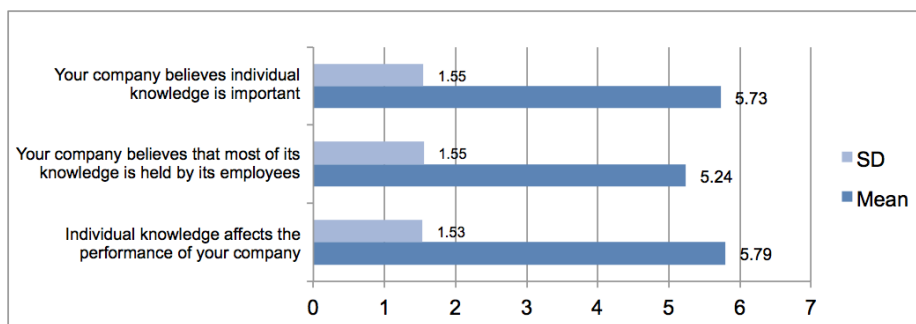


Figure 6: Questionnaire results - Importance of individual knowledge

(SD: Standard Deviation)

When the relevance of IKIs was assessed (Figure 7), most indicators were highly rated with nine out of ten indicators gaining average ratings of over 5 and the experience IKI rating 6.05. The lowest average rating of 4.49 was given to remuneration, which confirms the findings of the pilot study in which it was seen as the least relevant IKI. Metrics corresponding to each IKI are listed in Table 2 along with their mean ratings.

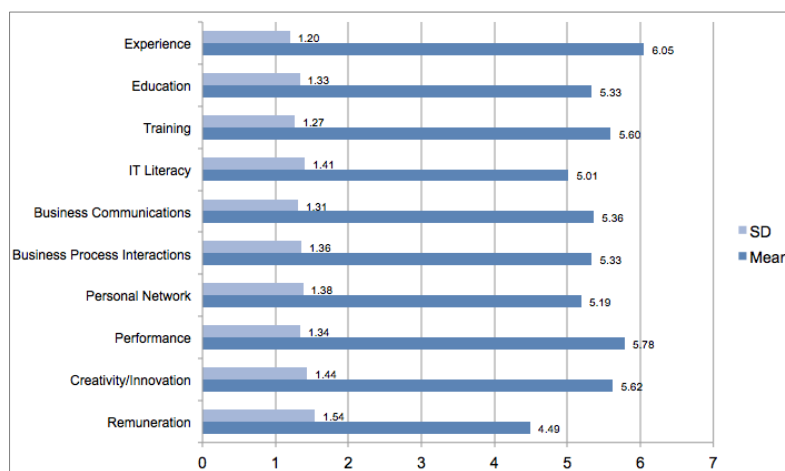


Figure 7: Questionnaire results - IKI Ratings

Table 2: Rating of Metrics

Indicator	Metrics	Mean	SD
Experience	Number of years in the company	4.8	1.5
	Number of years in function	5.5	1.3
	Number of years in the Industry	5.7	1.2
Education	Level of education	5.6	1.1
	Relevance of education to job	5.7	1.3
	International Exposure	5.6	1.3
	Proficiency in different languages	5.0	1.5
IT Literacy	Proficiency in general software & hardware	5.4	1.3
	Proficiency in function specific software & hardware	5.2	1.4
Training	Level of professional qualifications	5.5	1.1
	Number of training programs attended	4.8	1.4
	Impact of training attended on performance	6.1	1.1

Business Communications	Number of meetings attended per week	3.8	1.7
	Type of meetings attended (internal/external)	4.9	1.4
	Level of meetings (with managers/peers/subordinates)	5.2	1.3
	Rate of communications received per week	4.5	1.5
	Rate of communications sent per week	4.6	1.5
Business Process Interactions	Number of processes utilised	4.8	1.3
	Level of specialisation in utilised processes	5.3	1.1
	Number of processes supervised/reviewed	5.3	1.1
	Number of process improvement suggestions	5.7	1.1
	Level of involvement in business process improvement systems	5.7	1.2
Personal Network	Extent of contacts within the company	5.3	1.2
	Extent of external contacts	5.7	1.2
	Extent of international contacts	5.6	1.1
	Relevance of contacts to business	5.9	1.2
	Contact acquisition rate	5.0	1.5
Creativity & Innovation	Number of new ideas suggested	5.3	1.3
	Number of new ideas implemented	6.0	1.2
Remuneration	Salary	4.8	1.6
	Market cost of equivalent services	5.4	1.3

The last question in the questionnaire enquired whether managers believed that, overall, *MinK* would provide a *good* measure of individual knowledge. Results indicated it received a mean rating of 5.5. The response to this question in addition to the average ratings of indicators and metrics indicate that the *MinK* framework was *well received* by managers and accepted as a valid individual knowledge measurement tool.

6 Conclusion

This study presented the development of *MinK*, a framework designed to measure individual knowledge in a business context to support managers in KM decision making, enhance the effectiveness of KM systems, and to address an existing research gap. Ten indicators denoting knowledge stocks, flows, performance and market value were selected and metrics were developed to assess individuals' knowledge characteristics for each indicator. As a preliminary validation practice, a study was conducted through semi-structured interviews with managers from different industries to obtain feedback on the

model from a practitioner perspective. This provided valuable comments and constructive feedback that were used to refine the model.

A number of managers suggested that training should be evaluated by outcome rather than by duration or cost, and believed that remuneration and academic grades were irrelevant measures of knowledge. There was a general preference to use qualitative assessments rather than quantitative metrics while measuring knowledge flow parameters in order to reflect *quality* rather than *quantity*. The generalisability of *MinK* was also questioned and researchers were encouraged to investigate whether it would be a generic framework or should be adapted to different company profiles. Another proposition discussed the frequency of knowledge assessment and suggested it should be conducted periodically to monitor the evolution and/or loss of knowledge assets. Finally, the motivation to share knowledge emerged as a crucial factor for the success of KM in organisations. It was noted that most of the aforementioned practitioner views were found to be confirmed by researchers in the KM literature.

In the subsequent phase, a wide scale web-based questionnaire targeting managers was launched as part of the validation stage. Since data collection is still in process, only sample results were presented in this paper. Results showed that the *MinK* framework was highly rated by managers and well received as an individual knowledge assessment model. Once data collection has been completed, planned work includes an extensive statistical analysis of the questionnaire results to reveal data trends and correlations that may provide other new research insights.

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What effect is Entrepreneurial Capital having on the value creation in Italian companies?

Paola Demartini

Department of Business Studies, University of Rome TRE
Via Silvio D'Amico, Rome, Italy

Paola Paoloni *

Department of UNISU, Niccolò Cusano University
Via Don Carlo Gnocchi, 3 – 00166 Rome, Italy

** Corresponding author*

Structured Abstract

Purpose – The purpose of this paper is to show preliminary results from an international research project on intellectual capital and value creation led by Lappeenranta University of Technology (Finland) In the case of this paper, results from Italy will be reported and specifically . The Italian analysis focuses on the Entrepreneurial Capital (EC) and it analyses how large Italian companies develop and enhance this intangible element. The main research question is: What is the current level of Entrepreneurial Capital (EC) in Italian organizations and how does it affect value creation? To this end, the research addressed the different definitions of entrepreneurial capital that literature offers. As a secondary step we analysed the variables suggested by previous literature and we proposed an original definition for our research project. Our definition is that Entrepreneurial Capital is a stock of competences and the personnels' attributes related to proactive, risky and aggressive decision-making and behaviour.

Design/methodology/approach –In most studies IC has been seen to consist of three elements: human capital, structural capital and relational capital. However, we suggest that also three other elements could be included: “renewal capital”, in terms of innovative solutions, products and services available for the firms, “trust capital” i.e. the trust embedded in its internal and external relationship and “entrepreneurial capital” i.e. the competence and commitment related to entrepreneurial activities in the organisation. These variables were operationalized through meetings of the international working group. An empirical survey follows which analyses the Italian state of art . In particular the target population is made up of Italian companies with 100 or more employees. The companies involved were selected among 2,000 companies chosen from the database AIDA according to a stratified sample (according to geographical area, sector of activity and size). A questionnaire has been applied in order to gather information. This questionnaire is the same for all the countries participating in the project and has been administered mainly by means of e-mail and phone interviews. 100 companies have answered the questionnaire so far and this number is expected to increase during the next month. Additional economic and financial ratios have been obtained from AIDA

database, which contains economic and financial information for Italian firms. Descriptive analysis techniques will then be applied and differences according to industry and size will be explored.

Originality/value – This research provides researchers and managers with unique insights into the evolutionary nature of the relationships between distinct IC variables and draws a picture on the state of art of corporate entrepreneurial capital in the selected sample.

Practical implications – This research highlights and improves companies' abilities to manage their entrepreneurial capital. Furthermore this research will set the agenda for improving the entrepreneurial capital practices of Italian companies and will allow future comparison with firms from other countries that are participating in the same project identifying different pathways to success.

Keywords - Entrepreneurial Capital, Risk-taking, Proactiveness and autonomy, Aggressiveness.

Paper type – Academic Research Paper

1. Introduction

The purpose of this paper is to show preliminary results from the Italian research unit of an international project on intellectual capital and value creation led by Lappeenranta University of Technology –LUT (Finland).

The two key academic discussions addressing knowledge in organizations are Intellectual Capital (IC) and Knowledge Management (KM) streams of research. In particular, IC literature focuses on intangible resources that contribute to value creation (e.g. Edvinsson & Malone 1997; Sullivan 1998) that is “knowledge-based resources that contribute to the sustained competitive advantage of the firm” and “knowledge that can be converted into profits”. However, very few earlier studies systematically combine IC and KM practices to examine the key knowledge-related factors impacting value creation in firms

Yet the main question of the overall project is: << how do IC assets and their management practices interact to create value?>> and the common goal of the international research team is to examine the current state of IC stocks and KM practices, and how these interact in firms' value creation.

Academic Partners involved in the project are the following:

- Lappeenranta University of Technology, Finland (The Core Team)
- University of Rome 3, Italy
- Hong Kong Polytechnic University, China
- Deusto Business School, University of Deusto, Spain
- St.Petersburg University Graduate School of Management, Russia
- Educons University, Serbia
- Universidade Lusitana, Portugal
- Academy of Economic Studies, Bucharest, Romania

In most studies IC has been seen to consist of three elements: human capital, structural capital and relational capital(e.g. Bontis 2001; Guthrie 2001). The IC literature helps in identifying the kind of intangible resource stocks within the firms and in assessing them. However are the above-mentioned three elements sufficient?

In our research design we suggest that also three other elements could be included in IC visualizing and mapping: “renewal capital”, in terms of innovative solutions, products and services available for the firms, “trust capital” (i.e. the trust embedded in its internal and external relationship) and “entrepreneurial capital” (*i.e. the competence and commitment related to entrepreneurial activities in the organization*) (Kianto 2007; Kianto 2008; Kianto et. al. 2013).

Within the overall project, the Italian research unit will focus on Entrepreneurial Capital (EC). In particular it will be analysed how medium-sized and large Italian companies develop and enhance this intangible element. Consequently the research questions of our investigation are the following: what is the current level of Entrepreneurial Capital (EC) in Italian organizations and how does it affect value creation?

To this end, our investigation aims to highlight the importance of Entrepreneurial Capital as a stand alone component of the Intellectual Capital. As a secondary step we’ll analyse the variables suggested by previous literature trying to understand this phenomenon and we’ll propose a definition that fits our research design. The emerging definition is that *Entrepreneurial Capital is a stock of competences and the personnels’ attributes related to proactive, risky, innovativeness and aggressive decision-making and behaviour.*

Our research agenda will provide academics and managers with unique insights into the state of art of corporate entrepreneurial capital in the selected sample.

Furthermore this research will set the agenda for improving the entrepreneurial capital practices of Italian companies and will allow future comparison with firms from other countries that are participating in the same project identifying different pathways to success

2. Literature Review

Intellectual capital has been defined as “the total stock of capital or knowledge-based equity that the company possesses” (Dzinkowski, 2000). Intellectual capital is either the end product of a knowledge transformation process or the stock of organizational knowledge itself. Intellectual capital incorporates three main components that together form value: human capital, organizational (structural) capital, and customer (or relational) capital (Bontis 2001; Guthrie 2001).

Human capital refers to and includes know-how, education, work-related competencies, and psychometric assessments. McGregor et al. (2004) define human capital as the size and quality of broader labor markets, but also as the sum of individual competencies in organizations. Teece (2000) recognizes that knowledge assets or products result from the experience and expertise of individuals. However, the “physical, social, and resource allocation structure” of organizations are important if such experience and expertise is to be translated into competencies that help generate knowledge products (Teece, 2000; McGregor et al., 2004).

The term structural capital reflects these allocation structures and includes assets such as corporate culture, management processes, databases, organizational structure, patents, trademarks, and financial relations. Engstrom et al.(2003, p. 288) suggest that structural capital “includes all non-human storehouses of knowledge in organizations.”

Finally, relational, or customer capital refers to, in part, an organization’s customers, brands, customer loyalty, and distribution channels. Customer capital also refers to consumers as repositories of information and knowledge that is valuable to organizations (Bontis, 1998).

For the purpose of our research we deem that EC (roughly intuitively defined as *the competence and commitment related to entrepreneurial activities in the organization*) should be taken into consideration as a stand -alone element of IC in the light of the following rationale:

- in a unsteady and unpredictable business environment like today, Entrepreneurial Capital might be found as one of the most influent intangible to enhance corporate value;
- the construct of Entrepreneurial Capital is characterized by several attributes which, in the traditional definition of IC refer both to Human Capital (i.e. entrepreneurial competence and behavior) and Structural Capital (i.e. entrepreneurial corporate culture and processes).

2.1 Previous studies in the field of Entrepreneurship

It must be highlighted that no previous research within the IC domain refers to Entrepreneurial Capital , while many efforts have been done in the field of entrepreneurship studies especially to investigate the relationship between corporate Entrepreneurial Orientation (EO) (also called Corporate entrepreneurship- CE) and firm's performance.

Lumpkin and Dess, 1996 define *EO* as the *propensity of firms to be innovative, proactive to the market place opportunities and be willing to take risk*. While the EO is identified as a process, the entrepreneurship is define as the content.

To Schumpeter (1934), an entrepreneur is a person who carries out new combinations, which may take the form of new products, processes, markets, organizational forms, or sources of supply. Entrepreneurship is, then, the process of carrying out new combinations. In contrast, Gartner states that "Entrepreneurship is the creation of organizations" (1988, p. 26). Gartner was careful to specify that this was not offered as a definition but rather as "an attempt to change a long held and tenacious viewpoint in the entrepreneurship field" toward "what the entrepreneur does, not who the entrepreneur is" (p. 26). Nevertheless, it is clear from the literature that a large number of researchers in entrepreneurship have employed this definition, including Gartner (Gartner, Bird, & Starr, 1991; Learned, 1992).

The analysis of entrepreneurial capital can effect two level. The individual or organizational levels and from this levels depends the influence how contributes to

performance. EO by some scholar is associated only to SMEs because they are responsible for the majority of economic growth and new job creation (Birch 1979). **But recently (Guth & Ginsberg 1990) there has also been particular attention on corporate entrepreneurship as a means of growth and strategic renewal for existing larger firms.**

The organizational dimension may be viewed as encompassing the entire range of organizational activities that involve planning, decision making, strategic management and many aspects of the organization's culture, i.e. share value system and corporate vision. So many researchers have focused on delineating the dimension of EO in different ways.

Miller (1983) says that an entrepreneurial firm is one that "engages in product market innovation, undertakes, somewhat risky ventures and is first to come up with 'proactive' innovations, beating competitors to the punch".

So, to understand EO construct we must say that it had different definitions and that the scholar has been using several variables to identify it. At the **organisational level**, Vesper (1984) defined "corporate entrepreneurship" as any one of or any possible combination of new strategic direction; initiative from below; and autonomous business creation.

In other circumstances, reference is made to it as a "process of transformation of organisations through strategic renewal" (Antonicic and Hisrich, 2001; Guth and Ginsberg, 1990), corporate venturing (creating business in existing or new fields, markets or industries using a core competency within a firm: Ellis and Taylor, 1987; Narayanan et al., 2009), organisational innovation (Sharma and Chrisman, 1999; Yiu and Lau, 2008), as well as intrapreneuring (creating

an entrepreneurial mindset or culture within a firm, Pinchot, 1985; Thornberry, 2001).

At the **individual level**, Entrepreneurial Orientation has been associated to an individual who creates innovation of any kind within an established firm (Pinchot, 1985). A corporate entrepreneur is someone who engages in identifying and developing new opportunities relative to operations, methods, products or markets, sets the strategic vision for the organisation or persuades the top management to adopt these opportunities, and motivates others to implement them (Ireland et al., 2009). In more general terms,

corporate entrepreneurs are managers or employees who demonstrate key entrepreneurial attributes or behaviors within an established firm.

Each definition in the different levels (organizational or individual) has been associated with a number of characterizing variables that we'll discuss in the following.

All the researchers provided for each definition several variables to explain the meaning of EO/CE and its synonyms.

Each of the variables used was explained by attributing a shared definition. In the following we'll report on the meanings some of the variables used by the scholars.

Innovativeness : Developing new or improved products or services; may involve radical and discontinuous change, improvement and redevelopment of existing products or processes, or the introduction of novel products or production methods based on new technology.

Risk taking : Measuring and taking risks for the sake of profits; to take bold actions such as venturing units unknown new market or committing a large portion of resources to ventures with uncertain outcomes; preference is for moderately high risks rather than extremely high risks.

Networking : Developing personal relationships in which others willingly defer to one's wishes; networks include all internal and external, as well as formal and informal relationships that share information, experiences and resources and/or provide socialemotional support; networks represent a source of power that facilitates the acquisition of physical and monetary resources and advice, information and reassurance.

Integration: Being involved in all aspects of the organisation; requires seeing things in a broader perspective, analysing things in the abstract, and putting seemingly unrelated elements together in a meaningful way; may involve creating of a new order by selecting and fitting unrelated potential parts into a new pattern

Opportunism : Recognising and exploiting opportunities to develop new products and processes, improve existing operations, and/or develop new marketing approaches; may discover mundane opportunities that enhance efficiency or quality; evaluation of

opportunities involves balancing inadequate commitment of resources and the potential for return.

Non system bound orientation: Being unconstrained by rules, regulations and structures of existing organisational systems to be able to take advantage of opportunities; may require manipulating or bypassing the system; such freedom must be justified from the perspective of organisational benefit

Change Orientation: Responding to environmental changes in a proactive or reactive manner; proactive approach involves taking the initiative to shape the environment to one's own advantage; reactive approach involves responding to changes rather than exploiting and initiating change

Flexibility in Control: Having the ability to adopt flexible planning systems and take varying degrees of control as appropriate to take advantage of emerging opportunities; facilitates changing strategic plans in response to highly complex and ever-changing environmental threats and opportunities.

Informality: Preferring simple systems and informal structures; characterized in terms of being autonomous, resistant towards conformity and having a low need for support; allows for free crossing of organizational boundaries to promote a more open, cooperative atmosphere that is conducive to flexible decision-making processes, open communication and simplified work processes.

Result Orientation: Focusing on results; making decisions and solving problems intuitively to foster commitment to action; may become so immersed in work details that they are involved everywhere, ignoring corporate politics and individual egos, and violating bureaucratic procedures; similar to Type A behavior in terms of intense competitiveness, time urgency, polyphasic behavior and preference of immediate action over planning

AUTHORS	Proposed Construct/Concept	Attributes/VARIABLES the Construct/Concept	Level: INDIVIDUAL/ ORGANISATIONAL	JOURNAL
Miller (1983)	entrepreneurial orientation	innovation, proactiveness, risk taking	organisational	Management Science
Covin and Slevin (1989)	Strategic posture	Innovation Proactiveness Risk-taking	organisational	Strategic Management Journal
Lumpkin and Dess (1996)	Entrepreneurial Orientation	Propensity to act autonomously Willingness to innovate Take risks Tendency to be aggressive toward competitors Tendency to be proactive toward marketplace opportunities	individual/ organisational	Academy of Management Review
Zahra (1996)	Corporate entrepreneurship	Innovation Venturing Strategic renewal	organisational	Academy of Management Journal
Dess et al. (1997)	Entrepreneurial strategy making	Top management "intentionality" Organisational actor "autonomy"	organisational	Strategic Management Journal
Barrett et al. (2000)	Corporate entrepreneurship	Innovation Proactiveness Risk-taking	organisational	Journal of Marketing Theory and practice
Goosen et al. (2002)	Corporate entrepreneurship	Innovation Proactiveness Management's internal influence and relations	organisational	South African Journal of Business Management
Antoncic and Hisrich (2003)	Corporate entrepreneurship	New venture formation Product/service innovation Process innovation	organisational	Journal of Developmental entrepreneurship
Yiu and Lau (2008)	Corporate entrepreneurship	Innovation Venturing Strategic renewal	organisational	Entrepreneurship Theory and practice
Heavey et al. (2009)	Corporate entrepreneurship	Innovation Venturing Renewal	organisational	Journal of management studies
Ireland et al. (2009)	Corporate entrepreneurship Strategy	Top-management's entrepreneurial strategic vision Pro-entrepreneurship organisational architecture Entrepreneurial processes and behaviour	organisational	Entrepreneurship Theory and practice

As can be seen in the previous table, key words to define Entrepreneurial Orientation/Corporate Entrepreneurship are the following: Risk taking, Proactiveness, Innovation.

Despite the many names and the many variables studied it is yet unclear how these dimensions and business performance are linked. It is evident that all or at least a combination of some exhibit some relationship with business performance, generally positive link.

Lumpkin and Dess (1996) reasoned that the different variables of EC might lead to favorable outcomes on one performance dimension but unfavorable outcomes on another and this may also depend on different firm conditions (size, age, firm context).

3. Research Design: from Entrepreneurial Orientation to Entrepreneurial Capital

For the purpose of our current research, drawing from the above-mentioned literature, EC is comprehensively defined as “a stock of competences and the personnels’ attributes related to **proactive, risky, innovative and aggressive decision-making and behavior**”.

Proactiveness means taking initiative by anticipating and pursuit new opportunities and participating in emerging markets also has become associated with entrepreneurship.

Risky reflect an acceptance of uncertainty and risk inherent in original activity and is typically characterized by resource commitment to uncertain outcomes and activities.

Aggressive decision-making is the intensity with which a firm chooses to compete and efforts to surpass competitors reflecting a bias toward out doing rivals. Also includes the authority and independence given to an individual or team within the firm to develop business concepts and vision and carry them through to completion (Hughes, M., Morgan, R.E., 2006).

Innovativeness reflect the propensity of the firm to engage in a new idea and new processes and also new creative solution and opportunities (Wiklund, 1999).

To further address how the different dimensions are related to performance and value creations, we here overview several hypothesis. In fact to draw our research design it is necessary to examine how each individual variable of EC might influence business performance and value creation.

We will explore each dimensions above-mentioned and investigate why a specific variable might have a positive influence on business performance and value creation.

HP 1: Proactiveness is positive linking with performance and value creation

Proactiveness represents a forward-looking perspective where firms actively seek to anticipate opportunities to develop and introduce new or improved products, instigate changes to current strategies and tactics, and detect future trends in the market (Lumpkin & Dess, 1996; Slater & Narver, 1995).

Proactive firms, through proprietary learning and experience effects gained over time, tend to be more attuned to changes and trends in the marketplace, which yields opportunities to the firm to meet expressed and latent needs ahead of competitors (Hamel & Prahalad, 1991).

Proactiveness in firms is characterized by intentional change. That is, by force acting on information to make change not merely anticipating it (Bateman & Crant, 1993). This alleviates the risk of complacency by ensuring firms are better placed to serve markets in the short term and shape them in the longer term. The emphasis on anticipating and acting on future needs orients the firm to seize initiative and act opportunistically in the marketplace thereby shaping demand (Miller & Friesen, 1978)

HP 2: Risk-taking is positive related with performance and value creation

Risk-taking represents a willingness to commit resources to implement projects, activities, and solutions that contain inherently a high level of uncertainty regarding the likely outcomes (Lumpkin&Dess, 1996).When deciding to take risks, firms must tolerate one of two possible scenarios—the first being the risk of failing and second the risk of missing out on an opportunity

(Dickson & Giglierano, 1986). The former is caused by fear whereas the latter is caused by inaction. A tolerance of risk-taking orients the firm toward action and induces it to embrace uncertainty.

Timely risk-taking has been associated with strategic decision speed and both have subsequently been linked to improved business performance (Eisenhardt, 1989).

Risk-oriented firms combine opportunity-seeking behavior with constructive risk-taking to generate a bias for exploration and exploitation (Baird & Thomas, 1990; Lumpkin & Dess, 1996).

Risk-taking managements usually seize opportunities and make commitments of resources before fully understanding what action needs to be taken (Covin & Slevin, 1991). Such an approach seeks to take advantage of evolving situations by capitalizing on the fact that markets rarely stabilize for any length of time. Risk aversion renders firms passive to developing newmarket opportunities which is likely to deteriorate performance in an age of rapid change (Miller & Friesen, 1982).

HP 3: Aggressive decision-making is positive related with performance and value creation

Firms that are highly aggressive see competitors as enemies that must be conquered.

Aggressiveness can be implemented through the mobilization of resources to launch direct attacks on competitors with the aim of overwhelming their market efforts, steadily erode their competitive strengths, or establish advantage through continuous offensive tactics (Davidson, 1987).

Aggressiveness can improve performance because the emphasis on out-doing and out-maneuvering competitors strengthens the firm's competitiveness at the expense of rivals (Lumpkin & Dess, 1996). Examples of the manifestation of such an aggressive competitive strategy include aggressive price competition, market entry with a new or superior offering, fast-following a rival into a market, continuously exploiting information, and using unconventional surprise tactics.

Such an emphasis on acquiring market share and customers by aggressively targeting rivals' weaknesses should improve performance because it undermines competitors' ability to compete and

restricts the ability of competitors to anticipate and respond to what the aggressive firm will do next. Since the aggressive firm does not sit still and constantly implements incremental and adaptive change to undermine competitors, it is hypothesized Autonomy conveys the freedom to employees to encourage them to be self-directed, to exercise creativity, pursue opportunities,

and champion new ideas which are essential for effective entrepreneurial activity to occur Lumpkin & Dess, 1996).

Autonomy is, therefore, an important driver of flexibility, which is an essential attribute if a firm is to be able to respond promptly to environmental change and market signals by quickly reconfiguring its actions and activities (e.g., Grewal & Tansuhaj,

2001). Flexibility is created when people within the firm are given freedom to apply their human capital in ways that help the firm

change adaptively and be responsive to the needs of its markets and actions of its rivals. A lack of autonomy would likely result in passivity when change is needed to initiate effective response to

opportunities and threats to performance. The presence of autonomy, in contrast, should encourage a greater flexibility in the firm to facilitate active and reactive response to change. Although some framework of coordination is likely to be needed, on balance we expect that autonomy will be beneficial to improving business performance.

HP 4: Innovativeness is positive related with performance and value creation

Innovativeness represents a bias toward embracing and supporting creativity, experimentation, technological leadership, and R&D in the development of products, services, and processes to

generate novel solutions to customer needs and problems (Hughes and Morgan 2007). It is said to be present when firms pursue active implementation of new ideas, products or processes not merely their generation (e.g., Hurley & Hult, 1998).

Calantone, Çavuşgil, and Zhao (2002) establish that firm innovativeness has a positive impact on performance and contributes to competitive advantage by facilitating creative thinking within a firm's learning activities. Innovativeness also improves the application of market intelligence acquired through market orientation activities, which can benefit performance (Han, Kim, & Srivastava, 1998; Hurley & Hult, 1998). Also, a study by Hult, Hurley, and Knight (2004) uncovered that innovativeness benefits business performance regardless of market turbulence. Innovativeness changes how a firm applies market information (e.g., Slater & Narver, 1995) and together informs the generation of intelligent solutions.

3.1. Research Methodology

While the Italian research unit focuses on the Entrepreneurial Capital (EC), the overall research design aiming to understand links between IC managing and value creation.

In the next paragraphs, the following steps will be addressed:

- 1) Operationalising variables;
- 2) Survey Data Collection;

- 3) Target Respondent;
- 4) Public Data Collection.

1) Operationalising variables

Operationalising variables in social science involves defining a concept so that it can be measured. All variables defining Entrepreneurial Capital were addressed and discussed in meetings of the international working group.

As far as Entrepreneurial Capital is concern, the following are the operationalised variables and the related statement included into the questionnaire:

ENTCAP	Concept: Entrepreneurial capital <i>Variables:</i> <i>Risk-taking</i> <i>Proactiveness</i> <i>Aggressive decision-making</i> <i>Innovativeness</i>
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To what extent do the following statements on the entrepreneurial orientation apply to your company?					
(1 = completely disagree, 5 = completely agree)					
	2	3	4	5	1
ENTCAP1				Risk-taking is regarded as a positive personal quality in our company.	
ENTCAP2				Our employees take deliberate risks related to new ideas.	
ENTCAP3				Our employees are excellent at identifying new business opportunities.	
ENTCAP4				Our employees show initiative.	
ENTCAP5				The operations of our company are defined by independence and freedom in performing duties.	
ENTCAP6				Our employees have the courage to make bold and difficult decisions.	
ENTCAP7				The operations of our company can be described as creative and inventive.	

It must be noted that in the social sciences, much of what we study is measured on what would be classified as an ordinal level. In our questionnaire we then assign a value of “1” if interviewed Completely Disagree with the statement, up to a “5” if they Completely agree with the statement.

The finalized research instrument (survey questionnaire) was distributed in the beginning of September 2013 by the LUT research team.

The questionnaire was in English. Each partner should take care in translating the questionnaire to their own language. Utilization of professional language expert the first step. Additionally, the substance and flow of the questions was finally checked by the Italian research team to ensure that respondents could answer the research questions. The

core message of each item should remain the same to ensure standardization and applicability of the measures across countries.

The survey was conducted in exactly the same format in all cases. This means using all of the items in the survey, and in the same order, and with the same scales. The data were collected using survey questionnaire by the end of the year 2013.

Publicly available data were collected right after the primary data collection has ended.

2) Survey data collection and targeted population of firms:

In particular the target population is made up of Italian limited liabilities companies with 100 or more employees. The companies involved were selected among 2,000 companies chosen by a random sampling procedure from the database AIDA but according to the mix of a stratified sample representative of all population of the database (that is companies were randomly chosen within fixed percentage according to geographical area, sector of activity and size).

The main goal was to get a multi-industry sample with a representative variety of firms within Italy.

Up to April 2014, 100 companies have answered the questionnaire so far and this number is expected to increase during the next month. Additional economic and financial ratios have been obtained from AIDA database, which contains economic and financial information for Italian firms. Descriptive analysis techniques will then be applied and differences according to industry and size will be explored.

Aida data base covers 1 million companies in Italy and it contains comprehensive information on Italian companies, including: Detailed Accounts following the scheme of the 4th Directive CEE, indicators and trade description of Italian companies, Ownership and management, Consolidated accounts and accounts in IFRS.

3) Targeted respondent/informant:

The survey should be answered by one key informant from each firm

Preferably CEO, because the CEO will have best knowledge about the themes covered in the survey

If CEO cannot be realistically reached, the other high-level directors/managers in following fields are feasible respondents (in the order of preference)

- Chief operating officer
- HR / KM Director
- Development director

The data have been collected from October 2013 and March 2014. An hybrid approach to gather data has been followed. First by Internet-survey: the research team used internet-administered survey questionnaire (Google questionnaire), and sent each respondent a link to the questionnaire. This also allowed for follow-ups and reminders. Then to increase the number of filled in questionnaires the respondents were called via phone and each question was asked and filled by the research team. Finally, via face to face interviews.

In order to make respondents comfortable and willing to filling the questionnaire information about Why the survey is conducted, How the data will be utilized, Instructions for the answering was given. Furthermore we emphasize the confidentiality in analyzing the data **and we promise** them to receive a managerial report concerning the country's results .

4) Public data collection

Then the following Corporate Performance measures were collected trough AIDA database:

- Return on Assets (ROA) last three years
- Return on Equity (ROE) last three years
- Growth in Revenue last three years
- Growth in Turnover/Sales last three years

While Control variables are the following:

- Sales/Turnover (2010,2011,2012)
- The number of personnel (2010,2011,2012)
- Year of Foundation/Establishment
- Market to book value **OR** Price to book value (P/B), if available
- Industry information (NACE coding highly preferable, or other official industry coding)

4. First Results

Frequency of answers (%), Tot. = 100 questionnaires

VAR	KEY WORD	1	2	3	4	5
ENTCAP1	risk taking	2	20	19	40	19
ENTCAP2	new ideas	7	26	30	30	7
ENTCAP3	new business	8	30	32	25	5
ENTCAP4	initiative	4	20	31	35	10
ENTCAP5	independence	5	19	32	35	9
ENTCAP6	difficult decision	10	22	38	24	6

More than fifty % of all respondents (value = > 3) agree that in their companies there is a satisfactory level of Entrepreneurial Capital as defined by the above-mentioned variables.

5. Conclusions and a Research Agenda

As stated in Introduction this is a first conceptual paper on <<IC and Value creation>> aiming to:

- enlighten the overall framework of the international project and the specific role of the Italian unit;
- explain why EC should be considered – for the purpose of our investigation- as a stand-alone element of IC;
- illustrate the research methodology of the Italian research unit;
- define and operationalise the concept of Entrepreneurial Capital.

In the first step the Italian research team will address a deep analysis of data gathered in order to describe what is the current level of EC in Italian medium-sized and large companies. Clusters of firms by dimension, activity sector and geographical location will be investigated.

Future research agenda considers comparison with results emerging in other Countries in order to address environmental variables effects on EC, IC and corporate performance.

Finally, next year causality relation between EC and value performance will be tested.

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Intellectual capital value creation and economic theories

Gabriele Serafini

University of Rome “Niccolò Cusano”

University Address: Via Don Carlo Gnocchi, 3 – 00166 Rome; Italy

Structured Abstract

Purpose – An intertemporal comparison of the value created by Intellectual capital cannot disregard the current prices realized on the market by individual companies, because, at the corporate level, a decrease in sales prices results in a decrease of the value created (Zappa, 1919; 1920–1929). On the contrary, in comparisons in constant prices, this decrease is not measured at macroeconomic level (Weil, 2007; OECD, 2001). The goal of this paper is to examine the different measures of the Value Added created by Intellectual capital at micro and macroeconomic level and the relationship between these measures and the Neoclassical Theory of Subjective Value (Menger, 1976; Robbins, 1945; Wieser, 1889–2006; Wicksell, 1898–2006; Fisher, 1892; 1911–2006).

Design/methodology/approach – We present the theoretical and practical limits of the use of index numbers to express the value created in constant prices even in international comparisons (Fisher, 1911–2006). As stated by the Theory of the Subjective Value any quantity of the same good has a different value as a function of *marginal utility* (Marshall, 1890–2006); so the deflating by means of a price index, distorts the value attributed by the market at micro economic level to different goods. In this way, comparison to constant prices also modifies *relative prices*.

Originality/value – The valuation at current prices implies a different theory of the value of goods and we have identified a Third Generation of Marginalism in Friedrich von Wieser, Knut Wicksell and Irving Fisher since they indicate the difference between *subjective* and *objective* value. Intertemporal comparison at macroeconomic level is conducted deflating value so to consider the variation of the purchasing power of money (ISTAT, 2011). But the separation of changes in quantity from changes in price implies several problems (Fisher, 1911–2006) and we use *modified input-output analysis* to quantify in current prices the Value Added and the production realized in the economic system.

Practical implications – The international and intertemporal comparisons made by governments and by the statistical institutes via National Accountings, should be at current prices and at purchasing power parity, i.e. excluding the use of index numbers to deflate changes in production. The comparison at current prices would result in assessments of the contributions provided by the intellectual capital (VAIC) differ from those measured in constant prices and without indicating the *net asset* of the economic systems (GDP). It is therefore necessary that the comparison measures not only indicate the statistical model, but also the economic theory of reference.

Keywords – Intellectual capital measure, Economic Growth, Quality adjusted indexes, Value Theory.

Paper type – Academic Research Paper

1 Introduction

In this paper we survey the problem of quantification of the Value Added created by Intellectual capital at a macroeconomic level, related to the use of a deflating procedure by means of a Price Index.

First of all we'll identify a Third Generation of Marginalists which founded, in our opinion, the theory of the *objective value* that requires to quantify the subjective value of exchanged goods in terms of *current prices*.

We then intend to create a specific statistical and economic instrument – Modified Supply and Use Tables (M-SUT) – in order to represent the Value Added created by Intellectual capital in an economic system of production and exchange. This is because the *traditional* Supply and Use Tables, utilized in the National Accounting systems to describe the interrelations between the different economic sectors and the economic system as a whole (European Union, 2013), do not consider the remuneration of production factors as *intermediate consumption* and do not indicate the *origin* and the *allocation* of the economic wealth participating in the production process.

In addition, deflating modifies nominal and real value produced by Intellectual capital. So we propose an integration of System of National Accounts to include capital-value as sum of *corporate book value* and calculate the Value Added Intellectual Coefficient – VAIC (Pulic, 2000; 2004) at macroeconomic level.

2 Intellectual capital and price or quantity variations

We don't focus on Intellectual capital quantification, but on the relations between Economic Theory and the quantification of Value Added created by Intellectual capital.

The Intellectual capital value creation is related to the *effects on productivity*, either through a reduction of the input needed to produce the same output, or the increase of the output without prejudice to the same input. The effects, however, may also relate to market price that can then be higher in terms of a more efficient use of Intellectual capital.

The consequences, *ceteris paribus*, are then related to:

- Smaller quantity of inputs;
- Higher amount of output;
- Increased market price.

At macroeconomic level, these effects must be aggregated and compared with those obtained by all the companies and in an intertemporal perspective.

The aggregation and intertemporal comparison of Value Added, however, set the problem of the separation of changes in *quantities* of input and output from the *price* changes.

Here we see a radical difference. If, at corporate level, a change of price is recognized as a change of its Value Added, on the contrary at the aggregate level this intertemporal variation is usually deflated because the *deflating procedure* aims not to consider a “change in the price” as a “change of wealth”.

This procedure is based on the Theory of Subjective Value, which states that any individual economic agent attributes a subjective value to any good, according to its marginal utility. So, market prices for the same goods should be different according to the different subjective values of the commodities. However, a further part of the theory indicates that the process of price formation on the market is actually reversed.

The market price is not different depending on the subjective value attributed to each individual commodity. Instead, the marginal utility of the individual economic agent, through the procedure of exchange, adapts itself to the market price.

To make this clear there were *marginalism theorists* who have dealt with the macroeconomic aspects of the theory of subjective value and the relationship between money and market prices.

Economists which we refer to, in particular, are Friedrich von Wieser (1889–2006), Knut Wicksell (1898–2006) and Irving Fisher (1911–2006).

3 The Third Generation of Marginalism

As is well known (Schumpeter, 1990; Roncaglia, 2003–2011) the *First generation* of Marginalism (Jevons, 1871; Menger, 1871; Walras, 1874–1877–2006) believed that the marginal utility was measurable and therefore they reasoned about *Cardinal utility*. The

Second generation (Marshall, 1890–2006; Edgeworth, 1881; Pareto, 1919), focused instead on the problem of *Ordinal utility*, working on *Indifference curves*.

Almost simultaneously with this second generation, Wieser, Wicksell and Fisher produced fundamental works which allowed, in our opinion, to move from a vision of the economic system focused mainly on the exchange, to a vision based on the relationship between production and consumption in the long run, and on the analysis of the role of money in setting prices.

In his book about *the natural value*, Wieser (1889–2006, p. 118), the first to use the term *marginal utility*, said: “Subjective value represents a distinct feeling; that of being dependent upon the possession of a good for the satisfaction of a want,— a distinct degree of personal interest in goods. Objective value, on the other hand, merely represents a definite price; a definite amount of payment which is expected or required in buying and selling. The former has its measure in the different gradations of desire, the latter in the quantities of coin,— in the figures of the price.” Two years later, he wrote: “value in use is not only particular but also subjective; value in Exchange is not only general but also objective” (Wieser, 1891, p. 118).

Knut Wicksell, instead, studied the relationship between the isolated exchange (between two or a few people) and the exchange on the market, and wrote that “as a result of the prevalence of competition on both sides, among the sellers and among the buyers, an approximately uniform price for each commodity soon pervades the market...” and “if longer periods of time are being considered, this equilibrium between supply and demand gives way to an equilibrium between production and consumption.” (Wicksell, 1898, Cap. III, p. 131).

Irving Fisher, in his work about the *purchasing power of money*, as in many other parts of his vast scientific production (see: Serafini, 2013), studied in depth the aggregation of goods and the best way to express the purchasing power of money, reversing the logic of the previous studies on the *general level of prices*. Through the reformulation of the Quantity Theory of Money, in fact, to aggregate the goods he replaces the sum of the value of the goods, for an amount given by multiplying the volume of trade for a Price Index (Fisher, 1930–2006). In this way he expresses change in prices according to the quantity of money in circulation, trying to mediate between all of the different changes in the prices of individual commodities. In doing so, he argues that “a price is an objective datum, susceptible of measurement, and the same for all men.

Marginal utilities, on the other hand, not only are impossible to measure, but are unequal and vary unequally among individuals. The purchasing power of money in the objective sense is, therefore, an ascertainable magnitude with a meaning common to all men.” (Fisher, 1911–2006, p. 468).

According to these works, therefore, the price of commodities becomes something “objective” (Wieser), “approximately uniform” (Wicksell) and “ascertainable” (Fisher).

The relative size of prices is then determined by the balance between supply and demand in the short-term, and between production and consumption in the long run. Price level would depend, instead, on the amount of money in circulation.

In our opinion, the above mentioned statements indicate a *Third Generation of Marginalists* who make a leap from microeconomics to macroeconomics (in this paper we do not examine in depth the differences between this and the Keynesian macroeconomics or later), because they switch from the *subjective* value to the *objective* value. From the value determined in the exchange to the value determined in an exchange economy and dependent on the different *ownership structures, production factors productivity and needs*.

This is because, and this is the key point in our view, changes in prices set by coin are only the (roughly) parallel changes in the general level of prices. The changes in relative prices, however, are determined by changes in the relative productivity of individual producers and/or alteration of the wants and willingness to pay of the economic agents.

As stated by Gino Zappa (Zappa, 1919) price changes resulting from commercial causes exist only with respect to one, some, or many goods. On the contrary, variations that stem from monetary conditions manifest themselves in all the elements of wealth and income of all members of society or even in a given country and would result in changes in the general level of prices.

We note, therefore, that, if a change in price is not offset by a change in the opposite direction in other prices, such as to leave unchanged the overall value, there would be a change in the economic wealth produced and exchanged.

4 Price or Value variations

At the aggregate level and in the intercompany comparisons, therefore, through the calculation of price index numbers, a deflating of these changes takes place to separate

the change in price, which does not correspond to a change in wealth in real terms, but only in nominal terms. In case of increase of a single price, everything else being equal, by deflating through a price index, the amount of production accounted at a corporate level is reduced and the relative value of the production among the different companies is modified.

On the basis of these considerations, we believe that the process of deflating currently used to quantify the changes in real production is not consistent with the economic Theory of Value, as expressed by the *Marginalists* of the *Third Generation*. Even if the prices were only relative, and their absolute size – their level – was dependent on the amount of coin (Quantity Theory of Money; see Schumpeter, 1990), in an economic system is almost impossible to detect parallel shifts in prices. Only in the case of parallel variation of prices, in fact, we could identify the price changes in a change in the coin value.

In addition, in the current practice of business accounting, the Value Added created also by Intellectual capital is accounted in cash, at nominal value, and the production process is considered by the *Marginalist Authors* themselves as a production process of additional value.

So we come to the conclusion that the value of commodities, also in its level, has as its determining cause the production process and does not depend automatically on the amount of money in circulation.

We don't explore here the problem of *absolute prices* (Roncaglia, 2003–2011) and refer to our work on this topic (Serafini, 2012). However, according to this perspective, the Value Added variation, compared to the previous period, will be quantified in nominal terms because the deflating changes the *relative size* and the *objective value* of the company production.

In the next section we introduce an accounting and comparison system of the wealth produced by Intellectual capital which also complies with the guidance of the *Third Generation of Marginalism* and quantify changes without deflating. In particular, we represent an economic system of production and exchange, based on the model of Input–Output Analysis, whose foundation dates back to the theoretical and practical works by François Quesnay, Karl Marx and Wassily Leontief, and whose further evolution is now in use in the modern Systems of National Accounting (see: European Union, 2013).

5 Supply and Use Table with *objective value*

To represent an overall economic system, both in production and exchange, economic theory has developed the Input–Output Analysis (Leontief, 1986) and through the development of Systems of National Accounts (Vanoli, 2005 and Siesto, 1973), has created the Supply and Use Tables – SUT (European Union, 2013).

According to the previous version, the Input–Output Analysis consists of a square matrix that indicates per line the branches (industries) from which production is *originated* and in the corresponding column the branch that *use* the same production.

In the current Systems of National Accounts, however, the SUT are not square matrices but tables consisting of three parts.

A square matrix that indicates the wealth produced and reused as intermediate consumption; a part (graphically placed on the right of the first) that indicates the Final Uses (Government consumption, Investments, Exports, and minor items); and a part (located below the first) that indicates the Primary Resources, given from the revenues of the factors of production (wages, capital gains, taxes, profit, amortization and minor items), and Imports, which are a resource for a domestic economy. Read per row, the table indicates the sum of Intermediate and Final Uses, and read per column it shows the Intermediate consumption and Primary Resources. By means of this table, we can analyze the *entries* and the *payments* (Pasinetti, 1975–1981) that occur in an overall economic system, characterized by production and exchange.

From the theoretical point of view, according to the Theory of Subjective Value, in the long run profit tends to disappear as a result of competition. SUT, therefore, represent a short– term economic system, because there is profit. But even if Böhm–Bawerk (1998) and Fisher (1930–2006), for example, believe that there is *value creation* in the production process, SUT depict an economic system without indicating the source of additional value created, which, even according to the *Classical economists*, could be the labour–force and/or capital. Among the Classics we also include Karl Marx, which clearly states that the source of value is not just the *job* (see: Marx K., 1875–1990, p. 7). For further details on the thought of this *author*, who has expressed the economic problem of private ownership of the means of production, see Serafini (2012).

Since Vilfredo Pareto (1919) and Paul Samuelson (1993) (see: Schumpeter, 1990), for example, have highlighted the importance of the ownership structures of production factors in order to determine the level of production, as will become clear later, in the

tables that we developed you can also identify the *origin* and the *allocation* of the resources that enable productive investment.

In our case, the accounting system should highlight the added value produced by Intellectual capital, so we have created and implemented a *Modified Supply and Use Table*, M-SUT, which shows per column the production factors and per row the branches of production in which those factors are used. At first we indicate the variables in “value” – price per quantity – and then present the problems of measuring the Value Added, associated with a separate evaluation between price and quantity. The *net profit* will vary, like other variables, depending on Intellectual capital capability for Value Added creation.

In the following paragraphs we indicate the theoretical implications of this representation, modified with respect to that of traditional SUT. Now, to explain the limits of deflating, we assume a system with five economic sectors – branches – and two factors of production, such as that of *Table 1*, in which we express the different inputs and outputs in value. If the nature of Intellectual capital is both labour and capital, it can be present on both factors.

Assume a rate of profit equal to 10% of the capital invested in each industry, equal to 4000 for each branch and then 20000 for the whole production system.

Table 1: SUT in Value

Branch	Capital Consumption	Wages	Profit	Prices/Supply
I	40	8	400	448
II	40	6	400	446
III	30	36	400	466
IV	12	8	400	420
V	7	30	400	437
Intermediate Consumption	129	88	2000	<i>Total Supply</i> 2217
<i>Profit invested</i>	0	0		
<i>Profit not invested</i>	600	1400		
<i>Additional investment</i>	0	0		
<i>Total Use</i>	729	1488	2217	
<i>Total Use in produce</i>	129	88	217	

The amounts per line indicate the *capital consumed* in the production process, *wages* paid and the *profit* realized. In the section below the “Intermediate Consumption”, the first two lines indicate the share of the profit realized that was *reinvested* or *not invested* again (hoarded), in the production process. The third line instead indicates the additional

amount, as external source of the production process, which was necessary to proceed to the exchange of the finished production, indicated per line as *Total Supply*.

We start from these quantities and we assume an increase of efficiency in Intellectual capital, in the different sectors, according to the percentages shown in *Scheme 1*. Let us assume an increase in efficiency just for the factor remunerated in Wages.

Scheme 1: Efficiency variation

Branch	Capital	Wages
I	0%	5%
II	0%	7%
III	0%	10%
IV	0%	12%
V	0%	5%
<i>Average</i>	<i>0,0%</i>	<i>7,8%</i>

The effects of these increases in productivity consist of a reduction in the consumption of invested capital, as shown in *Table 2*.

Table 2: SUT in Value after efficiency variation

Branch	Capital Consumption	Wages	Profit	Prices/Supply
I	40	7,6	378	426
II	40	5,6	378	424
III	30	32,4	378	441
IV	12	7,0	378	397
V	7	28,5	378	414
Intermediate Consumption	129	81,1	1892	<i>Total Supply</i>
<i>Profit invested</i>	<i>0</i>	<i>0,0</i>		<i>2102</i>
<i>Profit not invested</i>	<i>945,8</i>	<i>945,8</i>		
<i>Additional investment</i>	<i>0</i>	<i>0,0</i>		
<i>Total Use</i>	<i>1075</i>	<i>1026,9</i>	<i>2102</i>	
<i>Total Use in produce</i>	<i>129</i>	<i>81,1</i>	<i>210</i>	

The amount of wages is reduced because we assume that the increased efficiency produces greater value, for the same use. In a competitive economy the profit remains the

same, as a percentage of invested capital, and thus decrease in the amount. This situation would lead to a reduction in available system resources (in the tables: *Total Supply*) where prices are intended as the sum of the compensation of the production factors, even though they contain profit.

According to the *Theory of subjective value*, an increase in efficiency in the use of resources, in fact, leads to a reduction in the price of goods as production increases in quantity. We did not, therefore, indicate an increase of profit in place of lower amount of money spent on wages. We will do this in the next example. We could also represent a SUT with the same production, indicating additional investments in other sectors. But, since reinvestment is an autonomous decision of entrepreneurs, we have just shown the *direct* consequences of a more efficient use of resources, without indicating possible additional production processes.

In addition, we have assumed a total hoarding of profit so as to indicate only the *endogenous variables* of the production system, which is strictly related variations inside the process. This representation of the production process is expressed in terms of value but to analyze the effects of a change in the Intellectual capital efficiency (as well as in any other productive asset) we have to separate the effects on quantity from those on prices. In this way, we will see the effect of the deflating of Value Added created, carrying out the three hypothesis of *reduction in the amount of input* (see: *Table 4*), *increase in the amount of output* (*Table 5*), or *increase in the price realized* (*Table 6*).

To analyze a reduction of the quantities, as a first step we divide the values in *Table 1* between *prices* and *quantities*, and generate *Table 3*.

Table 3: Prices and Quantities

Branch	Capital Consumption			Wages			Profit			Prices/Supply		
	p	q	v	p	q	v	p	q	v	p	q	v
I	4	10	40	2	4	8	40	10	400	20	22	448
II	5	8	40	3	2	6	133	3	400	20	22	446
III	5	6	30	4	9	36	100	4	400	23	20	466
IV	4	3	12	2	5	8	80	5	400	33	13	420
V	1	7	7	5	6	30	57	7	400	2	219	437
Intermediate Consumption	129			88			2000			<i>Total Supply</i>		
<i>Profit invested</i>	0			0						2217		
<i>Profit not invested</i>	600			1400								
<i>Additional investment</i>	0			0								
<i>Total Use</i>	729			1488			2217					
<i>Total Use in produce</i>	129			88			217					

Assuming an improvement in the use of Intellectual capital according to the percentages previously indicated in *Scheme 1*, and assuming that the change in efficiency does not change the final price (*Total Supply*), we see an increase in profit (now amounting to 2007 from the precedent 2000) and an increase in the rate of profit (from 10,0% up to 10,7%).

Table 4: Prices and Quantities after Efficiency variation (Stable Prices/Total Supply)

Branch	Capital Consumption			Wages			Profit			Prices/Supply		
	p	q	v	p	q	v	p	q	v	p	q	v
I	4	10	40	2	3,8	7,6	40	10	400	20	22	448
II	5	8	40	3	1,9	5,6	133	3	400	20	22	446
III	5	6	30	4	8,1	32,4	100	4	404	23	20	466
IV	4	3	12	2	4,4	6,6	80	5	401	33	13	420
V	1	7	7	5	5,7	28,5	57	7	402	2	219	437
Intermediate Consumption	129			80,7			2007			Total Supply		
<i>Profit invested</i>	0			0,0						2217		
<i>Profit not invested</i>	602,05			1404,8								
<i>Additional investment</i>	0			0,0								
<i>Total Use</i>	731			1485,5			2217					
<i>Total Use in produce</i>	129			80,7			210					

Total Supply being equal, the increase of efficiency in Intellectual capital is measured by a reduction in spending on *Wages* and a redistribution of resources in favour of the profit.

In the case, instead, of equality in spending in inputs, a higher efficiency in Intellectual capital would be expressed in a higher amount of output. In this latter situation we obtain *Table 5*, in which we consider the profit directly expressed in value, as a residual.

Table 5: Prices and Quantities after Efficiency variation (Increase in Total Supply)

Branch	Capital Consumption			Wages			Profit			Prices/Supply		
	p	q	v	p	q	v	p	q	v	p	q	v
I	4	10	40	2	4	8			534	20	29	582
II	5	8	40	3	2	6			512	20	28	558
III	5	6	30	4	9	36			493	23	24	559
IV	4	3	12	2	5	8			442	33	14	461
V	1	7	7	5	6	30			444	2	240	481
Intermediate Consumption	129			88					2425	Total Supply		
Profit invested	0			0,0						2641		
Profit not invested	727,43			1697,3								
Additional investment	0			0,0								
Total Use	856			1784,8					2641			
Total Use in produce	129			88					217			

We see that the rate of profit has risen from 10% up to $(2425/3.784 =)$ 12,3%. Total Supply is grown from 2217 up to 2641.

6 Deflating and price index numbers

The effect of deflating the variables of the overall economic system, however, is seen only in the third case, i.e. in a table that assume that a variation of efficiency in Intellectual capital consists of the chance to achieve a higher price for the same quantity placed on the market. As a matter of fact, the competitive advantage may also consist in the possibility to spend less in wages, as shown in Table 4; but to study the effects of deflating, we create the example shown in Table 6.

Table 6: Supply after variation of Price in branch I

Branch	Capital Consumption			Wages			Profit			Prices/Supply		
	p	q	v	p	q	v	p	q	v	p	q	v
I	4	10	40	2	4	8			512	25	22	560
II	5	8	40	3	2	6			400	20	22	446
III	5	6	30	4	9	36			400	23	20	466
IV	4	3	12	2	5	8			400	33	13	420
V	1	7	7	5	6	30			400	2	219	437
Intermediate Consumption	129			88					2112	Total Supply		
Profit invested	0			0						2329		
Profit not invested	600			1400								
Additional investment	33,6			78,4								
Total Use	763			1566					2329			
Total Use in produce	129			88					217			

In this example, the variation with respect to the initial situation (see *Table 3*) consists of a change in price on the market in the *branch I*. It has gone from 20 to 25. Other variables, however, changed due to this increase. In particular, the profit of the same sector rose from 400 to 512, and so the *Total Supply* from 2217 to 2329, even though the capital consumed remained at 217. The wealth produced is therefore increased and accounted for the individual sector and the productive system as a whole, as a mere effect of an increase in the market price. At the aggregate level, it becomes important to understand the effects of deflating, as the expression of the variables has so far taken place in current prices.

In case of deflating by the *Laspeyres Price Index* – see: Fisher (1921), for the construction and identification of index numbers suitable for every purpose, and Leti (1983), Bracalente *et alii* (2009) and Guarini *et alii* (2000), for the construction and the modern use of Price Index Numbers –, the increase in the general level of prices in *Table 6* was about 5,05%, as shown in *Scheme 2*.

Scheme 2: Price Index Number

Branch	Before		After	
	p	q	p	q
I	20	22	25	22
II	20	22	20	22
III	23	20	23	20
IV	33	13	33	13
V	2	219	2	219

Price Index Number: 105,053

Since quantities before and after the change in price did not change, even the *Paasche* or *Fisher Price Index* would have the same value.

In all these cases, the increase in profit recorded in the first branch amounting on $(112/400=)$ 28% and overall industries amounting on $(112/2000=)$ 5,6%, would be decreased due to the difference in value attributed to price changes and recorded by the index number. Profit in real terms would remain roughly the same as before, both in the first branch and in the economic system.

7 The meaning of the *Modified-SUT*

In the transition from *Table 3* to *6*, there wasn't a parallel shift of all prices. Instead, what changed was the purchasing power of money, because production changed between the different branches. According to Zappa, variations in relative prices have commercial or productive origins; so deflating may hide changes in the structure of production system. Moreover, in every production system, commodities change over time, even in quality and we have discussed elsewhere the problems of *Quality adjusted indexes*, and *Hedonic indexes* (see: Serafini, 2013). Now, since the same variation indicates the amount of money that has changed hands from buyers to sellers in *branch I*, deflating hides changes in production. Let us explain this passage.

If we recognize that production results in a net product (Böhm-Bawerk, 1998; Fisher, 1930–2006; Keynes, 1936–1978; Marx, 1867–1989), the change in output is usually measured in quantity. Since the additional quantity has an objective price on the market, to evaluate it we have to use a homogeneous size among all – and also with respect to the input –. Usually you multiply any quantity produced for its price, so to obtain a measure in coin.

The combination of these two premises, which assumes that the *production creates value* and that this is directly *expressed in money*, otherwise it would not be comparable, implies that changes in the economic wealth are not changes only in quantity or only in price, but are directly *changes in the value of exchange*; objective wealth, not only relative.

A confirmation of the effectiveness of this hypothesis arises from the fact that resources, risen to 112 to pay that extra price in *Table 6*, come from outside of the production process (see the row: *Additional investment*. Specifically: *Capital consumption* +33,6 and *Wages* +78,4). The increase of a price, therefore, is actually a greater economic value of the mass of resources inserted in the production circuit.

In this way we can say that *exchange process* depends on *production process* as they are strictly connected. Investment and Consumption depend on autonomous choices of the *economic agents*, but if the production process generates added value, as we can see in the M-SUT, profit can be *hoarded* or *invested* during the same period.

If the profit is hoarded then *Total Supply* will be reduced because of capital consumption and in the subsequent period there will be less wealth to spend; if the profit is invested, there will be a higher level of production and more value to purchase/sell.

This stems from the fact that by means of the M–SUT we analyze the production system and we see that the influence of money on the price level is opposite to the provisions of the *Quantity Theory of Money* (Fisher, 1930–2006). In the case of M–SUT, in fact, wealth is objectively assessed and directly in value, so coin does not determine price level, but the value of money is determined by the price level. The algebraic relationship is the same but the variable that controls is the opposite.

Connected with this, there is also the question of what resources are capable of economic assessment and therefore the assessment of economic capital and wealth not involved in the production process; but the allocation of the additional price (distribution), i.e. of the volume of the production process, depends on the destination of the resources themselves, and they depend on the ownership of final goods like that of the means of production.

From the M–SUT it is understood that *saving* cannot be considered as a virtue if it is a hoarding of productive resources. If, in fact, additional investment had not intervened from the outside (see the row *Additional investment*), the total profit achieved would be hoarded to a greater extent, and this would have resulted in a lower total value of the following production process, due to capital consumption. Therefore, we could not consider adequate the use of the SUT at current prices already developed by the National Accounts, because they do not show the variations in wealth put into the productive cycle.

Moreover, traditional SUT do not indicate where produced wealth is directed and the amount of the possible lack of hoarding that, although it seems to allow the production of capital, actually inhibits it.

8 M–SUT and Intellectual capital

8.1 Capital, Wages and Intellectual capital

As well as Intellectual capital is a productive factor, *Wages* and *Capital consumption* are not part of the net product, as they are inputs of production.

The traditional SUT, instead, do not indicate the wages as a factor of production since *Wage* is part of the Value Added (see: Vanoli, 2005; European Union, 2013) and the second is defined as the difference between the value of production and the value of goods consumed in the production process (Pasinetti, 1975–1981).

Although a part of economic theory (see: Sraffa, 1960–1991), believes that the *net product*, intended as *additional product* compared to the value of the factors of production, would be divided between labour and capital and that there would be a distributive conflict between *labour-force* and *capital*, there is a theoretical reason for our different representation.

If, on one hand, output is entrepreneur's property, on the other hand, in corporate accounting, Value Added is the remuneration of production factors and, after deductions, we get the profit as income amending heritage (see: Zappa, 1920–1929).

8.2 Economic agents decisions

By means of M–SUT is possible to understand the decisions taken by economic agents and quantified in supply/use changes, i.e. the mass of capital in production, as well as all its variables (productivity, distribution, production quality, etc.).

Such decisions can be traced in:

- 1) decisions of the entrepreneurs to hoard the productive capital;
- 2) decisions of money capital owners, not yet entrepreneurs, to enter more wealth into the production circuit;
- 3) decisions of those who are not owners of enough money but are willing to borrow in order to purchase – whether for investment or consumption – in the *capital* or *wage* field (the two columns in which we have grouped the factors of production).

In the latter case, we see a correlation between the *economic growth* and that of *loans*. In particular, an increase in debt, private or public, indicates that the production system has necessitated a purchasing power on the market that is built up by borrowing funds, from those who possess them in excess (or directly from banks) to those who do not have enough of them. To that effect, a more efficient use of Intellectual capital, produces an additional value which, to determine an increase in the production process, requires an increased mass of monetary resources; and this increased mass is *profit reinvested* or *previous savings* or *loans*.

To conclude this study, in the next section we indicate some reflections about the relationship between the most widely used measure of Intellectual capital efficiency (VAIC) and the Gross Domestic Product (GDP). In this way we clarify that more efficient use of Intellectual capital depends on both the characteristics of the production process and the autonomous decisions of economic agents.

8.3 VAIC and GDP

Regarding the relationship between the capital employed in the production process and the generated *income*, the Value Added Intellectual Coefficient is a measure that considers both *income* and *book value*.

According to Ante Pulic (2004), VAIC formula is:

$$\text{VAIC} = \text{ICE} + \text{CEE}, \text{ where: } \text{CEE} = \text{VA}/\text{CE}; \text{ ICE} = \text{HCE} + \text{SCE}$$

To understand the formula:

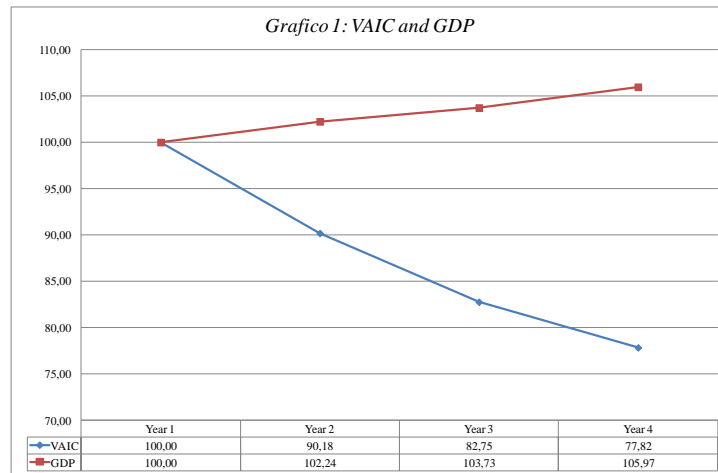
- HCE = VA/HC;
- SCE = SC/VA;
- SC = VA – HC;
- VA = Value Added
- CE = Book value of the net asset of company
- HC = Total salaries and wages for the company

The VAIC is inversely correlated to changes in the *book value*, which in turn directly depends on the Value Added created.

The example in *Table 7* and *Grafic 1* shows the relationship between VAIC, the VA and the *book value*, to understand how the added value, if not entirely distributed, increases the book value and thus makes the VAIC divergent with respect to GDP, because the latter is not related to the net assets of the economic system.

Table 7: VAIC, VA and GDP

	Year 1	Year 2	Year 3	Year 4
OP (EBIT)	20.000	20.000	20.000	20.000
HC	30.000	30.000	30.000	30.000
Depreciation	12.000	12.500	13.000	14.000
Amortization	5.000	6.000	6.500	7.000
VA	67.000	68.500	69.500	71.000
CE	10.000	12.000	14.000	16.000
ICE	2,79	2,85	2,89	2,94
CEE	6,70	5,71	4,96	4,44
VAIC	9,49	8,55	7,85	7,38
GDP (= VA)	67.000	68.500	69.500	71.000



In M–SUT, economic capital is only present as capital consumption as well as in the System of National Accounts (see: European Union, 2013). Since GDP measures only *income*, to measure the VAIC of an economic system we should dispose of the amount of the *net assets* of all the companies. For this reason, until the economic capital will not be present in the National Accounting systems, VAIC cannot be calculated at a macroeconomic level. A qualitative notation, however, can be deduced from the main Schools of Economic Thought because, according to the main theories of value, *Capital* tends to create *Income* as a decreasing percentage with the increase of capital.

According to Irving Fisher (see: Fisher, 1930–2006; Serafini, 2013), the rate of interest is determined by the *rate of time preference* between current and future consumption, while capital–value is the expected income, discounted at the interest rate. Since the consumption impatience tends to decrease with the increase of wealth, *Income*, in relation to capital–value, tends to decrease.

According to John Maynard Keynes (1936), the *marginal propensity to consume* is decreasing as income increases, because the needs arising after the most urgent have been fulfilled, find it hard to be in the form of *Aggregate Demand*. Therefore, the increase of capital tends to decrease the return on capital.

Finally, according to Karl Marx (1894–1989), the *falling rate of profit as a trend* stems from the fact that profit is generated only by labour–force employed in capitalistic production and the expense for this input tends to be compressed by the capitalists such as they reinvest in capital in order to increase the labour–force productivity. Against this

trend, on the other hand, there are *opposing forces*, and therefore this approach leaves open a possibility of variation of VAIC in all directions, not only in a necessary reduction for each growing economic system.

9 Conclusions

Changes in prices set by coin are only the *parallel* changes in the *general level of prices* and in an economic system is almost impossible to detect parallel shifts in prices. According to this perspective, Value Added produced by the Intellectual capital has to be measured in *current prices* because the deflating changes the *relative size* and the *objective value* of the company production. To validate this hypothesis we state that the process of deflating currently used to quantify the real changes in production is not consistent with the economic Theory of Value, as expressed by the *Marginalists* of the *Third Generation*. Wieser, Wicksell and Fisher produced fundamental works that make a leap from microeconomics to macroeconomics and switch from the *subjective* value to the *objective* value.

To represent an overall economic system without deflating procedure, we have used the Input–Output Analysis and created Modified–Supply and Use Tables to compare the theoretical and practical results. In this way we have disclosed that deflating is not consistent with the economic theory and with a correct quantification of the Value Added produced by the Intellectual capital. However, we refer to a future work the construction of the macroeconomic M–SUT for a real economic system.

In the last section of this paper, we have made a comparison between VAIC and GDP starting from the same data set and we get a *negative correlation* between the two methods because Value Added increases the book value and *tends* to reduce VAIC. In this way, being equal all other variables, a positive variation of GDP may result in a decrease of VAIC.

Finally, we hope for the accounting of the economic capital in the Systems of National Accounting in order to calculate the VAIC at macroeconomic level too.

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Governance and sustainability of the tourist destination

Marco Valeri *, Paola Poloni, Fabio Fortuna

Faculty of Economics.
University of Rome "Niccolò Cusano"
Don Carlo Gnocchi Street, n. 3

** Corresponding author*

Structured Abstract

Purpose: The aim of this paper is to measure the sustainability of a tourist destination. The tourist destination competitiveness is the result of combining the governance of tourist firms that are part of it and the sustainability of environmental resources of a 'geographical area. In this paper we will refer to the "albergo diffuso" experience. The "albergo diffuso" will be useful for the purposes of our analysis to see if this new and original model of hospitality meets the characteristics of innovation for sustainability, providing a good example of enhancement of an area in the perspective of sustainable tourism development.

Design/Methodology/Approach: The methodology is the case study research (Yin, 2003). The results will be validated through the application of the model of Weaver (2000, 2011). The model proves to be more explanatory for the evaluation of the level of sustainability of investigated tourist destinations.

Originality/Value: The sustainability implies that tourist destinations are governed and managed to satisfy the new expectations of the tourist's experience in accordance with the socio-economic and natural environment in which they operate. In this context, the strategic role rises in support of the development of an entire area within the perspective of sustainable tourist development.

Practical Implications: To be competitive, the tourist destination has a duty to propose an innovative bidding system that improves the quality of the tourist preserving natural resources and the cultural specificity on which the tourism is based. In this way, the tourist destination is identified as a node in a complex network of relationships that transcends national borders and involves different business actors who share goals and strategic decisions influence each other.

Keywords – Destination management and governance, knowledge management, sustainability, innovation, competitive advantage

Paper type – Practical Paper

1 Introduction

The hypothesis of this paper is based on the observation that the changes in the economy and society promote new business opportunities. In recent years, the recent downsizing of tourism in the World, was accompanied by a significant change in the quantitative composition of the tourism supply and demand.

From the point of view of tourism demand, companies are to relate more and more tourists with "elite", both Italian and foreign, who wish to spend quality leisure time tourist experience. In this context, the tourist shows a heightened sensitivity to the experiential aspects of their free time to discover the authenticity of the territory and to enable closer relations with the local native.

From the tourist point of view, the need to satisfy the most diverse needs of tourists has led to the success and development of specific formulas of entrepreneurial nature of accommodation, consistent with the changing needs of the tourists in a sustainable way. In particular, we refer to the agritourist firms and the "alberghi diffusi". The agritourist firms have experienced strong growth compared to the other components of the sector hotels and other facilities over the past five years. They are the result of the rediscovery of rural life and the rural world. The "alberghi diffusi" however, represent innovative models of hospitality and tourism Made in Italy, the result of renovation / redevelopment of historic towns, ancient hamlets, and ancient palaces, located in the center of the city of art and not. It is a reality differentiated within itself as to the degree of innovativeness of the business, still limited in number but strong in development and particularly appreciated internationally for its innovativeness (Paniccia, Silvestrelli and Valeri, 2010).

Undoubtedly, to intercept and manage the dynamics emerging in the tourism sector, it is necessary to analyze the problems of governance and management of the destination and the tourist industry. According to the setting of the coevolutionary perspective, tourism firms co-evolve with tourist destinations in the search for competitive advantage, being conceived, businesses, as critical resources for the development of the territory (Weick, 1969; Lewin and Volberda, 1999; Paniccia, 2006; Paniccia, Silvestrelli and Valeri, 2010). It becomes more and more essential to know how to manage the co-evolution, favoring a synergy of intent and behavior among all actors of the territorial system based on a sharing of goals (Selznick, 1976). In this sense, it appears increasingly central to the systemic capacity of tourism firms to perceive and evaluate the external

environment, which requires answers professional and responsible (Golinelli and Simoni, 2005). This can be a possible source of creativity for development more sustainable).

Therefore tourism businesses must be able to devote attention to the needs expressed by tourists visiting the tourist destinations competitors in order to implement strategic paths consistent (Nahapiet and Ghoshal, 1998).

2 The theoretical framework

In a globalized competitive environment, tourist destinations must act according to a decidedly more entrepreneurial than ever before. It is no longer sufficient to manage the relationships between the tourism system and the tourists, but it becomes indispensable upstream govern the relationships between all stakeholders in the tourism sector which, in various ways, contribute to the tourism. In this context, the competitiveness of a tourist destination is dependent on the capacity of each undertaking / tourist organization that works to compete in it compared to competing tourist destinations, national and international. This necessarily implies that each tourist destination not only the individuals operating in the territory of its borders, but especially to define an authority of governance, whether public or private or mixed (Pencarelli, 2001), able to develop a strategic plan that enhances not only the business but also the attractions of the area (Pechlaner and Weiermair, 2000; Franch, 2002; Golinelli, 2002; Ritchie and Crouch, 2003; Sainaghi, 2006; Martini, 2008; Valeri and Baiocco, 2012).

In the management literature, the concept of tourist destination plays a central role. We are witness to numerous studies, national and international that have long investigated this issue thoroughly, especially if linked to interventions to support the competitiveness of the tourism sector. In this regard, one can not but mention the contribution of Cooper (1993), commenting on the concept of destination region at the base of the model Leiper (1979) writes " [...] *the destination region is perhaps one of the most important elements. The destination represents the reason of travelling and the attractions at the destination generate the visit*".

By analyzing the extensive bibliography on the concept of a tourist destination (Pechlaner, Paniccia, Valeri and Raich, 2012), it is difficult to arrive at a single definition

that, both in terms of interpretation both in terms of managerial interventions, is satisfactory. This variety is justified considering that the topic is of interest both from scholars in different disciplines (Tamma, 2000). Some scholars see this as the cause of so much confusion and so many difficulties still exist for its own theoretical framework fully convincing. Over the years, leading experts in tourism management were compared on trying to shed light on issues that for years have been the focus of scientific debate (Pechlaner, Paniccchia, Valeri and Raich, 2012). In particular, one often tends to coincide with the tourist destination tourist product dispensed (eg destinations mono- product), forgetting that the latter is one of the possible outputs of the tourist destination.

Aware of the difficulty of proposing a work of systematization of the literature, the doctrinal debate on the concept of a tourist destination can be traced back to two different analytical approaches:

- 1) *touristic demand - side approach*
- 2) *touristic supply – side approach*

Compared to the same tourist destination, the tourism expert can analyze it in a different way; in the first case (touristic demand - side approach) it is privileged destination as a tourist product, or rather as a set of points of attraction, natural and artificial, capable of attracting tourists (Bieger, 2000), in the second case (touristic supply - side approach) priority is given to the importance of the supply system and tourism companies operating in the tourist destination (Tamma, 2000; Brunetti, 2002; Martini, 2002). From this there are inevitably different modes of design, management and organization of the tourist destination (Paniccchia, Pechlaner and Valeri, 2010; Minguzzi and Presenza, 2010) due to the historical, economic, cultural, social and geographical allocation of the available resources.

The prospects of analysis - touristic demand - side approach and touristic supply - side approach - have generated a multiplicity of positions by authoritative experts. They are not opposed, but on the contrary should definitely intersect when there is a need to adapt to the environment of the tourism through the preservation and change (Cafferata, 2009). The request to consider an integrated approach to emerging tourist destination, although this is not always given explicit mention, in some more recent contributions on the specific issue (Leiper, 1979; Della Corte, 2000; Pencarelli, 2001; Buhalis, 2000; Franch,

2002). Nevertheless, this integrated perspective is, to date, not too exhaustively developed as it deserves, even in view of a unitary systematization of the different approaches to the management of a tourist destination.

The management literature has dealt not only to define the concept of a tourist destination but also took care to address the problems and methods of government of a tourist destination. The identification of an authority of governance is of fundamental importance for the competitiveness of a tourist destination. The governance of the destination can be conceived as a system of decisions and actions aimed at consolidating and enhancing the competitiveness of the destination, setting clear goals and shared development between the actors of the tourism system. The identification of the authority of government to a destination is not easy; it depends on the characteristics of each destination.

The authority of government must seize and exploit the tangible and intangible components that characterize the cultural identity of a destination compared to competing destinations, local, national and international level. This assumes that there is a strong sharing of decisions, directly or indirectly, to each level of government tourism business both in the government of the destination and that all decisions are aimed at increasing the territory attractiveness and the tourist destination competitiveness.

Governance involves not only the shareholders, but also those who have an interest in the destination (eg. Individual managers, coalitions of labor providers) and an interest in the tourist destination: we refer to organizations "relevant" environment which operates as a tourist destination (the so-called stakeholders). Some of these issues directly affect the purposes of the destination (eg. Brokerage firms or companies providing tourist services), others are bearers of a public or social interest to the tourist destination, for example, the state organizations or associations of citizens.

The governing difficulties of a tourist destination are inherent in the structuring of strategic decision-making and in the allocation of the power to control resources within the tourist destination. This can be seen both in the tourist destinations strongly hierarchical, with a center of gravity well identified strategic and managerial (Franch, 2002) and in the *corporate* and *community* tourist destinations (Bieger, 1998; Flagesta and Hope, 2001). Both differ in relation to the design of the tourist offer and consequently have very different governance issues.

In the *corporate* destinations (eg, amusement parks, tourist villages, resorts, etc.), The tourist offer is designed by a firm which directly or indirectly controls, the attractiveness of the destination resources through contractual agreements. In this case, the destination assumes the configuration of a real firm, where problems of government are similar to those found in any other tourist organization (Bieger, 2000).

In the community destinations the local area offers a system of natural and manmade attractions in the tourist market. As a consequence the government is far more complex, considering that the resources of attraction are not owned by a single firm, but from independent business units, each of which pursues specific policies in terms of investment and income generation. In this regard, it is crucial the role of local institutions to the competitiveness of the tourism sector. In fact, they exert their control over resources (natural and artificial) and may support the tourism offer through forms of financing. Therefore, what distinguishes the corporate and community destination is a strong need to coordinate in the medium - long term the services offered by the different actors (public and private) which, through the direct control of the resources of attraction, help the generation of the tourist (Sautter and Leisen, 1999; Bramwell and Sharman, 1999; Della Corte, 2000; Presenza, 2007).

3 The Methodology of the research

The research methodology is the case study research (Yin, 2003). This methodology was useful to see if the “alberghi diffusi”, meets the common characteristics of innovation, providing a good example of enhancement of an area within the perspective of sustainable tourism development of a tourist destination. In this regard were analyzed some “alberghi diffusi”, representative of the universe of “alberghi diffusi” in Italy. For each case study we have identified the distinctive features and their consistency in terms of innovation, and verified the contribution of the company to achieve sustainable development of the territory of the local settlement, jointly from the viewpoint of economic, social and environmental.

The survey has made use of the following main sources: interviews we conducted with entrepreneurs and experts from local and national authorities operating in the tourism sector (CCIAA, Municipalities, Tourism Promotion Firms); disclosure documents of trade associations (National Association of “Alberghi diffusi”, Association Authentic Italian Villages); Web sites and corporate balance sheets; regional regulations in force;

articles published in daily newspapers, including international economic and political as well as academic publications related to the topics of this paper.

The results were further explored and validated by an attempt to apply the Weaver model (2000, 2011) to the reality of “alberghi diffusi”. This model is taken as a key to the sustainability of a tourist destination. It is applied by us with the particular aim of identifying the best conditions whose verification is essential to an effective diffusion model of the multi on our territory. The application of the model more appropriate adaptations required and it turned out to be explanatory for the evaluation of the level of sustainability of tourism in the investigated reality, and for the identification of the basic conditions that can promote more sustainable development.

4 Discussion of the results

The idea of *widespread hospitality* binds to the 1976 earthquake in Friuli Venezia Giulia, where it poses the need to appreciate whole villages of Carnia, converting them into tourist facilities.

The " diffuso " adjective denotes an integration enterprise with the socio-cultural reality and nature of the place. It is manifested from the horizontal configuration of the building structure, the authenticity of the buildings and furnishings that characterize the hotel (do not build anything new, but it restructures the existing carefully). The “albergo diffuso” is divided horizontally spread of existing housing units and of particular historical, cultural and artistic, which integrates with a land area according to different modes. Some hotels are divided in a historic village in a small mountain village or hill ; sometimes the structure of the hotel extends to cover a large part of the village, becoming an example of authentic experiential context in which the village and the inhabitants, farmers and artisans who live there, they become part of the experience of hospitality together with guests. Other hotels, however, are articulated in a rural or mountain area which, while not constituting a historic village, is, however, a local rich typicality ; still other hotels also are located in the center of a small or large cities.

From the point of view of technical and organizational, a second common feature is that the bedrooms are all located within the pre-existing units. They are of different sizes, independent and distant generally not more than 200/300 meters from the main building in which the activity takes place of reception and information. Unlike traditional hotels, the restaurant business is considered an ancillary service and therefore can not be carried

out; However, in most of the cases analyzed, we found that this activity is given special attention and care in key cultural. Species in some "alberghi diffusi" where we found annexed farms also of considerable size, the restaurant business takes an obvious role in the socio-cultural as well as economic. Similarly, it is considered the information activity to tourists, which is often supported by small libraries, mini-museums, training on local cuisine, etc

These interdependencies highlight in a very different way compared to traditional hotels, even the most traditional management activities of these companies (reception, information, accommodation, catering). During periods of increased tourist influx, some companies involved in its own process, as well as the homes owned by the hotel, other typical houses of the place owned by residents that are sold rented to guests.

The varied historical, cultural and architectural identity of the rooms that make up the hotels investigated (old houses of a village, a place of typical homes, old houses, agro-industrial wastelands, farms) and their equally varied possible dislocations in the area are distinctive elements very important, not only compared to other traditional formulas but also within the hotel segment of the "alberghi diffusi" among business and firms.

In the paper were examined 4 business cases properly selected within the universe of the "alberghi diffusi". It is small firms small within territories between their different. These hotels are suitable to be regarded in itself as a micro-business contexts territorial tourist destination, within the regions concerned.

4.1 *The "Al Vecchio Convento" albergo diffuso*

The "Al Vecchio Convento" albergo diffuso is an initiative by private entrepreneurs Italian with thirty years experience in the restaurant industry, which in 2007 decided to convert the hotel issued a prestigious building dating back to 1940, until then used as a restaurant. The renovation work lasted seven years and involved mainly the resident on-site and local cultural institutions attentive to the respect of the recovery of the real estate.

The hotel structure extends horizontally within the village for an area of 10 hectares or 10% of the total area of the village. The hotel consists of 7 units for a total of 25 rooms, which represent 61% of the total capacity of the village (41 rooms) and 0.2% of the carrying capacity of the destination Forlì-Cesena (18,674 rooms) (Istat 2011).

As regards the type of rooms, two consist of the main building and the annex that are owned by the entrepreneur, the other five rooms are rented by the inhabitants residing in

the borough. This is a good example of cooperation between the entrepreneur and the residents of the village attentive to the development of the area . The process of disbursement of the hotel service is configured as a "context of experience " authentic, in which the inhabitants and local artisans interact with hotel guests on the occasion of a series of events organized on site, such as painting classes and ceramics, typical local fairs and festivals . The hotel's clientele is predominantly international (30 % Italian and 70 % international) and comes not only from European countries (Netherlands, England, Belgium and Germany), but also from the United States, Russia, New Zealand and Brazil. In 2013, the number of arrivals registered in the hotel is 650 units. During the same period, the average stay of tourists was 3 nights . The data show that the " Al "Vecchio Convento" hotel still fails to express a strong tourist attraction because it is newly established and because located near tourist destinations known and characterized by high tourist flows.

4.2 The «Sextantio» albergo diffuso

The "Sextantio" albergo diffuso is located inside the fascinating medieval village of Santo Stefano di Sassano in Abruzzo (AQ). "Sextantio" is an initiative of Daniele Elow Kihlgren, Swedish-Italian entrepreneur, who in 1999 decided to buy part of the housing units in the village, now abandoned for years (Paniccia, Silvestrelli and Valeri, 2010). The hotel is made up of units and from a farm where the crops were reactivated typical products of Abruzzo cuisine, for years now abandoned. The "albergo diffuso" extends horizontally within the village for an area of 5,500 square meters, which represents approximately 40% of the total area of the village. The hotel consists of 9 units, 32 rooms and 72 beds, which represent 40% of the capacity of the village (70 rooms) and 0.5% of the carrying capacity of the L'Aquila destination (6,437 rooms) (Istat, 2011). Renovation works of the multi lasted 5 years and has involved mainly the resident on-site and local cultural institutions attentive to the recovery of the local real estate.

The process of service delivery involves fifteen hotel workers, all residents in the borough. The customers ' Sextantio consists for 25% of Italians and 75% of foreigners who come from Northern Europe (mainly Germany and England), the United States and Russia. In 2013, the number of arrivals registered at the hotel was 6,000 units. During the same period, the average stay of tourists was 2 nights . These data show that "Sextantio" is an important tourist attraction not only for the village of Santo Stefano di Sessano but

for the entire region . The hotel has in fact helped to revitalize a part in the history and local culture (from architectural structures to the typical food and wine) and, secondly, to generate economic value for the country, thereby strengthening the regional identity of the inhabitants of the village ; This is also reflected in the drastic reduction in the migration of the population residing in the village that until a few years ago was likely to jeopardize the survival of the local community .

4.3 *The «Sotto le Cummerse» albergo diffuso*

The "Sotto le Cummerse" albergo diffuso was founded in 2002 by two local entrepreneurs who have fully supported the huge initial investment for the restoration of the apartments in the town center . The units available to the hotel there are eleven (25 beds), of which ten apartments and a building used as a reception and lounge, from which are no more than 200 meters. There are three different types of accommodations (standard, superior and suites). The hotel offers accommodation only service to its customers and the food service is provided in collaboration with local catering companies . The process of disbursement of hotel service involves 4 people. The room occupancy rate during 2013 was 56 %, with an average stay of 2 nights during the winter and in the summer of 7 nights. During the same period, the number of arrivals amounted to 1,966 units . The hotel's clientele spread is composed of 70 % by Italian tourists (especially from Campania, Lazio, Lombardy, Piedmont and Puglia) and the remaining 30% are foreign tourists from Northern Europe (England, Sweden and the Netherlands) and Canada, Australia and Russia.

4.4. *The «Val di Kam» albergo diffuso*

The "Val di Kam" albergo diffuso was founded in 2002 by an Italian entrepreneur with experience in banking and insurance. The "albergo diffuso" was formed to retrieve the village of Sant'Angelo Muxaro in Sicily (AG), abandoned for years. The historic village is located in the town of Sant'Angelo Muxaro, which extends over an area of 64.55 square kilometers, and is located on a hill at an altitude equal to 335 meters above sea level The village of Sant'Angelo Muxaro assumes, in Europe, a position of particular importance in view of the archaeological world relative to the pre-proto (XII-th century BC.). Compared to the village of Sant'Angelo Muxaro, the "Val di Kam" albergo diffuso is in a kind of symbiosis with the territory integrating strongly with the local socio-

cultural reality. The hotel structure extends horizontally within the village over an area of 3,700 square meters, or 30% of the total area of the village. The “albergo diffuso” consists of 4 housing units, 20 rooms and 60 beds, which represent 40% of the capacity of the village (80 rooms) and 0.6% of the carrying capacity of the destination Agrigento (3,185 rooms) (Istat, 2011). The process of service delivery involves seven hotel workers all residents in the borough. The clients of "Val di Kam" “albergo diffuso” are Italians (30%) and foreign (70%) coming from the Netherlands, Spain, France and Germany. In 2013, the number of arrivals registered at the hotel was 660 units. During the same period, the average stay of tourists was 2 nights. Compared to the village of Sant'Angelo Muxaro, "Val di Kam" has strong capacity to attract tourist flows to the history and cultural traditions valued by local institutions, always attentive to the protection of the territory.

5 Conclusions and limitations

The case studies analyzed are placed within the Weaver matrix (2000; 2011) and are reinterpreted in the light of its two constitutive dimensions: "tourism intensity" and "regulation" . For each case we will verify the first position within the matrix and the possible evolutionary trajectories. Given the specificity of the investigated reality, the positioning of the hotels analyzed in different villages - specific points within the same quadrant of the matrix is not indifferent . In a dynamic view, it is evident that for all the analyzed cases it is desirable to develop towards a state of tourism " approved alternative " based primarily on the definition of a clear regulation of these activities. However, there are cases such as particularly "Val di Kam", "Le Cummerse" and " Sextantio " for which the challenges require higher capacity adjustment . It 'also clear that the development of enterprises surveyed towards greater sustainability requires all parties involved more attention to the cultural and social dimension of the territory of the settlement, which should be further enhanced to attract tourist flows in similar locations. In this sense, no less important is the issue of economic sustainability of these ventures, which indeed makes it even more critical the role of regulation. One example is "Al Vecchio Convento" who have benefited from a gradual increase in attendance at the property due to regulatory actions and policies of territorial marketing, provincial and regional.

The Weaver model is therefore more explanatory in relation to cognitive purposes of our investigation. In this regard, the following considerations apply. Our investigation

was concerned with a business model that tourist like a small tourist destination. In these cases, the identification of the company with the village allows to consider them as a whole with respect to the broader regional context in which they are located. It was thus possible to analyze the placement of such enterprises by assessing their ability to contribute to the development of local tourism. In this regard, the case is emblematic of "Sextantio" which has contributed significantly to the promotion of the territory at the provincial, regional and international levels.

A further consideration is that the reality under investigation for the "adjustment" variable takes on an important role in terms of sustainability. However, given the positioning of the cases analyzed in the CAT quadrant of the matrix, it is obvious that no less important is the "tourism intensity" variable and, in this context, particularly the amount of tourist flows, although these are niche destinations. We should not neglect the issue of economic sustainability of the analyzed firms. The "albergo diffuso" model can be considered a sustainable hotel service that presents original structures and places of production-service delivery, experiential contents and participants involved. In fact, it is not just a hotel spread of particular historical-cultural and artistic but it is a project to promote the history and culture of an area that can have a major impact on competitiveness, also because of its economic development social-local, as demonstrated by some excellence examples.

Within the historic villages, the tourism cannot become a mass phenomenon; However, it can play an important role in disseminating local and regional contexts in a new culture that relies on the small tourist business on the role of driving force for a healthier and more sustainable development of more territories, more and more local community.

From the legal point of view, still lacks a clear and consistent rules in the field of "alberghi diffusi". In regions with a higher concentration of these situations there is no proper regulation. Conversely, there is a more comprehensive legislation in the regions in which they operate a limited number of "alberghi diffusi".

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The interplay between MAS and innovation: insights from a research-intense network.

Rosanna Spanò *, Fabrizia Sarto

Department of Economics, Management, Institutions
University of Naples Federico II
University Campus Universitario Monte S. Angelo. Via Cinthia 26,
80126 Napoli

Claudia Arena

Department of Economics, Second University of Naples
Corso Gran Priorato di Malta
81043 Capua (CE)

Claudia Zagaria

Department of Economics, Management, Institutions
University of Naples Federico II
University Campus Universitario Monte S. Angelo. Via Cinthia 26,
80126 Napoli

* *Corresponding author*

Structured Abstract

Purpose The purpose of this paper is to better comprehend the interplay between MAS and innovation in research-intense networks. These networks are characterised by multifaceted knowledge sharing/integration/transfer processes that will be taken into account in order to understand how an effective MAS can positively affect innovation, and in turn how innovation shapes MAS.

Design/methodology/approach The research employs the single case study of a research-intense network located in Campania, namely *Campania Bioscience*, and investigate these issues through the lens of the *Middle Range Thinking* (MRT) approach developed by Broadbent and Laughlin (1993, 1997, 2003, 2005, 2013) advancing the Habermas Theory about Society, since this is particularly suitable to examine the issues relating to an on-going strategic change in management accounting practices fostered by changing environmental conditions.

Originality/value The novelty of this paper relies on the possibility to explore the peculiarities of an effective MAS supporting the innovation processes within a complex setting such as the researched network, that involves multifaceted knowledge sharing/integration/transfer. Moreover, it offers a newer perspective of analysis to

interpret the role of MAS in innovative networks, thus contributing to the growing debate on the antecedents and facilitators of knowledge sharing and knowledge integration.

Practical implications Our findings will be will to all the organizations involved complex processes of co-production of knowledge and innovation. Indeed the study broadens current knowledge on the factors that may contribute to bringing about an effective and positive interaction between MAS and innovation, relevant for both professionals and practitioners, opening the well-known “black box” of the creation/sharing/transfer/integration of tacit knowledge.

Keywords Management Accounting System, Innovation, Knowledge sharing and integration, Research Intense Network.

Paper type – Academic Research Paper

1 Introduction

This research focuses on the issues relating to the management tools and practices that support innovation processes in networks, and how these work in practice. Indeed, it is well acknowledged that given the importance of networks, it is fundamental to better comprehend how the progressive evolution towards these more complex and articulated organizational structures impacts on management practices and decision-making processes.

Over the last 20 years organizations, particularly those characterized by strong innovative approaches, have been prompted to redefine their boundaries, undertaking collaborative relationships with external subjects, to reinforce their strategies (Powell et al., 2005). What should be noted is that the involvement of several different actors for the development of the same project is regarded as an essential element to support innovation, because of the increasing complexity of external economic environments and the variety of tangible and intangible resources needed to develop new knowledge (Kale and Singh, 2007). From this perspective, the importance of networks lies in their role as mechanisms enabling participants to access more easily and less costly external and heterogeneous knowledge resources that can be combined with the existing ones, or used to create new expertise. Accordingly, networks constitute a conduit that channels the flow of information and know-how among the firms within the network, with each member acting as both a recipient and transmitter of knowledge (Ahuja 2000, Owen-Smith and Powell 2004). Not surprisingly, relatively copious literature investigated the key role played by networks for innovation processes, highlighting that diverse features can

variously influence the dynamics of information diffusion within networks. Some authors have explored how different network structures influence the generation of innovation and their performance (Podolny and Stuart, 1995; Powell et al., 1996). These studies provide a number of positive evidence in relation to networks' effectiveness. Moreover, other researches enlighten how the direct alliance relationships facilitate knowledge flows between partners (Gomes-Casseres et al. 2006, Mowery et al. 1996), thus enhancing the innovative performance of firms (e.g., Owen-Smith and Powell 2004, Soh 2003).

Despite the above-mentioned advantages relating to network relationships, it is undeniable that these latter profoundly influence the aspects of strategic planning and control that consequently need a broader attention. In this regard, it is important to highlight that when innovation is pursued going beyond the organizational boundaries it is essential to correctly understand how inter-organizational relationships should be managed, in order to promote collaboration and knowledge sharing within the network. In this context it is worth remembering that the provision of adequate management accounting systems¹ (MAS) - able to ease the information flows and to enhance the fiduciary dimension among the actors involved - assumes a vital importance.

With specific regard to management accounting systems, in the last decade a growing debate has focused on their strategic role, highlighting some key and still partially unclear aspects. In particular, some authors have highlighted small businesses in the initial growth stage's needs for adequate MAS, understood as strategic elements crucial to promote their development (Davila and Foster, 2005; Davila, 2005). Other scholars focused on the need to identify appropriate information systems and management accounting tools for the strategic management of network relationships (Tomkins, 2001). A further line of researches found that in research-intensive sectors, such as pharmaceuticals (Ma and Tayles, 2009) and aerospace, MAS have gradually assumed a strategic importance (Bromwich and Bhimani, 1994), by virtue of their ability to support decision-making and value creation (Simons, 1990; Nilsson et al., 2012), and therefore should not be regarded as mere instruments of conventional control. This literature agrees that MAS can stimulate the involved innovation processes (Bisbe and Otley, 2004; Widener, 2007) by assuming a crucial role as means of knowledge transfer and integration (Rhodes et al., 2008; Ditillo, 2004; Canonico et al., 2012). We claim here that the above-mentioned

¹ For the purposes of this research the expressions management accounting systems and management control systems are regarded as synonymous, on the ground of Broadbent and Laughlin's claim (2013, p.13) that the latter is an attempt to rename the domain of the former.

studies rather than providing clear and definitive answers, have emphasised the need for further investigation of these issues from the theoretical and the practical point of view. In fact, there is also some scepticisms in relation to the role of MAS as innovation facilitators, since some authors still argue that controls are likely to constrain and diminish innovative approaches. On this basis, existing literature emphasizes the need for a deeper understanding of the interplay between MAS and innovation, that as previously highlighted, assumes specific characteristics within networks, which deserve further research.

Hence, the purpose of this paper is to better comprehend the interplay between MAS and innovation in research-intense networks. These networks are characterised by multifaceted knowledge sharing/integration/transfer processes that will be taken into account in order to understand how an effective MAS can positively affect innovation, and in turn how innovation shapes MAS. To this aim, the paper employs the single case study, focusing on a research-intense network located in Campania, namely *Campania Bioscience*. This network has been recently created and is now facing a relevant process of change in its management accounting practices. Thus, the issues under investigation are examined through the lens of the *Middle Range Thinking* (MRT) approach developed by Broadbent and Laughlin (1993, 1997, 2003, 2005, 2013), advancing the Habermas Theory about Society, since this is particularly suitable to examine the issues relating to an on-going strategic change in management accounting practices.

The remainder of the paper is structured as follows. The second section provides an assessment of prior studies investigating the interplay between MAS and innovation. The third section describes the MRT approach advanced by Broadbent and Laughlin, which will be used as a theoretical lens to guide the interpretation of results. The fourth section discusses the research design. In the fifth section the context of reference for the case study is described. In the sixth section the main findings of the analysis are summarised. In the end, we discuss the results and provide some concluding remarks.

2 Assessment of prior studies

Over the last years a number of studies focused on the relationship between innovation and management accounting systems, providing heterogeneous evidence. As stated above the MAS are alternatively seen as innovation facilitators, or as tools constraining or (at best) irrelevant for innovative settings. Given the strong debate still

taking place, the following pages attempt to explain (not pretending to be exhaustive) the main issues raised concerning MAS and innovation, in order to better clarify the boundaries of this discussion.

Some studies claim that MAS hinder innovation. In particular, several articles argue that management accounting and management control systems cannot exert a constructive influence over product innovation (Damanpour, 1991; Dougherty and Hardy, 1996; Gerwin and Kolodny, 1992; Leonard-Barton, 1995; Tidd et al., 1997; Verona, 1999). Sometimes, formal control systems are seen as tools constraining, or at best irrelevant in innovation and R&D settings (Abernethy and Brownell, 1997; Birnberg, 1988; Brownell, 1985; Hayes, 1977; Rockness and Shields, 1984; Rockness and Shields, 1988). Also, these are regarded as obstacles to creativity and incapable of supporting innovation (Abernethy and Stoelwinder, 1991; Amabile et al., 1996; Miles and Snow, 1978; Ouchi, 1977; Ouchi, 1979; Tushman and O'Reilly, 1997).

However, a second stream of research agrees on the importance of MAS as strategic processes or tools, crucial to promote innovation both for small and medium businesses in the start-up phase (Davila and Foster, 2005; Davila, 2005), and also for the strategic management of network relationships (Tomkins, 2001). Still the positive role played by MAS is acknowledged for research-intensive sectors, such as pharmaceuticals (Ma and Tayles, 2009) and aerospace. Here, MAS have gradually assumed a strategic importance (Bromwich and Bhimani, 1994), by virtue of their ability to support decision-making and value creation (Simons, 1990; Nilsson et al., 2012), and therefore should not be regarded as mere instruments of conventional control. Also, this literature agrees that MAS can stimulate the involved innovation processes (Bisbe and Otley, 2004; Widener, 2007) by assuming a crucial role as means of knowledge transfer and integration (Rhodes et al., 2008; Ditillo, 2004; Canonico et al., 2012).

Also other studies in the management accounting field highlight that MAS are crucial for innovation (Clark and Fujimoto, 1991; Cooper and Kleinschmidt, 1987; Cooper and Slagmulder, 2004; Davila, 2000; Davila and Wouters, 2004; Hansen and Jönsson, 2005; Ittner and Kogut, 1995; Ziger and Maidique, 1990). From this perspective, management control systems can be enabling for corporate activities (Ahrens and Chapman, 2004, 2007), and their interactive use can stimulate innovation (Bisbe and Otley, 2004; Widener, 2007).

One of the main reasons that justifies the central role of MAS for innovative settings

is that, according to Simon (1990), in turbulent markets (where innovation plays a crucial role and is one of the main factors stimulating turbulence and rapid variations) the existence of formal management accounting and management control systems can help firms to promptly recognise changing markets or product conditions and to positively face the new circumstances. From this perspective it is well-argued that when the environments of reference are complex and dynamic, either for technological and scientific evolution or for changing regulation, the interactive use of MAS, such as planning, budgeting, cost accounting and performance measurement systems, can be helpful to set objectives and action plans, and to monitor their achievements, also supporting a timely adaptation to changing conditions where needed (Bisbe & Otley, 2004). Clearly, and as Davila (2000) states, from this perspective there is the need to regard MAS and MCS in their broader definition, going beyond financial measures and objective quantification, to include non-financial measures and qualitative dimensions. This suggests that researching management control systems in innovative settings, such as research-intense networks, cannot be restricted to traditional accounting measures, but needs to encompass a broader set of elements. In this regard, what should be noted is that the use of different combinations of financial and non-financial information depends on the characteristics of the context under investigation, also in terms of types of uncertainties that managers have to face.

It is worth remembering that both financial and non-financial information are essential elements of an effective MAS which assume the existence of *accounting calculations* that, as Robson (1992) argues, mobilise distant places of the organisation and make them parts of managers' world. Literature agrees that management accounting calculations provide a good deal of the knowledge that is available for management (Cooper, 1992, 1997; Law, 1996; Briers & Chua, 2001; Chua, 1995; Miller & Rose, 1990; Hines, 1988; Quattrone & Hopper, 2005; Miller, 2001). This knowledge develops visibility by stating what belongs to the past, and of what the future consists of and, by defining what comes before and what comes after, and making things visible, it allows the definition of what the elements to be accounted for are, thus influencing "how different spaces and different times may be produced inside the networks built to mobilise, cumulate and recombine the world" (Latour, 1987), towards (we say) innovation.

In this view, given that the nuances of the existing debate are various and that agreement has not yet been reached, a number of authors claim that there is still room for

further research on the interplay between innovation and MAS. Indeed, what should be noted is that in complex and dynamic settings, such as research-intensive networks, a fundamental question to take into account when addressing the issues relating to the interplay between management accounting systems and innovation is the so-called knowledge management.

Indeed, since the seminal work of Nonaka (1991), literature has assumed that innovation processes necessary involve the generation of new knowledge (Nonaka, 1991; Nonaka and Takeuchi, 1995; Subramaniam and Youndt, 2005; Du Plessis, 2007, Lundvall and Nielsen, 2007). For instance, according to Subramaniam and Youndt (2005) the innovation consists of an ongoing attempt to achieving new and unique knowledge. Similarly, Du Plessis (2007) states that innovation implies the generation of new knowledge and ideas to support new business processes and outcomes. Finally, Lundvall and Nielsen (2007) assert that the essence of innovation is to look for something new to add to existing knowledge. In this sense, what should be noted is that innovation involves different processes of knowledge management. Developing new knowledge should in fact require its transfer, interpretation, and integration within the previous existing knowledge contexts of other parts of the organization (Kusunoki et al., 1998; Rhodes et al., 2008). In this regard, several studies have focused on different mechanisms and initiatives which could act as facilitators of *knowledge sharing* (Rhodes et al., 2008; Stewart, 1998; Turner and Makhija, 2006). For instance, Stewart (1998) highlights that the information technologies play a crucial role for knowledge sharing. More generally, Turner and Makhija (2006) theoretically demonstrate that the organizational ‘control mechanisms’ influence the firm's knowledge management process by affecting how knowledge is acquired, disseminated, interpreted, and used to accomplish organizational goals. Other studies have instead enlightened the relevance of management control systems as crucial tools for knowledge *integration* (Koga and Davila, 1998; Nixon, 1998; Davila, 2000; Ditillo, 2004; Canonico et al., 2012). According to Koga and Davila (1998) and Nixon (1998) management control systems within product development projects provide information directed to coordination and learning by positively affecting the performance outcomes. Ditillo (2004) adds that the relationship between knowledge integration and control mechanisms in knowledge-intensive firms depends on the level of knowledge complexity. Finally, Canonico et al. (2012) report that within product innovation teams the formal control mechanisms may play the role of administering information exchange

in order to achieve projects outcome and the desired level of knowledge integration.

Notwithstanding the increasing relevance of the topic, literature is still lacking with reference to the understanding of the interplay between MAS and innovation in complex and research-intense contexts, such as networks, characterised by even more multifaceted knowledge sharing/integration/transfer processes. Thus, the aim of the paper is to better comprehend the interplay between MAS and innovation in research-intense networks, by referring to their multifaceted knowledge sharing/integration/transfer processes, in order to understand how an effective MAS can positively affect innovation (thanks to its contribution to knowledge sharing/integration/transfer processes), and in turn how innovation shapes MAS (thanks to enhanced knowledge sharing/integration/transfer processes).

On this basis, the paper, differently from prior studies, aims at gaining rich and detailed picture, through the observation of an on-going process of change, of the factors that possibly influence in a positive manner the effectiveness of a change in MAS in a research-intense network, with especial regard to the possible strategies to render a change in MAS seductive, effective (by avoiding resistances) and able to support innovation processes. What should be noted is that the above-described elements of complexity that characterise innovative settings and particularly networks, are an essential and unavoidable element for the correct understanding of the dynamics and the problems relating to implementing accounting and management accounting systems in innovative networks. Indeed, such complexity is able to exert a certain influence on the process of change and on the results of the process itself (Broadbent and Laughlin, 2005). Thus, in this view, the MRT approach developed by Broadbent and Laughlin (1993, 1997, 2003, 2005, 2013) is well suited to the study, as it allows the investigation of the dynamics of change in the MAS by also considering the effects exerted by complexity and any resistance to the introduction of the new management tools.

3 Theoretical framework

In short, it is possible to state that Habermas regards society as the combination of three elements: lifeworld (i.e. a symbolic dynamic space, a normative context within which culture, tradition and identity can be reproduced), systems (i.e. a functionally definable arrangement of operations, such as organizations, which represent the tangible expressions of the lifeworld), and steering media (i.e. mechanisms such as power, money,

law that steer the interface and interaction between lifeworld and systems, and play a role in ensuring that the latter reflect the former). He clarifies that increasing complexity of the systems can generate decoupling between them and the lifeworld, creating a situation in which the steering media follow the systems instead of the lifeworld, so that systems colonize the lifeworld.

Building on his view Broadbent and Laughlin's Middle Range Thinking elaborated a more practical oriented model based on the following refinements: (i) steering media are considered as "societal institutions" (e.g. government); (ii) systems of actions are considered as "societal organizations" (e.g., corporations, local health authorities, schools and universities); (iii) every societal organization has its own lifeworld, systems and steering media, which they regard as an interpretative scheme, subsystems and design archetypes respectively, where the design archetypes (such as MAS) attempt to balance and make coherent the interpretative scheme and subsystems.

The authors claim that internal colonization of the life-world/interpretative scheme arises not only at societal but also at organizational level and that the MAS as design archetypes, absorbing the external influences and transferring these to the interpretative scheme represents a crucial issue. In this regard, it is important to highlight that the equilibrium of the whole organization resulting from the coherence between the internal elements and the external environment (Mintzberg, 1989) needs to be considered. Indeed, when equilibrium is achieved, the organization tends to inertia, (Laughlin, 1991, Miller and Friesen, 1984) that can be interrupted only by an environmental disturbance (Laughlin, 1991). Clearly, the effectiveness of any change depends on a wide range of factors. In this regard, Brunsson (1985) argued that organizations with strong ideologies might be resistant to fundamental changes, Greenwood and Hinings (1988) found that contingencies creating contradictions between circumstances/context and organization lead to greater change, which can be mitigated by commitment to previous schemes, favoured or hindered by the dominant coalition's interpretative scheme, and is easier the higher the level of the skills and the capabilities of the top management. Smith (1982), Dunphy and Doug (1988) emphasize that morphogenetic changes are favoured by collaborative approaches between individuals and shared values.

On this basis, it is possible to investigate how societal institutions influence societal organizations, considering that according to Smith (1982) and Laughlin (1991), the following two types of changes may occur.

- ✓ Morphostasis (first order change) occurs when the change neither really affects the heart of the organization, which is reluctant and tends towards the pre-existing conditions, nor the interpretative scheme. It can arise as a Rebuttal, i.e. an environmental disturbance is tackled through changes in the design archetype, but afterwards this comes back to the original situation, or as a Reorientation, that consists in environmental disturbances that are internalized into the organization because they cannot be rebutted and therefore affect subsystems but not the interpretative scheme.
- ✓ Morphogenesis (second order change) is a change that influences the interpretative scheme because it profoundly permeates the organization. This may occur as Colonization, when the change is limited to the mandatory aspects, or as Evolution, when the change is free and not compulsory.

In this paper we draw on the aforementioned framework, by considering networks as Societal Organizations and the (Regional) Government as a Societal Institution. Accordingly, the subject of our analysis is the examination of the MAS as design archetypes of the network, capable of assimilating influences from the external environment, and effectively translating these influences into the interpretative scheme of the organizations.

4 Research Design

As already stated, the aim of the paper is to better comprehend the interplay between MAS and innovation in research-intense networks, characterised by multifaceted knowledge sharing/integration/transfer processes, in order to understand how an effective MAS can positively affect innovation thanks to its contribution to knowledge sharing/integration/transfer processes, and in turn how innovation shapes MAS thanks to enhanced knowledge sharing/integration/transfer processes.

The approach chosen for this research is qualitative, thus the paper employs the single case study methodology (Yin, 2003; Ahrens and Chapman, 2006). Indeed, consistent with Siggelkow (2007) view a single case study can contribute to existing knowledge through the deepening or widening of the current understandings. The real potential of the case study for the purposes of this research is also due to the fact that it helps the researchers to deeply understand the social systems of reference by providing an holistic view of the social practices in a specific set of circumstances (Scapens, 1990).

Moreover, the single case-study approach facilitates the use of in-depth longitudinal data, which is less feasible in multiple case-study designs.

The network chosen for the case study was *Campania Bioscience*. Indeed, this network has been recently created in the wake of external regulative pressures and is now facing a relevant process of change in its management accounting practices. Moreover, the complexity of this network, in which a wide range of entities (private companies, public entities, research organisms) and stakeholders (with different interests and backgrounds) are now interacting, renders *Campania Bioscience* an interesting setting to examine the issues under investigation.

The analysis of the case study has been carried out as follows. The data were collected over an eighth-month period in 2013-2014. This has enabled a closer examination of the developments and changes in MAS, as well as barriers, episodes of resistance, and accomplishments. At first, a relationship was established with the Chairman. He was briefed about the research project and the authors asked to be introduced to the managerial group.

Subsequently, the authors personally interviewed some of the managers. The informal interviews, which were later transcribed, followed an agenda of topics to be covered rather than a structured set of questions. This approach allowed a full coverage of the issues and resulted in a detailed picture of the practices and issues involved in the management of the network, with specific regard to the on-going changes in MAS. The aim of the dialogues with the people involved in the project was to investigate the areas of interest to the researchers, by identifying emerging issues of significance. In particular, these interviews aimed to build up a deeper picture of how the interviewees felt about their roles, what they thought about the network's role in the context of reference, the practices and management tools available within the network, and how they perceived the newly introduced MAS, and the impact of changes on their activities.

The interview strategy was mostly informed by a balanced consideration of the approach suggested by Scapens (1990), Yin (2003) and Ahrens and Chapman (2006). Each of the interviews lasted around one hour and most of them took place with two of the researchers present (always the same two members of the team carried out the interviews). An important aspect to underline about the interview phase is that the two researchers adopted tactics (Marginson, 2004) to improve the clarity of the data collected and limit misunderstandings when interpreting the responses. A first tactic was to make it

clear that the researchers did not have a specific theory to prove or disprove, and thus interviewees were not meant to provide the ‘right answers’. Also the researchers in several cases required respondents to illustrate the behaviour or issue s/he was describing (‘that’s interesting, could you provide an example or elaborate a little more?’), or in other cases asked permission to re-phrase within their own words, in order to find out the importance and comprehension of emerging issues. Over the study period interviews with 10 individuals, some of which repeated, were held at the study site (see table 1 below), amounting to a total number of 17 interviews. These were digitally recorded and then transcribed for analysis soon after the event. Moreover, a telephone follow-up with the respondents was conducted when a few data were missing. Before the analysis of the data, the interviewees were asked to review the transcripts and to make any corrections. Where necessary, we made a second visit to confirm some of the information or to follow-up on something which had arisen in another interview.

Table 1 – The interviews

Categories of individuals interviewed	Number of individuals interviewed	Total number of interviews per category
<i>President</i>	1	2
<i>CEO</i>	1	2
<i>Researchers</i>	3	5
<i>Entrepreneurs/Top Managers</i>	5	7

Once all the interviews were completed, the members of the research team discussed the main issues raised during the dialogues, and were thus able to develop the starting point for the analysis. These data were supplemented by an examination of other documentation, policies and digital videos for strategies and practices, publicly available for both the Region and the network considered, as well as some internal documents (see table 2). This information was collected and triangulated with data drawn from the direct interviews in order to enhance research reliability. This approach resulted in the production of a comprehensive analysis of the processes of change in the MAS of the network.

In summary, to guide the interpretation of the data gathered, several categories of relevant themes were identified to ease the analysis. Especially, the story of the change is addressed chronologically, by focusing in particular on the progressive role of MAS in supporting knowledge sharing and innovation and also on the role of the innovative

environment to support the effective implementation of MAS. The researchers carried out discussions about the interviews trying to refer all the responses to such categories where possible. In agreement with Ahrens and Chapman (2004), the interview transcripts were organized chronologically and the areas of agreement between the interviewers regarding the categories of analysis were identified. Subsequently, any area of disagreement was reviewed and discussed also in the light of the documentary sources available. The developing issues or emerging problems were then the subject of separate discussion and used to better understand/explain the phenomena or to identify any unsolved/open question for further investigation.

Table 2 – The documents

Public Available Documents for the Region and for Campania Bioscience	Internal Documents of Campania Bioscience
Regional Plan for research, innovation and ICT (Regional Council Decree April 29, 2011)	Statute
Memorandum of understanding June 25, 2009	Feasibility Study
Seventh Framework Program (FP 7) (2007-2013)	Strategic Plan (Internal)
The Campania Region's Innovation Scoreboard	First Draft of the Campania Bioscience Position Paper
Final Draft of the Campania Region Position Paper	
Protocol of Agreement with the Region	
Organization Structure and Chart of the Network	

5 Setting the context

As previously stated, the case study examined in this paper is *Campania Bioscience*, a network located in Campania and created in 2013. Hence, for a purpose of clarity this section will briefly describe the characteristics of the sector, the Regional environment and, the peculiarities of the network under investigation.

5.1 The sector

Biotechnology can be understood in its most basic conception as the application of biological systems and organisms to industrial processes. It has developed rapidly over the 20th century, to encompass a broad and diverse range of industrial sectors and products. What characterises the sector, in addition to the enormous growth opportunities, is the high level of technological discontinuity that also leads to considerable uncertainty, with biotechnology firms producing without assurance in terms of whether a market exists for their products, or whether the production process is technically feasible and economically sustainable.

The peculiarity of biotechnology is that it is a science-based activity, and its development primarily derives from academic research. This clearly leads to the increasing demand for a stronger linkage between industry and academic institutions. In fact, as Porter (1983) argues, biotechnology is characterised by number of entry barriers, including proprietary technology, which raises the effective opportunity cost of capital. The cost of entering the biotechnology industry is largely related to the R&D expenses. Thus, academic-industrial relationship (AIR) is regarded as an organizational means to reduce entry barrier by lowering R&D costs for commercialization. These AIR may have many forms, sizes, and designations through cooperative agreements, direct funding, or other contacts (Etzkowitz, Webster, & Healey, 1998) and can be advantageous for both the academic institution (in terms of replacement of lost government funds, avoidance of complex government regulations, potential for long-term financial and industrial support, and trainee support for students and scientists) and for the industrial partners (in terms of new ideas, approaches, and products, improved capabilities with an easiest access).

An essential element to take into account is that in this sector a crucial role is played by the knowledge that forms the basis of the development of such products. Clearly, knowledge is strongly related to people that over the years have contributed to its development, and this in complex settings such as the academic ones may complicate the sharing and transfer of biotechnology innovations, as well as the protection of its innovative outcome (Vona, 2008). The big firms deal with these problems by introducing internal units to coordinate and develop such knowledge through relevant financial investments. Nevertheless, it is worth noting that these kinds of formal structures, despite ensuring the protection of innovative outcomes, especially when the patentability is expensive or hard to achieve, may prevent the creativity of innovative process due to

strict and bureaucratic procedures (Sorrentino, 1995). From this perspective, the existence of informal organizations such as networks is well suited to achieve the needs of knowledge sharing that form the basis of the innovative process in this sector (Vona, 2008; Laycock 2005), preventing the risk of constraining the activities and the creativity, which is a typical limitation of formal bureaucracies.

5.2 The Regional environment

Campania is an ideal setting to examine the issues relating to innovation, as it represents a highly challenging region for innovation with its 7 Universities, 40 advanced Research Institutes, 10 Competence Centres, 1 Technology District, 5 Business Incubators and 2 Science and Technology Parks. Moreover, the Region is the main research hub in the *Mezzogiorno*, and since 2007 is the Italian region devoting the greatest amount of public resources to Research & Development activities.

To deeply understand the actions undertaken by the regional government over the last ten years to support innovation, it is important to consider that it constantly faces the highly competitive environment in persistent evolution that has characterised Europe over the last decades. The complexity of the environment and the competitiveness of the systems at the international level as well as the need to achieve industrial leadership and standards of excellence in research, prompted a number of regions all over Europe to develop pathways based on distinctive competencies and resources specific to the territory and complementary with those of other EU areas, that can be summarised as follows (Campania Region Position Paper):

- ✓ Knowledge-based strategic objectives based on fundamental priorities, challenges and development needs (priority setting)
- ✓ Policies to enhance the strengths, competitive advantages and potential for excellence (competence based)
- ✓ Actions to support technological innovation, combining the development of regional research systems (knowledge based research) and innovative capacity of firms (technology-based research)
- ✓ Mechanisms to ensure full participation of the actors involved in the different phases of the innovation process (open innovation system)
- ✓ Tools to ensure continuous monitoring of the public intervention through ex-ante, ongoing, and ex-post performance evaluation systems.

In this context, since 2001 the Campania Region has progressively attempted to elaborate specific legislation and new measures to promote research activities, innovation and scientific progress. The first decree was enacted in 2002 and further modified in 2010. The purpose of this legislation was to contribute to the promotion of the advancement and dissemination of basic research in science, technology, humanities, economy and law, encouraging the creation of funding opportunities for research designed and led by young people. Particular attention was devoted to the actions needed to avoid the risk of depletion of the innovative human resources in the system of the regional research, and to favour a proper management of the multiple skills within the region, with the aim of creating a real connection between the world of research and the world of production in the overall development process. What certainly deserves attention is that between 2000 and 2006 the Campania Region has strongly focused on a process to define the priorities of the various areas with high potential and territorial impact. Thus, in the following years (2007-2013) the strategic areas identified were categorized in 8 clusters, namely (i) aerospace/aviation, (ii) environment and safety, (iii) cultural heritage, (iv) energy and energy saving, (v) ICT, (vi) advanced materials, (vi) biotechnology and human health, (vii) transportation and advanced logistics, for which specific lines of action were elaborated and several funding programs were activated (Campania Region Position Paper).

In addition to the regulatory attempts the Region issues annual Plans which central concern is that scientific research and technological innovation are essential to strengthen competitive capacities, entrepreneurial creativity, knowledge and opportunities for growth. To achieve these objectives, in addition to the above-cited Plans, based on which are defined the priorities for action and investment in the territory of the Campania Region for the reinforcement of the system of research and the Promotion of Innovation, it has also a variety of tools, such as the funds made available with the POR 2007/2013 (POR FESR e POR FSE). A further tangible proof of the commitment of the Region to pursue the innovation is also the creation of the Regional Agencies *Campania Innovazione S.p.A.* (2011) and *Campania In Hub* (2012) to support research and innovation, by ensuring connection, communication and collaboration among the regional actors. The Agencies were created to strengthen Research and Innovation within the region by creating a network of multiple connections between research and enterprise system, and to exert the role of coordinators among all the actors involved into the

creation of innovative startups, finance for innovation, technology transfer, participation in European Programmes and International Networking.

5.3 The structure of the network

The process to create the network *Campania Bioscience* started in 2011 to benefit from the national and regional initiatives for funding (Europe 2020 and PON “Research Competitiveness”) and also in the light of the opportunities and constraints imposed by Regional Plan for research, innovation and ICT (Regional Council Decree April 29, 2011). The network *Campania Bioscience* actively operates within the Campania Region since the beginning of 2013. It has been created in the wake of an increasing attention within the Region for the issues relating to innovation and the need to find appropriate ways, such as the creation of networks, to support innovation on the territory and to enhance the previous-existing abilities and skills. In the South of Italy *Campania Bioscience* represents the first example for the biotechnology sector of a structured and organised model of cooperation capable in terms of size and skills available to compete on the international scene. The funds made available to constitute the network and to fund the operations for the first three years of activities amount to 50 millions euros provided by both private and public funders. The investments within the network are primarily directed to the development of innovative projects with especial priority for the testing of new therapies. Furthermore, over the first three years, the focus is not only limited to the development and testing of new therapies, but attention is also devoted to the production of nutraceuticals and cosmeceuticals, diagnostics, biosensors and innovative technologies for the biomedical industry.

The legal form of *Campania Bioscience* is a limited liability consortium (SCARL: Società Consortile a Responsabilità Limitata). The consortium has a capital of 1,7 million and is distributed among 47 companies (44%), 7 research institutes (44%) and 3 firms for knowledge and technological transfer (12%). The governance of the network is the classic one with the Assembly, Board of Directors (with an equal participation of representatives of public entities and private companies), Chairmain, CEO, and two committees (executive committee, internal audit committee) and an external assessment organism. However, what should be noted is that given the multifaceted nature of the innovative projects that the network is developing, in addition to the above-described structure five thematic tables were created to closely monitor each of the projects and also the transfer of

knowledge within the network. In particular, these tables define the programs to achieve the strategic objectives and are involved in the realisation of several projects. They are composed by three thematic round tables responsible of the industrial research and experimental development in the three thematic areas of interest of the network. The first group deals with the development and production of nutraceuticals and cosmeceuticals; the second is involved with diagnostic systems, biosensors and innovative technologies for the biomedical industry; the latter focuses on the development and testing of new therapies. In addition to these thematic tables, there are two transverse tables related with the advanced training, and the promotion/internationalisation/diffusion/transfer of technology.

6 Findings

Since the beginning of 2011, in the wake of the increasing attention paid at the Regional level to elaborate action and strategies to support innovation within the territory, as well as on the basis of the European, National and Regional regulation, the actors operating within the biotechnology domain started a process to create a formal network structure, with a view of benefiting from a relational model to foster innovation and to get access to public and private funds to support both basic and applied research, as well as the development and commercialisation of existing prototypes. The first action was the realisation of a feasibility study by the proponents of Campania Bioscience that was sent to the MIUR for approval. In 2012 after the positive response by the MIUR a Framework Program was signed and after a long negotiation process among parties the network was formally created in the form of a SCARL, which is now actively operating.

The process involved a number of different steps because, despite the general willingness on the territory to adhere to the proposed initiatives, some unclear aspects and misunderstanding needed to be carefully addressed. In particular, some of the interviewees clarified that a first set of problems was related to the perception of the actors involved about the real role of the network. As the following quote clarifies, some people were keen to participate as they could see the possible advantages relating to entering the network in terms of both knowledge sharing and access to new skills.

“We have the financial resources but do not have enough specific skills and abilities required at each stage of the process to support innovation. On the other hand, small businesses or universities have specific skills related to the individual stages but do not

have adequate resources to purchase the necessary technologies. For example, there are small firms with revenues of few million euros that produce very innovative components requiring to buy a number of technologies that they cannot afford...but we can offer them! In this sense, the participation in the network allows us to carry out an exchange of information, expertise and knowledge!” (Top manager of a big firm).

Other, as the Chairman claimed, perceived the upcoming network *only as a formal structure, with no effective potential and no real impacts, to get access more easily to the funding programs available to support innovative networks.*

The scarce clarity on the purposes and the potential of the network was acknowledged by a number of different actors. One of the major problems at the very beginning was that there were only a few and very *fuzzy* documents available to the various stakeholders and persisting communication barriers between them. The following quotations can effectively summarize the feelings about the network that characterized its emerging phase.

“When the network was going to be introduced in 2011, I was the general manager of Regional Centre for Industrial Biotechnology ... I read a hundred pages of statements of wonderful objectives and the long list of actors involved in the creation of the emerging network. I said to myself: ‘this is great but how we can achieve these goals is a different question!’ I had some doubts about the chance to achieve a real agreement among such heterogeneous actors because it was not clear at all how people at any level of the network should behave to support the initial phase”. (CEO)

“When we received the proposal to join the network, I had chats with some other entrepreneurs and no one had any idea about the way we could take advantage of the introduction of the newly created network. This is mainly because we were quite scared about the risk of losing the property rights of our knowledge and our innovative ideas”.

(Small Entrepreneur)

“When our university shared the news to join the network, my colleagues and I had some doubts about it. Hence, we did not immediately realize the motivations and the goals that lead to the introduction of this network (...). We dislike that someone else far from the world of research establishes the scope and the objectives of our activities (...) The innovation process is only matter of research! However, we also thought that probably

our participation will have given us the chance to get more funds and therefore we entered the process to see it was going to work". (Researcher)

In order to face with these misunderstandings and difficulties, which represented barriers and resistances possibly threatening the real potential of the emerging network, the proponents adopted a participative approach based on the involvement of the actors at all the levels in order to substantially share the purposes of the network and to elaborate in a participative manner any future actions. The following quotation from the CEO elucidates this approach.

"We suddenly realised that to avoid resistance by people, leading to the ineffectiveness of the new structure we had to make them aware of the fact that this was an opportunity that they could not miss. Hence, we stimulated the participation of the actors to the meetings, always fostering an open dialogue. Also, we clarified that the activities of the network would have never taken away individuals from their specific activities and the possibilities to benefit from the existing opportunities". In particular, we developed a shared strategic planning activity in order to stimulate cohesion and a real interaction between the actors, which however should be the primary aim of every networking initiative". (CEO)

With reference to the activities carried out to build the network in question, a central question pertained the strategic planning phase. This, as already highlighted, was characterized by a strong participative approach and was developed mainly relying upon what was defined at the Regional level when the Plan for research, innovation and ICT (Regional Council Decree April 29, 2011) was issued. In particular the two following documents laid the ground for the introduction of strategic planning and monitoring at regional level and acted as the starting base for the strategic planning of Campania Bioscience.

- ✓ *The final draft of the Campania Region Position Paper* which defined the regional technological priorities for the health, biotechnology and agro-industrial sectors for the 2014-2020 period.
- ✓ *The Campania Region Innovation Scoreboard Report* edited by *Campania Innovazione S.p.A.* Agency to identify the areas, dimensions and indicators to measure the degree of innovation within the Region.

On the basis of the tools and practices that were analytically established for the planning, monitoring and performance evaluation of the overall regional innovation system, *Campania Bioscience* could specifically define its strategic priorities both at a general level and focusing on specific projects. The starting point of the strategic planning was the analysis of the biotechnology regional context and its potential for the innovation. To this aim the existing industrial (number of big firms, revenues, employees) and scientific (number of academic departments, involved researchers) conditions were mapped and analysed to get a clear idea of the available resources, assets and capabilities. Moreover a negotiation and participative process was undertaken to define several technological pathways for the network.

Initially the problems with this process mirrored the limited comprehension of the purposes of the network addressed above, as the pressures for the definition of the strategic plan created the premise for a number of contrasts between actors with a varying degree of knowledge about the questions under discussion. Indeed several conflicts arose between the managers, the representatives of companies and the researchers due to the different interests that they wanted to pursue.

A particularly threatening problem was the unwillingness of researchers to accept strategic planning, as they wanted to keep doing research preserving their autonomy and had no clear view of the economic sustainability concerns that were discussed. To clarify we quote from a researcher.

“At the beginning we found it difficult to really rationalize why directors and top managers of the network wanted to intervene in decisions for which they did not have the skills. Moreover the economic focus of the companies was a bit far from our view that basic research is crucial and needs to be preserved. In this situation the negotiation of the objectives and projects was really difficult and I must confess that in the first meetings we tried to fight to defend our positions”. (Researcher)

However, thanks to the participative approach that has characterized the network since its very beginning the top managers tried to involve all actors at all levels in the strategic planning by using various tools. To elucidate this point we quote from the CEO.

“We were sure that changes could not be welcomed if the motivations and the goals that lead to the definition of the strategic planning were not enough understood. Hence, we wanted to build consensus before proceeding, in such a way that people did not feel

threatened but on the contrary were pervaded by a participatory and proactive spirit. So it was essential to clarify immediately that any type of instrument would be aimed at sharing opportunities and improving the results at both the individual-level and network-level (...) We organized a number of formal and informal meetings with the representatives of the researchers and top management, using several innovative communication tools such as Skype". (CEO)

During such meetings top management asked for an active participation at any level, towards the definition of the priorities, technological trajectories and projects that resulted in the position paper. Thus, the representatives of each group were involved in a survey to provide a more complete picture of know-how, specific skills, financial resources, roles and responsibilities that were necessary for developing the projects. This initiative was welcomed by participants that started to show greater interest and acceptance, as highlighted in the following quote from one researcher.

"I appreciate this kind of involvement as I am convinced that no one can identify the resources and the necessary steps to fulfil the goals of the projects better than someone who is involved in this process every day. Of course I recognize that I cannot replace an expert of strategic planning, but I think that our contribution was crucial to make sure that everything will work, and this is certainly an opportunity for improvement that we cannot miss." (Researcher).

The negotiation process of the strategic planning has been favoured by the existence of simple kind of electronic information system to share knowledge among the coordinators of different projects and, when necessary, among all members, further favouring the creation of a collaborative environment, ready to accept the strategic planning. What should be noted is that the involvement of different actors thanks to a user-friendly information system completely changed their perspectives, as the initially resisting people switched from being those who passively suffered the choices of top management to being active agents of the change. The following quotes from a CEO and a researcher can clarify this argument.

"The negotiation was more productive and useful thanks to a communication system that helped us to share the objectives of the strategic plans. From this point of view the technology has helped and allowed us to easily discuss each step of the planning process and develop a shared and agreed course of action" (CEO)

“Being involved in the definition of the strategic plan, also thanks to an easy and quick information system, made me feeling part of the challenge and prompted me to question my previous conceptual schemes. I realized that the subsequent defined lines of actions would have been in our favour and not against us or our intellectual freedom”

(Researcher)

At the end of the negotiation process, the following eight projects were defined.

- ✓ Recovery strategies of bioactive compounds from waste biomass from the oil industry and canning
- ✓ Design, development and production of functional foods and/or eriche
- ✓ Development and testing of molecules with nutraceuticals and cosmeceuticals
- ✓ New strategies for medical diagnostics and molecular and traceability and monitoring of food
- ✓ Diagnostic methods with high efficiency to the patient osteoarticular
- ✓ Smart materials and new devices for applications in the biomedical field;
- ✓ Preclinical development of new therapies and innovative strategies for the production of molecules of pharmacological action
- ✓ Development and preclinical and clinical evaluation of phase 0 and phase 1 of molecules with nutraceuticals, cosmeceuticals, pharmaceutical and new indications for already approved molecules.

These projects were attributed to one of the three thematic tables that were held responsible for the achievement of the objectives and the monitoring of the performance. Hence, the coordinators of each table together with the other member of the team gave way to smaller consultations with participants in the specific projects to establish more specific lines of action, as well as to identify operational roles and responsibilities. This approach was essential to ensure that what stated at the upper level in the Strategic Plan was implemented at any level within the network and put into action. It is also worth noting that to ensure the achievement of the stated strategic goals the network introduced a formal governance structure characterized by multilevel-monitoring mechanisms. At the bottom there are the five round tables appointed by the board of directors that ensure a first assessment of each project. In the middle, there is an executive committee composed by the coordinators of the projects monitoring the execution of the on-going programs, while at the top there is the Board of Directors. To clarify how this structure was established, we quote from one Director and the CEO.

“We strongly thought that the typical governance model could not fit the multifaceted nature of our network. Hence we tried to create something that goes beyond the traditional governance model composed by the board of directors, general manager and so on. Since the beginning, we created a series of tables and working groups with specific functions. Also, we allowed representatives of the private companies and of the public entities to participate in these tables on the basis of voluntary application mechanisms that avoid the risk of scarce legitimacy of the governance structure and are helpful in managing the risk of resistance by the actors involved”. (Director)

“Our aim was to create a place where both industry and public research could meet and really develop a common path through strong relationships and dialogues. To this aim a crucial role was played by the trust that the formal monitoring mechanisms of the projects created. Indeed, in addition to the round tables we also created a coordinating body whose members were chosen among public and private researchers, top managers and technical representatives coordinating the projects, that created a real and additional space of interaction and dialogue with both the participants to projects and the Board of Directors, also contributing to ease the information flows”. (CEO)

All the categories of individuals interviewed highlighted the positive aspects relating to the participative governance and their involvement that allowed avoiding misunderstandings and achieving cohesion at each level. The following quotations elucidate this situation with more detail.

“In my opinion the choice of involving us either at the bottom or at the top level of the governance structure has been really worthwhile for our leading role. In particular, the involvement in the coordination of the round tables and in the executive committee has been useful because this has allowed us to interface and dialogue with the board of directors by negotiating those action programs that better fit with our business needs”.

(Top manager of big firm)

“Our category is often not considered in the executive committee and the board of directors, but this was not the case. Even though my colleagues and I were not formal members of such bodies, we could attend those meetings mostly related to our research activities. This motivates us to act for and not against the new governance system as we were aware of what the Top Management were talking about”(Researcher).

“Being involved in the board of directors made me feeling active part of the decision making process. Thus, the strategic decisions were not merely imposed but for the first time could fully reflect the different needs expressed by our small business” (Small Entrepreneurs).

Moreover, regarding the monitoring bodies, it is worth noting that the network has also recently established an external assessment organism that will provide an independent evaluation on the research activities as well as on the impact of the projects in terms of technological transfer. This is made of three independent members, a professor, a top manager and an expert in entrepreneurship, that have to perform a general assessment of the activities of the whole network. The choice to create this independent organism was really appreciated by the majority of members. Indeed, as one of the researchers clarified *“The network has a great potential for research, there is no doubt that we have the skills to do research, but the point is how to transform our abilities in outcomes that impact the territory becoming innovation but also social and territorial development. I think that the objective and constant monitoring and evaluation of our performance from an external party will lead us to effectively achieve these aims.”* (Researcher)

This organism has not yet started to carry out its activities but it is surely important to highlight that the willingness of the actors to create such an organism represents a positive signal of the fact that the changes in action are working well and that there is an on-going transformation also in the cultural and ideological boundaries of these subjects.

What needs to be highlighted at this stage is that a common opinion shared by interviewees is that the existence of the network and the use of the new tools had for them three main advantages. First, they were able to create relationships that go beyond the network and often decided to cooperate also autonomously to carry out their projects, with enormous advantages in terms of access to skills, knowledge sharing and fostering new innovation processes. Second, the use of the information systems allowed them to share an unbelievable amount of information and previous knowledge, thus facilitating also the activity that they carry out outside the network. Third, the participation in the network and the necessity to collaborate with people from different backgrounds gave them the chance to acquire new knowledge and to develop other capabilities that they could then transfer to their own organizations. In turn, it is also interesting to note that all the interviewees agreed on the fact that they were more and more willing to accept the

changes in action, and to contribute to shape the new tools introduced as soon as they recognized the above cited advantages. However, despite the positive results achieved in this first phase what should be noted is that some difficult issues are still around and need to be resolved to ensure the embeddedness of the MAS introduced. Indeed, some of the interviews highlighted two major problems. First, some researchers are still reluctant to accept a formal governance structure. Second, not all the actors constituting the governance bodies had the right skills to actively participate to the decision making process.

7 Discussion and conclusion

The subject of this paper is the investigation of the matters concerning the implementation and effectiveness of management accounting systems in complex organizations, and especially networks, to support innovation processes. The study was developed on the ground of the lacking understanding of the interplay between MAS and innovation, that in research-intense networks assumes specific characteristics given their multifaceted knowledge sharing/integration/transfer processes that need to be taken into account. Hence, the specific purpose of the research was to understand how an effective MAS can positively affect innovation, and in turn how innovation shapes MAS. To this aim, the paper employed the single case study, focusing on a research-intense network located in Campania, namely *Campania Bioscience*, which has been recently created and is now facing a relevant process of change in its management accounting practices. Thus, the issues under investigation were examined through the lens of the *Middle Range Thinking* (MRT) approach developed by Broadbent and Laughlin (1993, 1997, 2003, 2005, 2013), advancing the Habermas Theory about Society, since this is particularly suitable to examine the issues relating to an on-going strategic change in management accounting practices. Hence, this section discusses the results of the analysis in the light of the theoretical model, to understand which are the factors that possibly justify an effective change in MAS and what are the implications for practitioners and professionals involved in the process of change.

For purposes of clarity, it is important to briefly recall here the implications of the theoretical model addressed in the second section. In particular, we have previously highlighted that changes may occur as Morphostasis (first order change) when the change neither really affects the heart of the organization nor the interpretative scheme, or as

Morphogenesis (second order change) when the change influences the interpretative scheme because it profoundly permeates the essence of the organization. Especially, the former can arise as Rebuttal, when an environmental disturbance is tackled through changes in the design archetype, but afterwards this latter returns to the original situation, or as Reorientation, when environmental disturbances are internalized because they also affect subsystems, but do not affect the interpretative scheme. On the other hand, Morphogenesis may alternatively occur as Colonization, such as a compulsory change, or as Evolution, when there is a free and non-compulsory change.

With specific regard to the findings of our research, it is possible to maintain that the examined network has experienced a successful process of change, i.e., an Evolution (Morphogenesis of the second order), because the MAS introduced in the wake of changing regulation and environmental competitive disturbances at the European, National and Regional level, have been effectively implemented within the organization. Indeed, the MAS introduced were able to translate the pressures coming from the outside in terms of new legal requirements, to the interpretive schemes of the network, towards the creation of a shared and accepted business culture aiming to maximize the effective and efficient use of the resources, and to create a common locus for interaction and the development of new knowledge. This is possible because the abilities, skills and knowledge of the territorial jurisdiction of the network are now organized in a system, thus fostering a more effective collaboration to realise innovative products and to trigger new development processes, through projects with a relapse of the market of short-medium term. The network is a great achievement that fully enhances the skills in the field of biotechnology that characterise its territory of reference, and the partnership built with about 50 industrial companies, as well as the choice of a joint Executive Board between public and private partners, are important elements to ensure the success of the initiative.

What should be noted is that a crucial element to ensure such effectiveness has been the constant involvement of the various actors over the different phases of the changing process. Actually, one would expect that a complex organization such as *Campania Bioscience*, characterized by multiple strong (and sometimes conflicting) ideologies, might be resistant to fundamental changes in the interpretative scheme. On the contrary, the effort of the management to continuously involve the various subjects, the constant attention to their needs, the negotiation of measures to be taken with the representatives

of the various groups, rather than simply the coercive adoption of pre-packaged systems, have made the difference, by helping to create, if not entirely at least in large part, a corporate culture that did not exist before. This fully reflects the view of Dunphy and Doug (1988) who highlight that Morphogenetic changes benefit from shared values collaborative approaches between individuals.

Furthermore, it is worth remarking that at the very beginning, the introduction of the MAS shed light on the existence of problems in terms of lack of dialogue between the different categories of people involved. However, the need to sit at a negotiating table in a compact way to deal with the management led the various groups of professionals to put more effort into developing the dialogue among them. This not only resulted in a more rational mode of approaching the innovation process, but can be also identified as an additional element in the ultimate success of the process of change. In fact, the improvement in the innovative performance of the single subjects was possible thanks to the integration between the different actors that made them aware of the potential of the network and of the new measures. They were able to verify that the new tools were useful in achieving not only economic objectives but also a better performance, through the reduction of waste and the release of resources of knowledge not accessible before, thus pushing them to proactively support the changes taking place.

That having been said, it is also worth highlighting that, even if the changes in the MAS have been effective and have helped to create a corporate culture oriented to fulfilling the objectives of efficiency and innovation in the broadest sense, a number of issues, as the results of the analysis show, are still open and will need further work. The reference here is to the concerns relating to the persisting resistance of several categories, which has been reduced but not completely set aside. Then, the tools currently available need to be refined, and more importantly effort need to be made to eradicate the factors or conditions that may favour resistances.

Therefore, it is possible to maintain that a proper understanding of the changes taking place requires a move beyond the oversimplified reference to the moment in which the tools implemented begin to be correctly used. From this perspective, the effort that the various subjects involved have made in terms of commitment towards the improvement of the MAS also for the future, agreeing on the introduction of external evaluation is a further positive signal. In particular, this bears witness not only to the authentic evolution that is on-going within the network, but also emphasizes that the MAS has exceeded the

objectives of strategic and operational planning, as well as of the control system for which it was initially conceived. Accordingly, the MAS of *Campania Bioscience* can be regarded as a means of change and mediation between different and contrasting institutional subjects. From this perspective, their real potential has not yet been entirely revealed. The usefulness of the MAS lies here in its future ability to create a common language that will facilitate a productive exchange, and dialogue and discussion between the different subjects, helpful in superseding their previous inability to interact, due to a lack of comprehension that led to strong opposition or open conflicts among them. Indeed, a common language allows more relaxed relationships within the organization, based on understanding, and leads increased participation favouring improvement of organizational performance in terms of efficiency, effectiveness, and innovation.

On this basis we can conclude that the novelty of this paper relies on the possibility to explore the peculiarities of an effective MAS supporting the innovation processes within a complex setting such as the researched network that involves multifaceted knowledge sharing/integration/transfer. It is worth noting that this study can have a twofold contribution. First, from a theoretical point of view it adds a newer perspective of analysis to interpret the role of MAS in innovative networks, thus contributing to the growing debate on the antecedents and facilitators of knowledge sharing and knowledge integration. Also, from a more practical point of view it broadens current knowledge on the factors that may contribute to bringing about an effective and positive interaction between MAS and innovation, relevant for both professionals and practitioners, opening the well-known “black box” of the creation/sharing/transfer/integration of tacit knowledge. In fact, this case study will have an important impact, by providing useful practical suggestions for all the organizations involved complex processes of co-production of knowledge and innovation.

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The new technologies to support the users: The use of health Apps (Medicine Cat.)

Rocco Reina*, Fabrizio Ambrosio, Concetta L. Cristofaro. Marzia Ventura

Department of Law History Economics and Social Science.
University of Catanzaro “Magna Græcia”
Viale Europa 88100 Catanzaro

** Corresponding author*

Structured Abstract :

Purpose - The purpose of this research, beside the general comprehension of the phenomenon, its dissemination and penetration in the medical community, is mainly to gain a better understanding of determinants and factors that may impede or enhance its use in the medical context considering the potentials provided by the new technologies. On these assumptions, this study offers an insight on two of the most popular operating systems on the market (Android and Apple) analyzing the specific aspects of the Apps present on the main store of the operating systems as referred above (Play Store and iTunes).

Design/methodology/approach - The methodology will use a blended approach articulated in two phases. The first phase of inquiry explores the phenomenon object of study, outlining the potentials to it connected, with a particular reference to the Italian context. The second phase is oriented to build up a data base with the different medical Apps of the two main operating systems, trying to map the offer of medical Apps which are available at present and finally identify possible reading keys of the phenomenon and its developments from a socio-medical viewpoint.

Originality/value - This methodology puts in evidence that the adoption of “mobile health” is regarded as the creation of a new market full of opportunities and potential growth. This paper provides a reflection on how the use of Apps may improve the relationship with the different stakeholders (wholesalers- patients- customers) by giving qualitative answers in real time on the base of provided data, creating a trust community through the sharing of information and offering a support and/or coaching to the different users as well.

Practical implications - The knowledge of the use and the spreading of new technological systems, such as Apps for specific and particular demands related to the new emerging informative needs in the medical field, give rise to doubts concerning safety, privacy and reliability of information itself. Therefore, we would like to know the real motivations which drive patients to use the device. The users themselves should not be disregarded in the overall process play an important role by applying the information they have at hand to the product they are interested in and evaluating whether it meets their needs.

Keyword: Knowledge Society, Health Mobile App, Health Knowledge Management.

Paper type – Practical Paper

1 Introduction

It is quite evident as they become present in our daily lives, Apps, the particular utility, available on most mobile devices – like Smartphone and / or tablet - are able to offer a wide range of information and or solutions to the most varied demands of our curiosity. On the other hand it's clear how such a situation is highly dependent on the impact that new technologies have on our lives, so deeply changing and not always consciously, our rhythms, skills, effects, and not least social relations. While these considerations are easily shared, others are less, therefore ignoring the emotional effect. This reflection wants to bring attention and focus on the Apps as information tools available to the complex system of health, with the capacity of transferring knowledge, learning, and then, perhaps, attention to the complex world of prevention in medicine. On the other hand, the use of the network as the context in which the apps take shape and force , suddenly brings our attention on an international and global level, so as to urge the same to the Food and Drug Administration (FDA). In fact, with specific reference to the health sector, the U.S. Supervisory Authority has started an intense phase of analysis and study of appropriate proposals to control the medical applications downloaded directly to mobile devices, having regard in a specific way for those Apps capable of "Influencing the performance or functionality of currently regulated medical devices" and therefore may represent "a major risk for patients" (Sole24Ore, September 2013). The principle object of the research is to understand the general dynamics of the new phenomenon, by getting an updated picture of the different existing Apps (Medicine Category) in the Italian context. In order to obtain this goal we focused on the two main available operating systems (Android and MacIOS) ¹, through the use of dedicated stores, such as play store and itunes. The working progress research permits to identify, however, a whole range of possibilities and limitations in the use of Health Apps, regarding the actors involved, the process to ideate the instrument, the trust/reputation respect the user/patient. The different aspects of analysis stimulate a serie of considerations on the opportunities to use the Apps in the Italian Health Context, both regarding the organizational performance and the impact on society and community.

1 The survey on different browser share shows worldwide the following situation (Mobile-Tablet, march 2014): Internet Explorer 2,31% - Chrome 12,94% - Safari 53,61%- Opera mini 3,51% - Android 23,44%; Other 3,88%; Operating System Share (march 2014): Ios 53,29%;Android 36,58%; Symbian 3,92%; Java me 3,36%; Blackberry 1,13%; Kindle 0,85%; Windows phone 0,69%; Samsung 0,10%; Bada 0,04%; Windows mobile 0,02%; lg 0,02%; Huawei 0,01%; Brew 0,00%; Source www.netmarkshare.com;

2 Conceptual Framework

As a starting point, the assumption is the impact of new Information and Communication Technologies in everyday life (ICT). With "Knowledge Society" is indicated a kind of collective structure in which the ability of humans to innovate the system of things and relationships has become a key instrument for the promotion of social and individual welfare, through the interconnection of people for learning and intelligence (Volonté, 2010). These interconnections promote the creation of a global knowledge society that it is found on the exchange of information and data by highlighting the focus on individual and social learning. The technological infrastructure of the network makes this exchange effective and real, like a unique virtual and global space, able to create conversation, communication and the exchange of ideas (Moreno-Jiménez et al., 2012). The widening of knowledge and information and the strengthening of technological infrastructure based on internet and web allow to remove the physical distances and to change the same concept of time, in order to implement new learning process. So, in this way the "Knowledge Society" is able to organize the acquisition, maintenance, utilization, and distribution of knowledge (Meier, 2012), and it (Moreno-Jiménez et. al., 2009) can be understood as a space oriented to the talent, intelligence, and creativity of the human being, true protagonist of this new society. The main objective of the "Knowledge Society" focuses on building partnerships and platforms that allow the integration of the skills of all actors involved in the process of resolution, the promotion of interrelations and the improvement of society (in terms of quality of life and cohesion). The four key aspects of this " Knowledge Society" are: 1. the increasing value of intangible aspects; 2. the de-territorialisation of knowledge and power; 3. the interconnection between the actors involved in the decision making processes and 4. the importance of the human factor, particularly regarding continuous learning and education (Moreno-Jiménez and Polasek, 2005). In the "Knowledge Society" the principle role is related to Information and Communication Technologies (ICT), that gives to people the opportunity to produce a lot of information and to facilitate its collection, processing, handling, storage, retrieval and exchange. In recent last years, the knowledge and information (that is an implicit assumption of knowledge), used in addition to traditional paper-based the most innovative new technologies and their interrelationships through the web. So, this situation changed the way in which people can communicate and access to a

lot of data and information, but often unfortunately they are redundant, irrelevant or of poor quality (Albano, 2011). Furthermore in this new changing context, a particular role plays the Apps (on mobile devices), like a new technological systems of transmission, creation and sharing of knowledge. In fact, the use of the internet through computers and the use of WIFI networks allowed a further evolutionary step. The use of new generation phones and the development of tablet and / or laptop computers led to a freely "available" and "user friendly" knowledge in order to modify or stimulate new ways of using it for learning and exploration. If this is true in general terms, the implementation of specific Apps in the health sector - available for download on mobile devices (like smartphones and tablets) - spurred particular interest to investigate this phenomenon.

3 Methodology

The used methodology adopt a mixed approach based on two step: the on the desk step explores the phenomenon and underline its characteristics and peculiarities, through the study of the main literature; the on the job step, is focused to obtain a survey of the different Medical Applications existing in the national context through principle operating systems; the resulting mapping give us identifying keys in order to understand the phenomenon and suggestions for improvement. Specifically, in the second phase, focus is on the figure of user / patient and so it has been articulated in order to understand the ways of its fruition, following the process of using the App: a) identification of keywords with which it's possible to access the services offered by Apps, belonging to Medicine Category (source: Sole24ore – Special Report on Health, December 2013); b) research and taxonomy of available Apps in the Italian context by Mac and Android, with smartphones and tablets; c) focus and selection the resulting Apps, respect the costs related to them in order to classify the various information; d) furthermore, another selection covered those apps with comments; e) definition of specific database.

4 New Technology for Health Knowledge Management

The evolution of the application of Information and Communication Technology (ICT) has inevitably led to a new clinical management of information flows (Buccoliero and Nasi, 2004). The relevance of information systems, depends on the availability of integrated information and it is confirmed by the constant research for synergies between

the organizational system, management processes and information systems. More generally, in the world of health care, trends caused by the introduction of ICT and Web, can be summarize in: 1. more transparency and accountability in the public sector with new governance models (new partnerships, intermediaries involvement, recognition of new roles of stakeholders); 2. greater choice and accessibility of public services and focus on efficiency and quality; 3. a strengthening of policies based on data and evidence that allow us to make correct decisions; 4. an improvement of digital skills in health professionals. In addition, however, several complementary trends exist of "digital inclusivity" that tend to shift the paradigm from organizational aspects to customized health, such as E-Health Applications that are able to securely process large amounts of data integrated, more and more essential for medicine and health management. The same Sole24Ore –Special Health Report on last December – was dedicated to Medical Apps, like a particular tool activated by searching of a series of keywords through which, in different ways, it's possible to access to specific health information. So the starting point is the recognition of different keyword presented by special report of journal (Sole24Ore, Italy), as reported in the following scheme.

Tab. 1- Keyword

1. Psychology	2. Heart	3. Sport
4. Diabetes	5. Kids	6. Flu
7. Heart attack	8. Obesity	9. Tumor
10. Antioxidant	11. Women	12. Skin
13. Diet	14. DNA	15. Cancer
16. Genetics	17. Psyche	18. Drugs
19. Ictus		

Source: Sole24ore Health Report, 2013.

In fact, the use of keywords allows to access to a world of information related and consistent with the topics selected and required. For example, keywords related to the medical context, can be represented (among others) by "heart", "diabetes", "obesity", "diet", "drugs", etc...;the Apps in these cases give the opportunity to access to a range of information suitable to describe, measure, represent and support the user in his quest for knowledge and satisfaction. In this way, the Computer Applications for Health - created to interact directly with users with or without the presence of a healthcare professional - help to better manage their own health (Parsons, 2011). The Apps - Medicine category - are therefore tools that can support health care by increasing user participation in the awareness of one's state of health and, therefore, its ability to self-health-management.

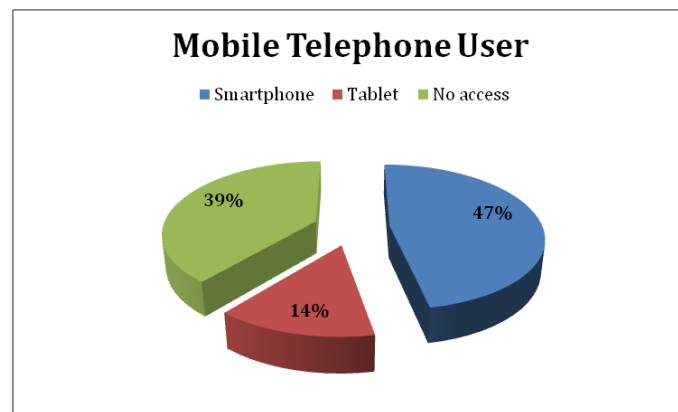
Thus, among the basic objectives of Medical Apps, include those related to the increase of the involvement of the patient in relation to their care process, by improving their ability to monitor and support them in finding alternatives to the focused pathology. In the case of Medical Apps, they can therefore be used as an aid in the diagnosis and treatment of the disease, often portraying similar agendas, where the user can record their clinical values (eg level of insulin in the blood , etc ...), or glossary that it can help to understand the disease or in other cases, guidance on what to do in case of a positive response to some specific diagnoses, etc. ...; other Apps can vice versa, through a virtual tutor, explain the human body. In doing so, the total number of active applications for category Medicine - according to the mechanism of the keywords said in advance - turns out to be several thousand can be reached either through the selected platform Mac-IOS and ANDROID. In fact, the two operating systems allow to access very different applications from each other, both in quantity - the number of tools in the Android world is considerably greater than those on the Mac - for quality and cost - in most cases are open free App on the Tablet, while most of those on Ipad cost directly. From what we saw, the phenomenon appears of great importance; in fact the Apps appear to be widely used with the new mobile devices opening new horizons of knowledge and usability, never achieved before. In recent decades new technologies based on web have profoundly changed the way with which people communicate and access to knowledge and more and more people have access to data and information in ways never seen before; it allows us to find specific and particular needs related to new information emerging needs, to change relational modes, although unfortunately often redundant, irrelevant or low quality (Albano, 2011). Specifically, the mobile App can be installed on device in seconds by clicking a button, without to install complex software, allowing to perform tasks such as creating documents, editing photos and listening music, only with an updated because they break down the time between production and use of knowledge by downloading the App relating to when you need it. The only indication is to use the latest generation of mobile devices, such as smart phones and laptops and tablets. This ease of use and the same portability determine the fortune of those Apps and the exponential growth of their offer. The National Agency U.S. FDA - Food and Drug Administration - (2013) has estimated that over 17 000 Medical Apps are just available on the world market and 500 million smartphone users, potential users of Medical Apps by 2015. However, the relevance and delicacy of the argument treated through Health App, the FDA has begun to

control the available Apps on the U.S. area, and so only one hundred of them was actually authorized. If the focus moves to the Italian national figure, the source of information is represented by the ratio Audiweb Trends of 2013 (special study conducted by the DOXA Research Institute), which indicates the presence of at least one computer owned in over two-thirds of households Italian (70.5 % of households = 15.357 million) and, among these , about 96% have the ability to access the internet. Then the analysis on how to access the world wide web (same source), shows that in the age group between 11 and 74 years is :

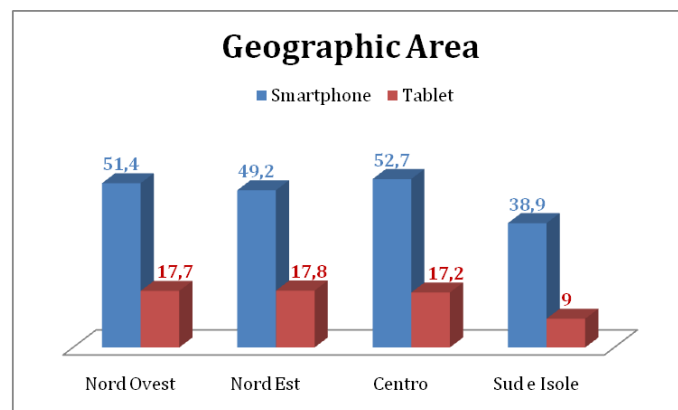
- high availability access from home via computer (in 74.9% of cases),
- access to the workplace for 47% of the workforce (10.4 million individuals approx.)
- access to phone / smartphone for 46.8% of individuals (22 million approx.)
- access to tablet for 14.6 % of individuals (6.9 million approx.) .

These data - shown in the Report Audiweb - allow to learn the effective diffusion of these technologies on our community, and therefore, the potential of development that the same Apps have demonstrated with reference to the local context; in the following figure, it is adequately represented and visualized. The analysis of the socio-demographic profile of individuals with access to the internet from mobile phone \ smartphone, shows that the most vulnerable segments of the population are young people (about 70% of individuals aged between 11 and 34 years), residing in the North and in densely populated areas (with more than 250,000 inhabitants); and specifically for the identified segment, the rates of concentration levels are found between the profiles most qualified in terms of education and professional status. In addition, those who declare internet access from a tablet have a socio-demographic profile definitely qualified in terms of education and professional status. In fact, compared to a mean of 12.7% of the entire population aged 11 to 74 years, there has been a concentration rate of 31.3 % for executives, managers and academics, 29.4% for entrepreneurs and professionals and 24.7 % for graduates; higher penetration rates are found among those who live in densely populated areas (with more than 100,000 inhabitants) and in the younger segments of the population, especially among students, academics and otherwise. The same data indicate that 43.1% of those who use the network, it does so primarily because it is able to acquire information on any subject quickly, for the possibility of finding things otherwise unavailable (25.2%), the quick access to public and private services at a distance (26.3%), to be informed in real time on current news (23.4%). On the contrary, those who use the internet or mobile device from

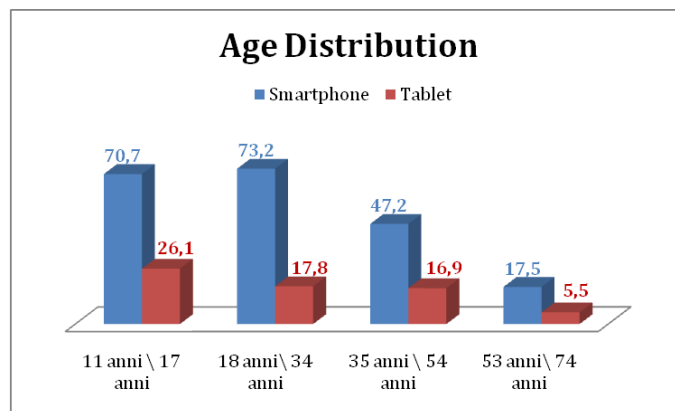
time to time, he would do more often if access to the network would cost less (20.7%), although more than a third said that , however, would connect to the internet no more than they already face (31.7 %).



Source: Audiweb Trends Report, updated data, December 2013.
Chart n° 1: Internet access to Mobile / Smartphone and Tablet in percent



Source: Audiweb Trends Report, updated data, December 2013.
Chart n° 2: Distribution of Mobile / Smartphone and Tablet regarding geographical area



Source: Audiweb Trends Report, updated data, December 2013.
 Chart n° 3: Distribution of Mobile / Smartphone and Tablet regarding Age

So the diffusion of these devices show the possibility that the applications are like an effective source of health information and a tool for self-management of the users/patient. The *mHealth Summer Institute* states that "mobile technology allows providers to help patients improve their health in real time, allowing them to personalize health care, and monitoring the progress" (National Institute of Health, 2011).

5 Results

So, mobile applications for health are designed to interact directly with consumers, with or without the presence of a health worker, helping them better manage their own health (Parsons, 2011). In this way, the Apps - Medicine Category - are tools that support health care by improving the participation and the capacity for self-management of the patient. The objectives that are proposed APPs in medicine are to increase patient involvement in their own treatment, improving the monitoring process on their care and supporting them in finding alternatives to the pathology observed. The Apps cover a variety of areas that support people to have a pro-active approach to health with self-monitoring programs associated with the care of your body, definitions and comments about the diseases concerned. The following results show the first analysis of the Android operating system, analyzing the specific aspects of the Apps in the play store, considering both mobile Smartphone and Tablet.

Chart n°4 - Distribution of the Apps regarding different categories

Key	Medicine Category	Medicine Category (%)	Other Category	Other Category (%)
Psychology	0	0	20	100
Heart	1	2	43	98
Diabetes	2	4	53	96
Flu	0	0	17	100
Heart Attack	4	10	35	90
Obesity	0	0	28	100
Cancer	1	2	14	98
Antioxidant	0	0	51	100
Regimen	0	0	26	100
Drugs	7	14	42	86
Genetics	2	7	27	93
Ictus	3	8	33	97
Kids	0	0	9	100
Women	0	0	10	100
DNA	0	0	35	100
Psyche	0	0	30	100
Sport	0	0	4	100
Tumor	3	7	40	93
Skin	0	0	136	100

Source: Our adaptation of Tablet e Smartphone, march 2014

Chart n°5 – Distribution of Apps regarding cost

Key	Free APPs	Payments APPs	Total APPs	Average cost APPs
Psychology	230	20	250	€ 1.34
Heart	206	44	250	€ 1.27
Diabetes	195	55	250	€ 3.12
Flu	233	17	250	€ 2.97
Heart Attack	79	39	118	€ 4.72
Obesity	222	28	250	€ 3.75
Cancer	235	15	250	€ 2.49
Antioxidant	106	51	157	€ 2.54
Regimen	224	26	250	€ 1.88
Drugs	201	49	250	€ 2.35

Genetics	221	29	250	€ 2.08
Ictus	214	26	250	€ 3.44
Kinds	241	9	250	€ 2.58
Woman	240	10	250	€ 1.89
DNA	215	35	250	€ 4.63
Psiche	230	20	250	€ 1,87
Sport	246	4	250	€ 2,55
Tumor	207	43	250	€ 9,49
Skin	114	136	250	€1.21

Source: Our adaptation of Tablet e Smartphone, march 2014

Chart n°6 - Mobile APPs - Category Medicine with Comments

Key	Comments	
	Presence	Absence
Psychology	0	0
Heart	1	0
Diabetes	2	0
Flu	0	0
Heart Attack	4	0
Obesity	0	0
Cancer	1	0
Antioxidant	0	0
Regimen	0	0
Drugs	4	3
Genetics	2	0
Ictus	2	1
Kids	0	0
Woman	0	0
DNA	0	0
Tumor	3	0
Skin	0	0
Psyche	0	0
Sport	0	0

Source: Our adaptation of Tablet e Smartphone, march 2014

The following results concern the analysis on MacIOS operating system, with the specific aspects of these Apps in *Itunes*.

Chart n°4.1 - Distribution of the Apps regarding different categories

Key	Medicine Category	Medicine Category (%)	Other Category	Other Category (%)
Psychology	1	1	34	99
Heart	3	3	12	97
Diabetes	70	35	125	65
Flu	3	98	2	2
Heart attack	5	100	0	0
Obesity	0	0	5	100
Cancer	6	6	9	94
Antioxidant	0	0	0	0
Regimen	2	2	110	98
Drugs	20	95	5	5
Psyche	0	0	0	0
Ictus	0	0	6	100
Tumor	4	100	0	0
Skin	2	2	13	98
Genetics	10	10	21	90
DNA	16	15	90	85
Sport	0	0	306	100
Skin	4	4	72	96
Kinds	2	2	548	98

Source: Our adaptation of Tablet, March 2014;

Chart n°5.1- Distribution of Apps regarding cost

Key	Free APPs	Payment APPs	Total APPs	Average Cost Apps
Psychology	44	35	79	€ 3.21
Heart	15	15	30	€ 4.11
Diabetes	258	195	453	€ 3.59
Flu	12	5	17	€ 1.97
Heart Attack	4	5	9	€ 4.15
Obesity	1	5	6	€ 2.69
Cancer	22	15	37	€ 3.89
Antioxidant	1	0	1	€ 0.00
Regimen	154	112	266	€ 3.59
Drugs	40	25	65	€ 7.76

Psyche	1	0	1	€ 0.00
Ictus	19	6	25	€ 52.85
Tumor	7	4	11	€ 9.46
Skin	56	15	71	€ 6.08
Genetics	41	31	72	€ 7.09
DNA	148	106	254	€ 7.02
Sport	1887	306	2193	€ 2.34
Woman	158	76	234	€ 2.43
Kids	1635	550	2185	€ 2.13

Source: Our adaptation of Table, March 2014

Chart n° 6.1- Mobile APPs- Category Medicine with Comments

Key	Comments	
	Presence	Absence
Psychology	0	1
Heart	1	2
Diabetes	5	65
Flu	0	3
Heart attack	0	5
Obesity	0	0
Cancer	1	5
Antioxidant	0	0
Regimen	0	2
Drugs	10	7
Psyche	0	0
Ictus	0	0
Tumor	0	4
Skin	0	2
Genetics	1	9
DNA	1	15
Sport	0	0
Women	0	4
Kids	0	2

Source: Our adaptation of Tablet, March 2014;

The total number of mobile application is n°4525 for the Android operating system and n°6009 for MacIOS; so through this first representation we analyzed n°23 Apps related to the category "Medicine" in Android and n°148 for MacIOS. In addition we focused only on Apps with comments from users/patients, in this way we reach n°19

applications for Android (n°1518 comments) and n°19 regarding MacIOS with n°373 comments. Regarding the total number of the mobile Application on Smartphone was n°4525 on Android operating system and n°7221 in MacIOS; in this way we map n°23 Apps related to the category "Medicine" Android and n°259 for MCOs. In addition the focus on Apps with comments show n°19 applications for Android, with n°1518 comments and n°38 Apps for MacIOS with n° 334 comments.

In recent years the Health Sector there is a tendency to an increasing use of Information and Communication Technology (ICT) to support the operations, particularly in support of medical research, clinical practices and assistance to citizens. It is expected, in five years, 500 million people worldwide will use mobile applications that help them update-schedule and manage their health by improving their quality of life.

In Italy, even diffusing ICT is extended in different regions unevenly. The main application areas are concerned, however, the electronic medical record (Reina, 2013), electronic health records, telemedicine and so on., Operational tools to manage information, and provide users with remote assistance; view of self-management is part of the mobile application that aims to simplify the relationship between the patient and physician self-management of health status, the reorganization of health care and social progress. The analysis made us understand how the different typing key words "heart attack" - "obesity" - "antioxidants" - "diet" and so on., The apps available for download, not only belong to the category "medicine" but - in most cases-those categories fall within the "other" that collects items as "lifestyle" - "entertainment" - "fitness" - to the category "games". In the event that the apps that appear on the home page belong to the class "medicine", these are used as a mere support to the diagnosis and treatment of the disease, often portraying similar agendas, where the user can record their clinical values (eg level of insulin in the blood, ect); Glossary or that can help you understand the disease or in other cases, guidance on what to do in case of a positive response to some specific diagnosis, ect . In addition it has been shown that there are Apps that through a virtual tour will explain the human organism. In this first phase, the data collected confirms that there are limited data to infer on the 'usefulness of Apps in the process of accompaniment to medical care or what motivates you to discharge the Apps for self-management. Through the comments and reviews issued on a voluntary basis, by users on Apps, more information can be found:

- 83% of cases there is the presence of comments and \ or reviews;

- In the remaining 17% of cases there are no comments and \ or reviews.

In 57% of cases are positive and the remaining 43% are negative comments.

The table n°2 and n°2.1. percentage divided into the following two categories of comments, with the inclusion of some description.

In MacIOS system it's possible to found:

- 85% of cases there is the presence of comments and \ or reviews;
- In the remaining 15% of cases there are no comments and \ or reviews.

In 70% of cases are positive and the remaining 30 % are negative comments.

6 Considerations & Critical

From what we saw, dissemination and use of smart phones and tablets around the world , led to the creation of applications widely available and suitable for multiple uses, in increasing numbers over time. All this is also confirmed by the analysis carried out by the Research Centre of DOXA , with reference to the Italian system. These structural features and the same qualities attributed to the App, easily, availability, quantity and depth of information that can be acquired, allow to predict a future of safe growth and development, being able to have the same Apps all the potential to play a significant role in the education of patient 's own health and in disease management . Obviously if the anticipated stresses the ability to implement even in the medical context , one can not deny the limitations and / or critical to their specific use . In fact, the points that need further study, strongly linked to the excessive novelty of the instrument, being limited literature available information, are on the one hand on the safety of sensitive data and information untreated, the other the same reliability of instrument called. In relation to the first aspect, the information asymmetry that normally exists between the patient and medical information, often means that the user is not in a position to assess the subjective quality of the application, while conversely the sensitivity of the data being transferred requires to know and evaluate the best use. On the other hand , if it exceeds the problem of the sensitivity of the data processed, judging the reliability of the instrument - App - does not appear to be a simple thing; in fact, often the only review process is put to a simple score (by the user) with commentary (Rodrigues and Brody, 2011). Therefore, the only form of protection for the wearer is given by reading the reviews and comments made by those who have downloaded and used the app itself, or alternatively - for those who are more versed in the subject - the verification of credentials who has produced the

specific application. In addition, however, the same research process of most suitable App for their use, is not as direct and immediate, given the use of keywords, which can sometimes be misleading respect the objectives pursued. Sensitivity of the content Treaty reliability of the instrument used, the process of research pursued, are therefore each and all items on which the attention of the research will have to converge in order to provide new answers to new emerging information needs in health care, helping to improve the approach to the health of the citizen / patient , including by means of specific dedicated Apps.

Table n°3 : Detail Card Android- McIOs

	Android Detail Card	McIOs Detail Card
Market share of operating systems - 2013- ²	708,90 m (ML.of licenses)	47,78 m (ML.of licenses)
Cost	25 \$	99 \$
The Accreditation Developer	Account @gmail	Fiscal and banking informations iTunes Connect
APPs Review	NO	Yes
Security Certificates	NO	Yes
Language	Yes	Yes
Title	Yes	Yes
Description	Yes Max 4000 characters	Yes
APPs Categorize	Application - Games	Application - Games
Country	Yes	Yes
Availability Date	Yes	Yes vacations to go: 10 gg
Price Tier	Yes	Yes
1. Customer Price	70%	70%
2. Your Proceeds	30%	30%
Contact Information	First Name Last name Email address Phone number web- email- cell.	First Name Last name Email address Phone number
Keywords	No	Max 100 characters
Category	Primary	Primary Secondary
Valutazione	Yes	Yes
Screenshots	Yes	Yes
Made for Kids	NO	Yes

Source: support.google.com – developer.apple.com

² By the GlobalWebIndex, updated to 2013.

On these initial considerations in the future will be, on the one hand, to deepen the understanding of the use and dissemination of new technological systems such as App, - for specific and particular needs related to new information needs emerging in health care - other , we will focus on typical issues such as those related to the reputation of as a process of interaction and communication in which circulating subjective assessment compared with a target of interest, which may contain truthful statements or deceptive(Conte and Paolucci, 2002). The opportunity that each user has their own opinion about purchasing a load of experience allow comments that made an impact on reputation, positive or negative, that a particular app can take, so you will have to quantify this impact in terms of social innovation related the use of new technologies.

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Collaboration for Solving Problem of Poverty, Social Development and Community Happiness Condition

Chalard Chantarasombat *

Department of Educational Administration, Faculty of Education,
Maharakam University, Thailand

Structured Abstract

This study aimed to: 1) create a collaboration between the state (local government) and local communities to solve the problem of poverty and develop appropriate sanitation for local communities, 2) developing a community database to help formulate policies for developing solutions to poverty, social development and community happiness 3) developing learning procedures and knowledge management. Samples were based on 202 families from 12 villages, 6 sub-district, and 6 districts in Maha Sarakham province. Research methods included 1) a household account diary; living development plan, operational handbook, community plan handbook, and sanitation data, and 2) An instrument for evaluation purposes. The results revealed that: 1) Factors of success included the integration of a plan for collaboration matched to a local community plan. 2) Factors of failure consisted of a lack of joined up thinking, consensus amongst stakeholders and volunteer attitudes to community development. 3) The issue of debts accrued by farmers should be highlighted.

Purpose – 1) to construct mechanisms of collaborative parties for development in solving problem of poverty, social and community happiness condition 2) to develop the data base system from community base to policy determination to development at different level, 3) to construct the learning process of community knowledge management leading to solving problem of economic and social and community happiness condition 4) to enhance and support parties of solving problem as needed by community, and 5. To construct a model of collaboration for solving problem of poverty, social development and community happiness condition in Maha Sarakham province.

Design/methodology/approach – The research area covered 6 sub-district, 6 districts and 12 villagers in Maha Sarakham. The focus group consisted of 202 model households research using the operational process of research and development by applying participatory action research (PAR) stage of action : 1) the survey of information concerning current problem conditions, 2) data analysis, 3) participatory making plans, 4) action by following the plans and improvement, 5) follow-ups and evaluation, 6) development of potential and up grading the body of knowledge, and 7) lesson conclusion and learning sharing. Two types of the instruments used were 1) the instruments for development to generate participatory learning innovation including a household account book a life quality development plan work action manual a community plan manual and a manual for making community happiness condition, and 2) the instrument used for collecting data was an evaluation form on achievement indicator and the Satisfaction Questionnaire. The

statistic using for data analysis consisted of the Percentage, Mean, Standard Deviation and t-test.

Practical implications – The level affecting competency obtaining from the project: 1) The project work – staff was appointed according to Maha Sarakham provincial Order Number 918/2011 on An Appointment of research report working – staff on the Project for Collaboration for Solving Problem of Poverty and happiness condition in Maha Sarakham province. The operational mechanisms were generated at the following 3 level: (1) At the community level, there were working staff numbers from local leaders, local area leaders and village public health volunteers, (2) Party agenise at the local area, sub district and district level such as local administrative organization (L.A.O.) were important mechanisms for work driving in work plan integration to support personnel and budgets, and (3) 3The party agencies at the provincial level enchained and supported workplan personnel and budgets and dried work operation at the policy level, 2) For developing the data base system from community base to policy determination for development at different levels, there were data base systems in real action, 3) For building the learning process for organizing the body of knowledge of the community leading to solving economics, social and happiness condition problems, For the PAR was used. The following were significance stages, operational process and operational results: (1) Surveying current problem condition concerning household account and data about community happiness condition, (2) Data analysis leading to planning for solving problem at the household level through the life quality plan and at the community level through the community master plan for solving problem poverty, social development and happiness condition, (3) Participatory making plans through the public opinion forum on the community master plan for solving problem of poverty, social development and happiness conditions leading to perception of common operational goals for seeking cooperation in working both inside and outside the agencies to generate a pilot activity for solving problem with model household volunteer, (4) Following the plans and developing the plans. The working staff encouraged the personnel in their area through various learning activities were the operational results could be summarize as below : In Loeng faek sub district, Kudrung district, In Nong Pho sub district, In Phra that sub district, In Nakha sub district, In Khwao yai sub district, and In lao Dokmai sub district, (5) For follow up and evaluation the working staff organized the learning process through activity for meeting to follow up the process in the operational process as a hole at the area level in continuity, (6) For developing potentials in raising the level of body of knowledge for the focus group, there were resource person training, the process of training, and field trip in accordance with contexts and needs of the community, and (7) For summarizing lessons and exchanging forum for summarizing lesson and presenting operational result from solving problem of poverty, social development and happiness condition , the stage and method of operation emphasized presentation of operational result concerning success, 4) For parties to exchange and supports, for solving problems of poverty as needed by the community, there occurred par lies to enhance and supports the development for solving problem poverty, social development and happiness condition as needed by the community result: (1) For participatory planning in the past operation the working staff emphasized, (2) Real action is a very important factor which could cause the parties to enhance, (3) Reflecting was a factor of stage 3 of learning by doing, (4) For learning sharing, there was organization of activities for summering lessons and learning sharing at

the levels of community sub district, district, and across in continuity, and 5) For the model of collaboration for Solving Problem of Poverty and community happiness condition as constructed and developed through 5 experts, the following were found : 1) the model was appreciate at the highest level, 2) Congruence between participatory action research and the plan for operating learning activity management was all so at the highest level, (3) Forcibility of the model was all so at the highest level. However, some detail of the plan for operating learning activity management sound be slightly as jitted for more clarity. Finally, after trying out with the focus group, it was founded the developed model was highly appropriate to the environment and work operation .

Keywords – Collaboration, solving problem of poverty, social development, community happiness condition

Paper type – Academic Research Paper / Practical Paper: Then, using them as conceptual framework of Participatory Action Research (PAR) stage of action : 1) the survey of information concerning current problem conditions 2) data analysis 3) participatory making plans 4) action by following the plans and improvement 5) follow-ups and evaluation 6) development of potential and up grading the body of knowledge, and 7) lesson conclusion and learning.

1 Introduction

The factors of failure included : lack of good coordination in working ; lack of awareness, sacrifice, and public mind for community development.

The guidelines for further operation included : the model household should implement the life plan to action in a concrete from. The Activity plans should have a forum to follow-ups progress in continuity. The number of households should be enlarged to participate in the operational project. There should be connection with the issues an solving farmers' debt problem. The community financial institutes should be developed. For further operation, the participatory action research could be used.

His majesty the King Bhumibol Adulyadej' s working principle which has been try out which for implemented as an important principle of working development this principle is sufficiency economy philosophy. It is a guide philosophy which aims for Thai society to be a strong and reliable society with 3 aspect society of quality, society of wisdom and learning, and society of reconciliation and assistance. Therefore, implementations of the principle, theory and philosophy in actual and concrete actions should be determined to be the policy and goal of improvement and development of each organization, agencies, community, or stakeholder. This is incongruence with. His Majesty the Kings

address at the graduation ceremony at Kasetsart University on 18 April 1960. He began from he was first interested in community development he transferred his royal through initiation from his own studies his loyal address to the graduates at the graduation ceremonies he kindly pointed out the importance of farmers to the national economy "Economy of Thailand depends mainly upon farmers. Therefore, you must always remember the very great importance of this essence and must help one and another habitable agriculture of the country to be rapidly prosperous. Also, address Majesty the King who kindly to given Khon Kaen University graduates at graduation ceremony on 20 December 1973 his initiation goes To develop the country it is necessary To use the first importance which basic necessities : sufficiency in food, property and expenses of most people using save and right techniques and tools who reasonably stable fundamentals are obtain, then prosperity and economic fundamentals are gradually created (Chalard Chantarasombat. 2009) According to the study from Mr. Chanthi Pathumpha, Chumphuang district, Nakhon Ratchasima province, who focused on using 23 Rai of land ($2\frac{1}{2}$ Rai = 1 aou) for minimum advantages at his economy sufficiency learning center and local wisdom, it was found that there occurred innovations for solving problem of poverty because it was the creation of the body of knowledge through practice knowledge and their occur knowledge management is a concrete form His is accordance with the idea of PhraMahaSupab, the Abbot of Wat Pa Na Khum Monastery. The administrator of farmer learning center for self-reliance who develop the concept of one Rau without poverty to be a more concrete form with an emphasis on real body of knowledge from practice. There was development of successes indicator of the people in the focus group. There were the interested farmer who wanted clear their debts, beginning from surveying income-expenses accounts and enhancing farmers to solve problem by themselves at family through learning by doing. There was knowledge management of the farmer to be a concrete form which could be transferred to interested farmers with high expectation (A summary on the field trip on one Rai without property in Kalasin province on August 2010).

Getting together of formal and informal leaders at the village and sub-district levels to solve problem of community happiness by application of sufficiency economy philosophy of the model village which was important was still limited,

Perhaps, it was because there were no mechanisms for knowledge management to organize group for solving problem by community people to lead to knowing themselves and resources, and to be able to manage basic resource, Especially for Necessity which resulted in sufficiency and happiness. When health operation as well as building awareness mechanism at the sub-district was considered, it was found that working for operation was limited. Therefore agencies in both the state and private sectors have to work cooperatively for development in parties. The results were as follow : In Maha Sarakham province, the farmer's problem were solve and there production abilities were developed and its community happiness conditions network were built. The principle of sufficiency economy was applied at the sub-district and villages. The parties that worked together were Bank for agriculture and agricultural cooperative, MahaSarakhamBanch ; Mahasarakham University, communities school, a local wisdom. Sub-district administrative organization used participatory action research and action plans for organization of learning to construct the collaboration form for solving problem of poverty, developing ability to production system of agriculture and for setting up a appropriate MahaSarakham network. At this stage the farmers relied on themselves, learned in groups in communities and for their own communities. If appropriate participatory work at the village and sub-district levels was found the results could be extended and planed in other communities with similar content

A project for collaboration for solving problem of poverty, social development and happiness condition in Mahasarakham Phrase 1 (2011) was collaboration between Bank for agriculture and Agricultural cooperative (BAAC) and the section of research and development research units and development of community strength and knowledge management, Faculty of Education, Mahasarakham University, began from – March 2011 to February 2012. The operation was divided into 4. The operation area covered 6 district, 6 sub-district and 12 villages. There were Kudrung district, Lerngfak sub-district, cluster 3 and 14 of Buakaew village, Nachuak district, Nong Pho sub district, cluster 3 and 8 of Nongbueng village, Nadun district , Phra that sub district, cluster 4 and 5 of Dongnoi village, cluster 8 of Ton village, Wapipathum district, Nukha sub – district, cluster 4 of Wang chan village, cluster 13 of Wungmai village, cluster 16 of Wang nua village, Katharawichai, Khwaoyai sub district,

cluster 13 of Hin pun village , ChueanChom district, Lao dokmai sub district, cluster 6 of Nongkhu village. For operation in Phrase 1 (March 201 – February 2012) aim to suamine data about potentialities and problem of communities to lead to planning for developing and solving problem of poverty society and happiness condition at next stage.

2 Research Question :

- 1.What should an appropriate form for the community to solve the problems of poverty be?
- 2.How will the community data base lead to determination of policy for local development?
- 3.Can integrated operation for solving problem of poverty generate to action or not?

3 Objectives

- 1.To create mechanism of parties for operation cooperation in development of solving problem of poverty and development of society and happiness condition to be appropriate to the local area,
- 2.to develop data base systems from community base to policy determination for development at different levels,
- 3.To create the learning process for organization of the body of knowledge of community leading to solving economic, social and happiness condition problems,
- 4.To have the parties enhance and support in solving problem of poverty as needed by the communities
5. To construct a model of collaboration for solving problem of poverty, social development and community happiness condition in Maha Sarakham province.

4 Significances

- 1.The research results will provide an appropriate participatory working model at the provincial level for solving problem of poverty and for developing ability to manage the production systems of farmers.

2.The research results will generate learning network and knowledge management for solving problem of poverty for developing ability to manage production systems of farmers across communities sub districts, districts, provinces and network at the regional levels.

5 Research Framework

This research used project administration which generated solving problems of poverty together. This the thinking principle (inside out) in order to stimulate the community sector administration to could be able to manage itself and determine its own needs to persuade supply and administrator supply to be more efficient of empowerment. At the same time, condition were made for Maha Sarakham province and network parties to learn about way to respond to production (demand) at the right point and efficiently (Enrichment) by the uses of participatory action research (PAR) The seven stage were : team preparation examination of problem, conditions and needs ; participatory planning, doing and improvement, summary of operation learning sharing (Chalard Chantaasombat. 2008) were encouraged to be confident in learning from doing in these 5 stage : goal setting, planning together, doing and improvement, reflecting sharing the learning in the groups, community, sub–district and province (Chalard Chantarasombat. 2009) Then, using them as conceptual framework of Participatory Action Research including 6 steps as: (1) Identity Task and Learning Oppornity, (2) Studying Context, Problems, and Needs , (3) participatory planning together, (4) Doing through action, (5) conclusions of implementation findings and (6) sharing according . From the method of learning the action learning in the 5 stage as mentioned a figure can be drawn as below :
Figure 1:

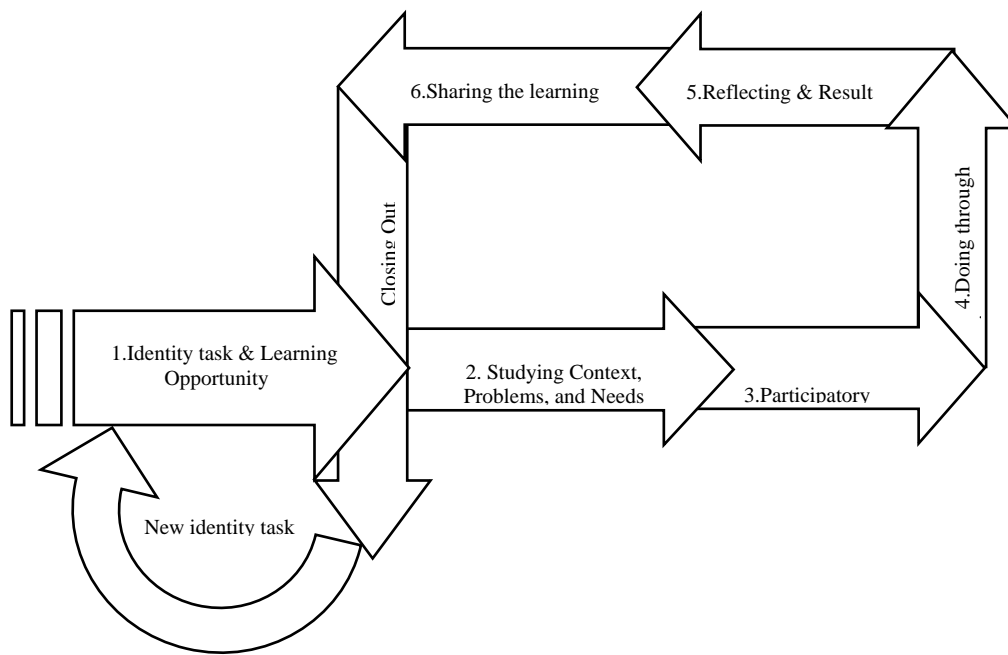


Figure 1 Action Learning (Chantarasombat Chalard. 2011)

6 Methodology

1. research area, the research was conducted in the area of 6 district, 6 sub-districts, 12 village in Maha Sarakham province, purposively selected. Data base of focus village according to the Bank for Agriculture and Agricultural. Cooperative Maha Sarakham province. Six out of 13 districts readiness data base of the focus awareness, simply selected. WapiPathum district, Nadun district, Nachueak district, Kantharawichai district, Kudrang district and Chuenchom district. There were meeting for selecting interested research subdistrict district in activity participation ; six obtained sub district were 1) Nakha sub district , WapiPhathum district 2) Phrathat sub district 3) Naphosubdistrict, Nachuak district 4) KhwaoYai sub district, Kantharawichai district 5) Loengfaek sub-district, Kudrung district, Maha Saralham province, 6) Lao Dok Mai sub district, Chuenchom district and these six sub district consider the sample of 202 model households.

2. The research operational process mainly used the research development method by applying action learning and PAR there were 1) survey of data about current problem conditions 2) data analysis 3) planning together 4) action and improvement 5) follow ups and evaluation 6) developing potentiality to upgrade the body of knowledge and summarizing lesson and learning sharing

Two types of the instrument were 1) the instruments used for the developing work to generate participatory learning innovations included household account books, life quality development plan, work operation manual, community plan manual and manual for organization of data about community happiness condition 2) the instrument for collecting data was an evaluation used forms on success indicators. The statistics used for analyzing the collect data (Boonchai Srisa-ard. 2002) frequency percentage man and standard deviation.

7 Result

1. For creations of mechanisms for collaboration for solving problem of poverty, social development and happiness condition as appropriate to the local area, there was coordination in cooperation of the project research staff as by Maha Sarakham governor and those involved at provincial, district and sub district level. The project work – staff was appointed according to Maha Sarakham provincial Order Number 918/2011 on An Appointment of research report working – staff on the Project for Collaboration for Solving Problem of Poverty and happiness condition in Maha Sarakham province Phrase 1 (2011) Issued on 27 May 2011 and Maha Sarakham Provincial Order Number 2229/2011 on An Appointment of the working staff for driving policy for Solving Problem of Poverty in Maha Sarakham province. The operational mechanisms were generated at the following 3 level:

1.1 At the community level, there were working staff numbers from local leaders, local area leaders and village public health volunteers, no less than 15 persons each. There were totally 17 model volunteers households. In each household, the members had learning activities together through using a household account book, a life quality development plan and data about community happiness condition as instruments for solving problem of poverty at a both households and community levels.

1.2 Party agencies at the local area, sub district and district level such as local administrative organization (L.A.O.) were important mechanisms for work driving in work plan integration to support personnel and budgets. Each school supported personnel to be resource persons and advisors in recording household

account data analysis and places for activity organization district health promotion hospital supported the personnel to participate in activities to integrate community happiness condition plans. The office of District Agriculture The Office of District Community Development Bank of Agriculture and Agricultural Cooperative and the bank branches in each of these area enhanced and supported the operational process, the personnel who gave academic knowledge budgets and integrated the plan to action.

1.3 The party agencies at the provincial level enhanced and supported work plan personnel and budgets and derived work operation at the policy level. For example, the provincial office, the office of provincial community development The office of provincial social and human security development support the personnel to be the working staff at the provincial level the office of provincial cooperative audition supported the printing of account book, the office of provincial commerce supported with budget to buy a cherry – shell grinder for making for feed in the plan for solving poverty in Khwao sub district An institute at the higher education at Maha Sarakham university worked as a coordination unit, and the secretary division of the project working – staff. Bank for agriculture and agricultural cooperative in Maha Sarakham province integrated the plans into practice and helped with places for organization of learning activities and the project operational process.

In addition, in order for the operation to drive according to the established plan, and for the mechanism parties to understand the process, and the operational goal together, then agreement and commitment on working together with the parties t every levels were made and signed. The outcome of working for 1 year as mention caused the working – staff to receive lesson leading to mechanisms for driving work in a more concrete form of collaborative parties. In these parties had earnest collaborative activities for at least 3 years , the working-staff would be greatly confident that the mechanisms parties would lead to working for solving problem of poverty and happiness condition in strength and stability.

2.For developing the data base system from community base to policy determination for development at different levels, there were data base systems in real action. The community participated in every working area. Data were collected in several forms including documents, Hard copy, Field electronic program and

programmed household account and then developing to be project website <http://health.drchalard.com>. Detail included data about income and expenses, maps of community happiness condition and evaluation results before development. When the mentioned data were analyzed and synthesized, participatory policy and work plan for solving problem of poverty, social development and happiness condition in the form of plan for life quality development, community master plans for solving problem of poverty, social problem and happiness condition, pilot were project for solving problem of poverty, model household account, lists of debts, and the result of development.

The data base system condition as mentioned were connected into the information data base system of the agencies for mechanism parties of work at every level of community, sub district, district and province. The plan in solving problem of poverty in every area were pushed to be filled in the plans for local development however, The 3 years development plan of the local administrative organization and the operational results in the first year plans for solving problems of poverty social problem and happiness condition were filled in Expense Budgets Act 2012 with a total of 450,000 baht 5,000,000 baht for Loengfaek sub district, 50,000 baht for Nong Pho subdistrict 50,000 baht for Phra That Noi sub-district 100,000 baht for Nakha sub-district and 100,000 baht for Lao Dokmai sub-district.

3. For building the learning process for organizing the body of knowledge of the community leading to solving economics, social and happiness condition problems in Maha Sarakham province, there was learning process leading to action of the parties cooperation for solving problems of poverty, social development and happiness condition, was appropriate for local conditions. The PAR was used. The followings were significance stages, operational process and operational results.

3.1 Surveying current problem condition concerning household account and data about community happiness condition

3.2 Data analysis leading to planning for solving problem at the household level through the life quality plan and at the community level through the community master plan for solving problem poverty, social development and happiness condition.

3.3 Participatory making plans through the public opinion forum on the community master plan for solving problem of poverty, social development and

happiness conditions leading to perception of common operational goals for seeking cooperation in working both inside and outside the agencies to generate a pilot activity for solving problem with model household volunteer.

3.4 Following the plans and developing the plans. The working staff encouraged the personnel in their area through various learning activities. The operational results could be summarize as below :

3.4.1 In Loengfaek sub district, Kudrung district, households had plans and acted in reducing their own unnecessary expenses, for example, they had vegetable plots, grew all edivle thing, ate all things they grew. Seven household had agricultural plots to grow sugr cane plants. There was one labour bank activity at the village level. There was one truth saving activity in the community. Every model household became a member of the truth saving group. Also the Bio Fertilizer making group to reduce the production cost for community people.

3.4.2 In Nong Pho sub district, it was found that each model household had a plan and could reduce their own unnecessary expense for example. They had plots grow all endive thing. Ate all thing they grew. Four for household had sufficiency economy plant plots. A learning activity outside the community occurred once. There was one truth saving activity, every model household became a member of the truth saving group. There were activity for monastery forest rehabilitation for environmental revitalization and to create unity and reconcilitations of people in the community.

3.4.3 In Phra that sub district it was found that each model household had a plan and could reduce their own unnecessary expenses. There was sufficiency economy learning centers at 62 household. There were 3 learning center at the village level. There were 9 career network group to create jobs and incomes to extend to neighboring sub district. There occurred activities for rehabilitee and campaign for plugging and covering rice straws to reduce production cost and to create unity and recon citation a people in the community. There occurred activity for buying and selling collection to the community. There occurred activity for training to provide knowledge of communicative diseases and incommunicative diseases through coordination in cooperation with promotion sub district hospital and Nadun district hospital, public health volunteer group got

together to serene diabetes according to the maps of happiness condition every three months.

3.4.4 In Nakha sub district, model households had plans and acted in reducing expenses and increasing income. There occurred 12 sufficiency economy learning centers at these households, and one learning center at the village level. There was one Para Rubber planting network to create jobs and incomes to extended to neighboring sub district Twelve households performed modern of 2 Rai of land without poverty (Mr. Na Sudphan, interviewee) There were activities of relitalization for neighbours to help reap rice for reducing production cost and to create unity and reconciliation of community people.

3.4.5 In Khwaoyai sub district Kantharawichai district, it was found that model housesolds hand plans and acted in reducing expense and increasing incomes. They occurred 1 learning center at the village level. They had a group for analyzing household account leading to reduction of expense and interment of incomes for members in the community. Some example were reductions of cost of raising fish in floating raising – nets by producing fish feeds from cherry shells, getting – together to make group for solving community problems, raising funds for rice seeds to help flood victims ; value addition and income creation community potential were such as mushroom culture for expense reduction

3.4.6 In Lao Dokmai sub district, Chuenchom district, the following were found : Main expense were in career operational and daily expense such s expense for child's / children ' s reduction, and food The village viewed that the important should be given to reduction of expenses on living making such as reduction of costs of rice farming, pig raising and bag sewing (bag sewing made from fertilizer sacks) However, the expenses on education and food were difficult to reduce. The villages views that, for reducing expenses, chemical free agriculture to be used. (Comprehensive agriculture, therefore, could motivated these farmer for fields trips concerning comprehensive agriculture and sufficiency economy.

3.5 For follow up and evaluation the working staff organized the learning process through activity for meeting to follow up the process in the operational process as a hole at the area level in continuity. As results there were exchanges in learning, experience, lessons and seeking problem solutions together. In addition

there was education according to the indicators post- before and after development. This cause the working staff and focus group to understand situation and movement of working leading to developing transferring and extending.

The results of the collaborative project for solving problem of Poverty, Social Development and Community Happiness Condition in Maha Sarakham Province in Phase 1 (12 Villages in Maha Sarakham Province)

Table 1: Overview of 12 Villages

Main Indicators or additional indicators of development	Comparison of Results of Operation	Household Number	(\bar{x})	(S.D.)	t	sig
Overview of 12 Villages	Post Operation	175	3.686	0.502	9.465	.000**
	Pre Operation	175	2.999	0.839		

Table 2: The results of analyzing Development of Community

Main Indicators or additional indicators of development	Comparison of Results of Operation	Household Number	(\bar{x})	(S.D.)	t	sig
Overview of the development for solving problem of household poverty	Post Operation	175	3.53	0.621	10.049	.000**
	Pre Operation	175	2.72	0.903		
Decreasing the household expenses	Post Operation	175	3.48	0.707	9.017	.000**
	Pre Operation	175	2.71	0.893		

Main Indicators or additional indicators of development	Comparison of Results of Operation	Household Number	(\bar{x})	(S.D.)	t	sig
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Increasing the household incomes	Post Operation	175	3.47	0.698	8.219	.000**
	Pre Operation	175	2.68	1.045		
Build up the opportunity for increasing household incomes and products	Post Operation	175	3.53	0.732	6.961	.000**
	Pre Operation	175	2.79	1.173		

* Significantly difference at the level of . 05

** Significantly difference at the level of. 01

Table 3: Overview of the Development of Household Society

Main Indicators or additional indicators of development	Comparison of Results of Operation	Household Number	(\bar{x})	(S.D.)	t	sig
Overview of the Development of Household Society	Post Operation	175	3.74	0.543	6.109	.000**
	Pre Operation	175	3.29	0.853		
Development of Human Resources of the household member	Post Operation	175	4.02	0.571	12.017	.000**
	Pre Operation	175	2.96	1.109		
Religion, culture, and custom of the household members	Post Operation	175	4.02	0.571	3.729	.000**
	Pre Operation	175	3.73	0.904		
Education of household members	Post Operation	175	3.37	0.710	7.000	.000**
	Pre Operation	175	2.71	1.002		

* Significantly difference at the level of . 05

** Significantly difference at the level of. 01

Table 4: The Development of Happiness of Household Members

Main Indicators or additional indicators of development	Comparison of Results of Operation	Household Number	(\bar{x})	(S.D.)	t	sig
- The Development of Happiness Condition of Household Members	Post Operation	175	3.76	0.537	4.577	.000**
	Pre Operation	175	3.39	1.016		
- Sanitation of Household Members	Post Operation	175	3.70	0.613	6.700	.000**
	Pre Operation	175	3.08	1.088		
- Environmental Sanitation in Household	Post Operation	175	3.81	0.567	5.648	.000**
	Pre Operation	175	3.33	1.047		

* Significantly difference at the level of .05

** Significantly difference at the level of .01

3.6 For developing potentials in raising the level of body of knowledge for the focus group, there were resource person training, the process of training, and field trip in accordance with contexts and needs of the community. In Laengfaek sub district, Nongpho sub district, Phra that sub district and Nakha sub district, the villager were trained and had field trips on solving problem of owing debt and property in based of the sufficiency way at the sufficiency economy at learning center of Mr. SawaengManolai, Dong KhangNoi sub district Kasetwisai district, Roi Et province. In Khwaoyai sub district, they trained in making fish feed and had field trip at Federation of shrimp Raisero, Yangtalad district, Kalasin province and DonMan village learning center Kham Riang sub district, Kantharawichai district, MahaSarakham province, In Lao dokmai sub district, Chuenchom district, they trained in making pig feeds and had field trips to learn comprehensive agriculture in Don Daeng sub district, Borabue district and Talad Mueng sub-district, Nachueak district, MahaSarakham province.

For the results of training and field trips in each area, the trainees could understand the training contents and showed their satisfaction at a very good level. They had skill and awareness of recording household account, and sought way to reduce expenses and increase incomes for their families. Also they make group for doing activities leading to solving communities problems.

3.7 For summarizing lessons and exchanging forum for summarizing lesson and presenting operational result from solving problem of poverty, social development and happiness condition in phrase 1 (2011), the stage and method of operation emphasized presentation of operational result concerning success. Emphases were also on important lesson problem, obstacles, continues operational plan, including experience sharing, and ideas and recommendation given by academic.

As results, the participation could know the operational result concerning success, important lessons obstacles and continuous operational plan.

4. For parties to exchange and supports, for solving problems of poverty as needed by the community, there occurred parties to enhance and supports the development for solving problem poverty, social development and happiness condition as needed by the community through local Administrative organization by doing process from the stage process and result of operational were as follow.

The stages process results

4.1 For participatory planning in the past operation the working staff emphasized the participating process of parties of network in solving problem of poverty, social development and happiness condition by beginning from examining data about current problem condition and analyzing data as a main mechanism to generate participation of network parties Different type

4.2 For participatory planning, the past operation, the working staff emphasized participatory process of parties of network in solving problem of poverty social development and happiness condition. It began from examining data about current problem conditions and analyzing data as the principal mechanism to generate participation of network parties. Several type of the instruments used consisted of households account for analyzing data to solve problem at the household level for planning to develop the quality of life for solving problems at the community level, happiness conditions and the community master plan were

used. The outcome of using the method as mentioned could lead to the integrated work among network parties in terms of budget and resources and could lead to driving the work of the development plan for solving problems of poverty of the target community.

4.3 Real action is a very important factor which could cause the parties to enhance the plan for solving problems of poverty, social development and happiness conditions. The methods of plan action and important were used as instruments and mechanisms for leading to real action by encouraging the working staff at different level and the target communities to have participatory action plan, to follow the plan and to improve the plan in order to be in accordance with the situations for examples, Khwao-Yai sub-district followed the plan for solving problem of poverty by mushroom culturing to reduce expense without waiting for the budget from the state sector or the project. From an analysis of data about incomes and expenses, it was found that the quantities of mushrooms bought for consumption everyday by the villages and fields trips caused the village to know how to cultivate mushrooms from the materials available in the community. Nong Pho subdistrict raise funds from villages to drive the plan for solving problems of poverty in the same issue. It could be seen from these 2 sub-districts that after following the plan for some each community would improve the plan in order to be practical/

4.4 Reflecting was a factor of stage 3 of learning by doing. This was used as the research conceptual framework for solving problem of poverty, social development and happiness conditions. The action were done through learning activities by development potentials in upgrading the body of knowledge level training, field to enhancement of the operational were encouraged and enhanced to generate awareness of in keeping household accounts and to realize the important of farming according to principle of sufficiency economy, leading to group making for reduction of expenses and increment of income in community. Some examples, group making for rice seeds in Na Kha sub district, group making for comprehensive farming in Lao Dokmai, sub district and rehabilitee and campaign for flushing to cover rice straws to reduce production costs and to create unity and reconciliation of people in the communities, and activities for buying and selling collection in Phra That sub district. These could lead to

connection to coordination in budget, cooperation and sources. There occurred parties to enhance and support for solving problems of poverty as needed by the community. The parties were sub districts, districts, and province.

4.5 For learning sharing, there was organization of activities for summarizing lessons and learning sharing at the levels of community sub district, district, and across in continuity. Learning sharing was regarded as an important factor, which could lead to integrated solution of problems of poverty. Because the community would have opportunity to summarize their own lessons and to share learning together with other communities and government agencies, academics private development organizations there occurred competitions and self-development. This would lead to plan improvement help in the working process to achieve the goal. Also, the exclusive offices would perceive success, problems, obstacles, guideline for solving problems and development plan in continuity. Then these offices could use the result in process of decision making and supporting them into the level of community and local policies. It could be said that the operational results in Phrase 1 in 2011 the organization of parties could enhance and support plans for solving problems of poverty, social development and happiness condition of the target community. Particularly, Sub – district administrative organization (SAO) and Bank of Agriculture and Agricultural Cooperative which could play the roles in support enhancing and connecting the operational process according to the missions of the organization.

5. For the model of collaborative for solving problem of poverty, social development and community happiness as constructed and the Developed through 5 experts, the following Were found : (1) The model was appropriate at the highest level. (2) Congruence between participatory action research and the plan for operating learning/activity management was also at the highest level. (3) Forcibility of the model was also at the highest lever. However some details of the plan for operating learning activity management should be slightly as just led For more clarity. Finally after trying out with the focus group, it was founded the developed Model was highly appropriate.

There were 9 stage of the participatory action research, plans for operating learning activity management with 16 sub-activities and outcome of the model with 16 pieces of work as illustrated in Figure 2.

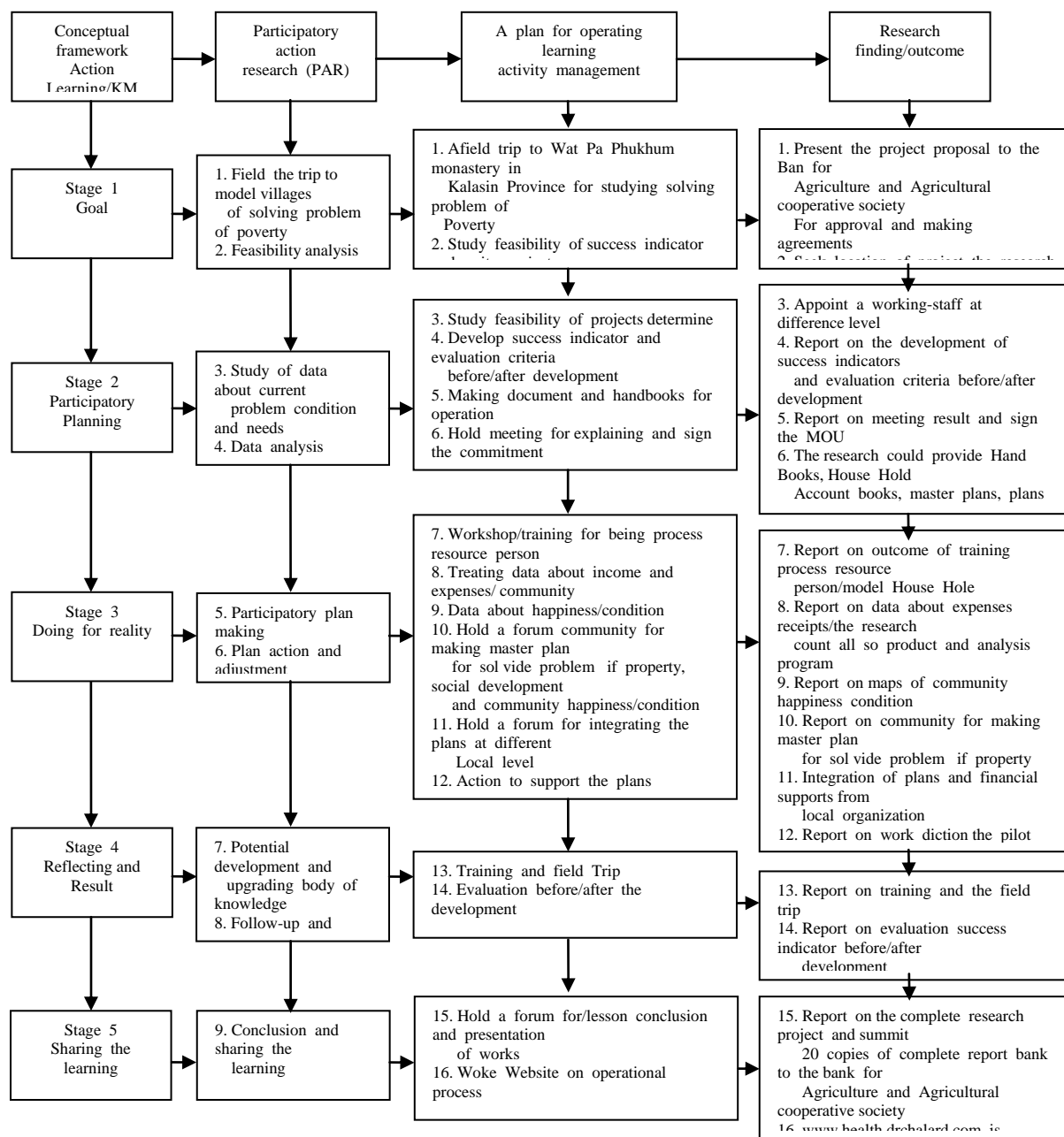


Figure 2 Model of Collaboration for Solving Problem of Poverty, Social Development and Community Happiness Condition in Maha Sarakham Province

The results of the study of the Project for a collaboration for solving problems of poverty, social development and happiness condition in Maha Sarakham province Phase 1 in 2011 are in accordance with the concept of poverty and development of economy society, and happiness condition. There were several

authors and organizations that presented articles. The following issues should be discussed.

1. For the definition of poverty factors of poverty, and the methods of solving of poverty that is to say, the operation of this project upheld the operational framework by building mechanisms of collaborative parties to develop method of solving of problem and happiness conditions which are appropriate to locality. Then the operation can generate mechanisms collaborative parties to develop method of solving problems of poverty and develop the society and happiness condition. Project work- staff were appointed based on the Maha Sarakham provincial Gender Number No. 98/2011. The following working mechanisms can occur. At the community level, there are working volunteers (CPHV) community public health household of volunteers is the goal of developing determination of learning activities together through the use of household accounts. Planning for life quality development and searching data about community happiness condition are instrument for solving problem of poverty at the household and community levels.

1.2 Party agencies at the sub district and district levels such as local Administrative Organization (LAO) are important mechanisms for work driving in terms of integrating work plans, supporting personnel, supporting budgets, enhancing and supporting the operational process, and in terms of personnel to academic knowledge, budget, and integration work plans into action

1.3 Party agencies at the provincial level enhances and support work plans, personnel and budget and drive operation at the policy level such as the provincial office, the provincial community development office, the provincial office of office and human security development, the office of provincial commerce, Higher educational institutions, Mahasarakham University and Bank for Agriculture and Agricultural could lead to solving problems of poverty social development and happiness condition in strength and sustainability.

9 Conclusion

The study results are incongruence with the concept of the results of the study conducted by Chaturong Boonyaratanasunthon and Kitti Phatanonthapatamadum (2007 : 253-254) Who gave the importance to an emphasis on solving problem of

poverty. The recommend increasing incomes from micro indicators such as GDP gross domestic product per head of physical macro-investment and infrastructure development

2.The development of data base from the community base to policy determination is for development at different levels. Having actual action data base of systems which community participation is made in the operational area. They develop programmed household accounting records. And then develop to be the website on project. There are details of incomes of expense and maps of community happiness condition. Evaluations are conducted before development to support the data as mentioned for analysis and synthesis. The determination of participatory policies and work plans for solving problems of poverty, social development and happiness condition is in the form of life quality development plan. The community master plan for solving problem of poverty, social development and happiness condition the pilot plan for solving problem of poverty includes keeping household account, list of debts and evaluation after development the data as mentioned can connect to be in information data base system of the parties mechanism agencies in work operation at every level of community, sub district, district and province. The plans for solving problems of poverty in all study areas the plan are pushed to be filled in the local development plans. The 3-year development plan of the local administrative organizations (LAO) are filled in the Expense Budget ACT of Fiscal year 2012 in the focus area of 6 district for 450,000 Bath. This is in accordance with the concept of Somchai Chitsuchon who believes that poverty is transient poor which may become chronic poor and poorest. That is to say, poverty can be cured by developing or changing correctly. That is to correct the cycle of poverty. There must be the actual action data base system, data about incomes and expenses for making maps of community happiness condition, evaluations before and after, development, analysis and synthesis, and making plans for solving problems with community participation.

3. Building the learning process manages. The body of knowledge of the community leading to solving economy, social and happiness condition problems. There is a learning-to-doing process of the collaborative parties for solving problems of poverty, social development and happiness condition, which is appropriate to local conditions. This process uses participatory action research. The

following are important stages of the operational process and outcome. Surveying data about current condition and problems concerning household accounts data about community happiness condition, data analysis, participatory plan making, action following the plan, follow ups and evaluation, developing potentials to upgrade the focus group's body of knowledge, summarizing lessons and learning sharing, organizing forum for summarizing lessons and presenting operational outcome of collaboration in solving problems of poverty, social development and happiness condition in Phase 1 (2011) in order to know

the project success, important lessons, problems and obstacles, and continuous operational plans.

The results of the study are accordance with the study conducted by Chalard Chantarasombat. (2004) on the concept concerning community study. He states there is an organization of community master plan. It begin from analyzing potential and determining guidelines for self-development, seeking instrument for determining popularize strategy, and other process.

The result of the study are also in congruence with the concept of Arisara Chuchat and others (1995) in relation to the process of developing by learning the concept of development : receiving experience identify experience, analyzing experience, planning, and acting There are important process of participatory development.

The results of this study are in accordance with the concept of basic principle of participation working. This concept is the concept of Therephong Kaeohawong (2000) and that of Praphon Piyarat (2000) concerning the stages of participation : decision – making participation, work operation participation in receiving benefit and evaluation participation. At the same time, actual participation consists of participation in seeking problem and causes of problem, participation in planning for doing activity, participation in investment and operation, and participation in follow-ups and evaluation. However the levels of participation include : decision – making level, collaboration level, and utilization level.

The results of the study are in accordance with the concept of the process of participation development by learning in the concept of Arisara Chuchat (1995) Their development consists of action to generate clear experience, and testing,

seeking, experimenting and action leading to learning new Things from new experiences. Identifying experiences, and stages identifying, explaining experience sharing, analyzing stage of beginning ; making understanding of experiences, concept of analyzing, and planning and identifying what to do next. There will be role in what have learned from experiences and in developing strategy.

The results of the study mentioned indicate that the project for collaboration for solving problem of poverty, social development and happiness condition, Maha Sarakham province in Phrase 1 (2011) upholds the principle of participatory development, aimed at building strength at the grassroots level. If there is a problem white operating work, the problem will be solved immediately. The community problems were used as major problems of operation.

The results of the study as mentioned are in accordance with the concept of participation in the shape of ladder steps of participation decided by Theeraphong Kaeohawong (2000) concerning 8-steps ladder of participation. These 8- steps are treatment step, explanations step, information step, discussion step, idea expression step, partnership step, agent-empowerment step, and controlled by people step. This project had 8-steps operation. At the same time there is a problem watch process. Attention was paid to formal and informal coordination in operation.

4.Success indicators for the project operation

For success in operation frame of operational issues, and success indicators for the project operation, there are studies and determination of frame of operational issues, and success indicators for the operation. Also, there are constructions of obligations, agreements accept ions of frame operational issues together to be used for evaluation before-after operational as indicators for work success.

The results of the study as mentioned are in congruence with Chalard Chantarasombat (2002) and others who conducted several projects and developed multi-dimensional indicators. Some examples are careers group such as production and quality of production, group management. For the project, social development and happiness condition in Maha Sarakham province, Phrase (2011), the indicators for development or operational outcomes are determined They are divided into the aspects of solving, social development and happiness condition. Also these aspects are divided into sub aspects, with a total of 73 indicators. All of these indicators are obtained from mutual agreement and approvals of the project participants. This

shows true responsibility based on the concept of participatory action research (PAR)

The collaborative parties enhance and support to solve problem of poverty as needed by the community through local administrative (LAO) from the learning by doing process. There are important stages of-the operational process and outcomes : participatory planning, real action, reflection, and learning sharing.

The results of the study mentioned are accordance with the writing by the Center for Information and Education Service, the article by ChoetsakChumnum (1997), the article by PhanthipRamsut (1997) the article by Rattana Buason (1998) and the writing by the Office of Human Resource Development Project, Krabi province. The writing emphasizing participation in every process based on the concept of participatory action research in supplement to utilization of the parties of enhance and support development for solving problem of poverty, social development and happiness condition. These is collaboration form local administrative organization, agencies in operation area, and other collaboration parties. It indicates that the operation by this project must use local potentials and must coordinate with the other agencies at every level.

10 Recommendations

1. Policy recommendations

For lessons from experience in conducting the project for participatory solving problem of community poverty in the part 1 year, policy recommendation are as follows.

Policy recommendation for the local Administrative organizations

The local administrative organization should made the community master plan of each community which lead to annual review in community forum and sub district in order to suit the changing situations. This will enhance and support the community plan to lead to action in a concrete forum and in continuity There will be a process and mechanisms for follow ups and evaluation to extend the lesson to other communities.

Policy recommendations for the work staff for provincial development strategies

The provincial development committee should bring the project into the plan in order to be the provincial pilot project for solving problems of debts and

poverty of the people, and enhance and support the project to generate continuous development in the pilot area and extended area to cover the whole province in the manner of community for solving problem of poverty in Maha Sarakham province to be successful.

3) Policy recommendations for Bank for Agriculture and Agricultural cooperative. For Agriculture and Agricultural cooperative should consider household accounts records of the farmness in each area for planning to enhance and support to be the property for loan guarantee for family development according to the plan for life quality development. Also the development of group activities should be considered supplementary careers to increase incomes in the community which are in accordance with community plan in each community.

2. Recommendation for development to solve problems of poverty

1) It is very necessary for working in the project for solving problems of poverty to build participation of all sections in playing their role in working together in the form of the collaboration parties. All sections must be able to work integrated in continuity.

2) All development organizations, agencies section, and invention of different instruments for leading process of poverty solving for villagers should suit for the target group and should be in accordance with the way of community life in order for the target group is lead to action in a concrete form.

3) Recording continuous incomes expense accounts and monthly analysis income expense accounts, and using analysis results for leading to planning will enable the target group to consider the self-development model in a appropriateness.

4) For community participation, in every process for community plans are made beginning from the process of committee appointment, working staff appointment, basic data survey, putting data into the system, data system making, community data base making ; data analysis for making community plan, development plan, activity plan and project plan together. These plans actually meet the needs of community.

5) For research and development for solving problems of poverty, participatory action research could be used for solving problem of poverty because it is research with development at the same time which can improve the operation

leading to success. While operating work, it takes community of participate in the process of development from thinking, decision – making, planning, action, evaluation, and receiving benefit

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Environmental Sustainability: An Empirical Survey On Italian Listed Companies

Stefano Fontana *, Daniela Coluccia, Eugenio D'Amico,
Silvia Solimene

Department of Law and Economics of Productive Activities
University of Rome, La Sapienza
Rome, Via Castro Laurenziano 9

** Corresponding author*

Structured Abstract

Purpose – The aim of the present study is to verify the presence and the evolution of (voluntary) environmental disclosure with reference to Italian firms. We have examined the documentation of listed firms both in 2006 and 2009, that have been chosen because they immediately precede and immediately follow the emanation in Italy of the legislative decree n. 32 of 2007 that introduced for the first time in Italy – at least in voluntary terms - the information about environment. Therefore, the analysis of the two years mentioned allows us also to verify whether and how firms operated after this new legislative indication.

Design/methodology/approach – We propose an approach based on multivariate regression analysis in order to assess the evolution and the determinants of voluntary environmental disclosure. The dependent variable is represented by the disclosure index, that we have estimated through the analysis of the corporate documents of the years 2006 and 2009. Independent variables are as follows: firm size, business industry, economic performance, financial situation, age, foreign markets, public shareholders, company ownership, audit, legislation and environmental performance.

Originality/value – The first contribution provided by our work is to realize, for the first time, a specific analysis on environmental disclosure of Italian firms. Moreover (second contribution) our study has extended this analysis to all the informative documents of the entities. For this purpose, besides the individual, we have analyzed the consolidated financial reports, the management reports, the sustainability reports and the reports on corporate governance, if present. Finally (third contribution) the present work allows to examine the effects of the introduction of a new legislation which requires (without obligation) environmental information in the document of the corporate financial annual report.

Practical implications – In contrast with the previous studies on this issue, the results of our analysis show an inverse (negative) and statistically significant relation between voluntary environmental disclosure and the level of minority shareholding, the presence of international audit firms (Big 4), environmental performance, profitability and quotation in foreign exchange markets. Finally, our analysis confirms the positive relation between environmental disclosure and firm size and with the presence of government shareholdings in the ownership structure.

Keywords – Voluntary environmental disclosure, disclosure index, sustainability, Italian listed companies, environmental performance.

Paper type – Academic Research Paper

1 Introduction

The aim of the present study is to verify the presence and the evolution of (voluntary) environmental disclosure with reference to Italian firms.

For this purpose we have examined the documentation of firms listed in Milan Stock Exchange both in 2006 and 2009. The choice of these two years is not random. 2006 and 2009 have been chosen because they immediately precede and immediately follow the emanation in Italy of the legislative decree n. 32 of 2007: through the modification of the article 2428 of the civil code, it introduced for the first time in Italy – at least in voluntary terms¹ - the information about environment. Therefore, the analysis of the two years mentioned allows us to verify not only the evolution of disclosure throughout time, but also whether and how firms operated after this new legislative indication.

The first contribution provided by our work is to realize, for the first time on the basis of our knowledge, a specific analysis on environmental disclosure in Italian firms. In fact from the empirical point of view the existing national contributions aim at a general survey on the existence of Environmental Management systems in corporate financial annual reports (Azzone et al., 1996; Azzone et al., 1997; Noci, 2000); other contributions aim at surveying the determinants of the firm's overall voluntary disclosure (Boesso and Kumar, 2007), the channels of diffusion of corporate Social Responsibility Disclosure (Vitolla and Rubino, 2012; Balluchi and Furlotti, 2013); the effects of disclosure strategies on the cost of risk capital (Bagnoli and Mantovani, 2009); other scholars aim at surveying the coherence between the information contained in the firms' strategic plans and those contained in the mandatory documentation (Avallone and Ramassa, 2009). Moreover (second contribution) our study has extended this analysis to all the informative documents of the entities. For this purpose, besides the individual, we have analyzed the

¹“The financial annual report must be accompanied by a relation of administrators with a reliable, balanced and complete analysis of the society's situation and the management's evolution and results [...] and also a description of the main risks and uncertainties the society is exposed to. The analysis [...] is coherent with the entity and complexity of the society's affairs and it contains – as much as it is necessary for the comprehension of the society's situation and the management's evolution and results - the financial results indicators, and if appropriate [from here the voluntariness indicated in the text], the non-financial results indicators which concern the firm's specific activity, including information about environment and employees”.

consolidated financial reports (with a specific reference to the supplementary notes and notes to the financial annual report), the report on management (with the innovations referred to in the legislative decree n. 32 for 2009), the sustainability report and the report on corporate governance, if present. Finally (third contribution) the present work allows to examine the effects of the introduction of a new legislation which requires (without obligation) environmental information in the document of the corporate financial annual report.

The prosecution of the work is structured as follows. Paragraph 2 shows the description of dependent and independent variables of our model and the hypotheses to be verified. Paragraph 3 describes the criteria for the selection of the sample. Paragraph 4 shows descriptive statistics and the matrix of correlation (univariate analysis). Paragraph 5 shows the multivariate analysis. Finally, the last paragraph (6) includes the conclusions.

2 Model variables: literature review and development of hypotheses

2.1 Dependent variable: the disclosure index

The mostly used disclosure index in international studies is obtained by the relation between the number of disclosure items effectively applied by each company to the total number of applied elements (Spero, 1979; Robbins and Austin, 1986; Wallace, 1987; Wallace et al., 1994; Meek et al., 1995; Wallace and Naser, 1995; Cooke, 1996; Inchausti, 1997; Cammferman and Cooke, 2002):

$$0 \leq I_j = \frac{\sum_{i=1}^n x_i}{n_j} \leq 1$$

Where n_j is the number of elements applicable to j-firm; n is the maximum number of applicable elements; x is the x-element of disclosure (elements vary from 1 to n).

Therefore, for instance, if the elements selected for the disclosure are 10 and the firm X highlights only 3 of them, the value of the disclosure index for that specific firm is equal to 0,3 (= 3/10).

From the description above it is clear that the first step in the calculation of the index is establishing how many elements must be applicable to disclosure. The indication of these elements is given by the guidelines of Global Reporting Initiative (GRI) (Clarkson et al., 2008) and the guidelines for ESG homologated by the European Federation of

Financial Analysts Firms (EFFAS). This led to individuate 31 elements which – according to the sources cited – should be included in the several corporate documents so as to give complete environmental information.

The presence of these elements in the documents of each firm has been verified.

For each firm of the sample three disclosure indexes have been calculated: a general disclosure index, a qualitative and a quantitative index (Wiseman, 1982; Freedman and Wasley, 1990). To each item it has been assigned a score in relation to the completeness of information in the documents examined; it has been distinguished among:

Detailed information: information is expressed in a clear, complete and systematic way in relation to the reference items: score equal to 1;

Generic information: information is given imprecisely and not completely in relation to the reference items and it does not allow a systematic comprehension of the phenomenon: score equal to 0,5;

No data: there is not any information in relation to the items, neither qualitative nor quantitative: score equal to 0.

In substance, at the level of general disclosure, for each item the minimum score assigned is equal to 0 if the item is not present in the documents examined, and the maximum score is equal to 2 if the item is present and is described in a detailed way from both quantitative and qualitative points of view. It derives that the maximum score obtainable from the total general disclosure index (qualitative and quantitative) is equal to 62 (31x2); the maximum score of the disclosure index respectively in the qualitative and quantitative versions is equal to 31.

In order to avoid problems of results' reliability and subjectivity, a team of three researchers has realized the score. The authors have defined the list of items and have instructed the three researchers who have carried out the analysis on the corporate documents, in order to individuate the presence of items. A preliminary verification of the scores assigned by researchers has been made on a sample of 3 annual documents.

2.2 Independent variables and formulation of hypotheses

Below we will indicate the variables selected in our study, the hypotheses developed with reference to each of them and the methods of measurement.

Firm Size

Among the variables which influence positively disclosure in general and specifically environmental disclosure, the principal international literature has included Firm Size (Patten, 1992; Gray et al., 1995; Deegan and Gordon, 1996; Adams et al., 1998; Al-Tuwaijri et al., 2004; Freedman and Jaggi, 2005; Brammer and Pavelin, 2008; Garcia-Sanchez, 2008; Stanny and Ely, 2008; Reverte, 2009). There are several reasons which led to this inclusion. Firstly, bigger firms afford considerable investments which make them more dependent on the capital market and on the problem of information asymmetries. But they can produce more information than those considered obligatory with lower costs than those afforded by small and medium firms (Mukherjee et al., 2010; Monteiro and Aibar-Guzmán, 2010). In fact big firms are provided with highly developed internal control systems, which provide the analysis and the study of supplementary information with respect to the information contained in the financial annual reports. The costs of production and diffusion of the information are considerably lower in big firms due to the minor incidence of fixed costs (Lang and Lundholm, 1993). It derives that most part of voluntary disclosure represents a sort of “obligatory information” for those firms which have a relevant role in the marketplace. Secondly, big firms which operate through branches and plants can obtain some benefits by providing additional information concerning their impact on the territory, the economic activity produced and the value realized for the areas where they operate, in order to obtain a “social and general appreciation” of their activity. Thirdly, the theory of legitimacy suggests that big firms must satisfy the social expectations of a large range of stakeholders, and for this reason they need to produce more information (Schipper, 1991).

Therefore the hypothesis to be verified is the following:

H₁: the level of voluntary environmental disclosure of firms tends to be higher the larger is the firm size.

As what concerns the measurement of the firm size, according to the principal studies on the issue (Zarzeski, 1996; Ahmad et al., 2003; Cormier et al., 2005; Brammer and Pavelin, 2008; Clarkson et al., 2008; Liu and Anbumozhy, 2009; Monteiro and Aibar-Guzman 2010; Mukherjee et al., 2010; Dawkins and Fraas, 2011; Galani et al., 2011; Wang et al., 2012; Zeng et al., 2012; Stanny, 2013) it has been used the natural logarithm of total assets.

Business Industry

The Business Industry is also a variable considered by the studies on environmental disclosure (Deegan and Gordon, 1996; Gray et al., 1995; Ho and Taylor, 2007; Brammer and Pavelin, 2008, Sinclair-Desgagné and Gozlan, 2003). The characteristics of the sector in which firms operate influence the quality of the information produced; this quality partly depends on the level of environmental sensitivity of the reference stakeholders (Sinclair-Desgagné and Gozlan, 2003). In particular, firms operating in sensitive sectors and having a high environmental impact (Cowen et al., 1987; Patten, 2002; Xianbing Liu and Anbumozhi, 2009; Salama et al., 2012) tend to produce more environmental information (Deegan and Gordon, 1996; Moneva and Llena, 1996; Sharma, 1997; Hoffman, 1999; Bowen, 2000; Patten, 2002; Brammer and Pavelin, 2008).

The hypothesis to be verified is the following:

H₂: the relationship between voluntary environmental disclosure and sensitivity of the sector is positive.

With reference to business industry we have adopted a binary variable which has a value equal to 1 if the firm belongs to a sector which is environmentally sensitive, and a value equal to 0 in the opposite case. The identification of the sectors has been taken from the Bloomberg database. Coherently with the classification proposed by Salama et al. (2012), several sensitive sectors have been considered: energy supply, paper and pulp, extraction and mining, contracting, chemicals, aerospace and defense, steel and auto parts, medical and telecom equipment, food processing.

Economic Performance

According to the stakeholders' theory of, even the economic performance of a firm influences positively the voluntary social and environmental disclosure (Cormier and Magnan, 2003; Ho and Taylor, 2007) and investments in social responsibility (Cho and Patten, 2007; Roberts, 1992). In regards to this it is possible to hypothesize that firms with a higher profitability have a higher possibility to invest their economic resources even for activities with higher social value and have the wish to provide this information in order to reduce the risk of adverse selection (Lang and Lundholm, 1993). In fact, most profitable firms have more resources for the writing of voluntary informative documents. Therefore, the hypothesis to be verified is the following:

H₃: The level of voluntary environmental disclosure tends to increase with the growth of the firm's profitability.

Profitability has been measured with the Return on Investment, calculated by the relation between operating profit and capital invested (Clarkson et al 2011; Dawkins and Fraas, 2011).

Financial Situation

According to some scholars, the level of environmental disclosure can be influenced even by the firm's financial situation (Zeng et al., 2012; Clarkson et al., 2008).

On one hand, it can be generally hypothesized that an indebted firm tends to provide more environmental information because its shareholders evaluate it even on the basis of its environmental performance and behavior (Al Arussi et al., 2009; Liu and Ambumozhi, 2009). On the other hand – especially during the periods of economic and financial crisis such as the one which characterizes Italy, due to the strong concurrence of eastern countries and to the adoption of the Basle 2 criteria (these have been completely applied from 2007) by the bank system – is highly probable that indebted firms destine their resources for the production of information for financiers (typically obligatory information) and disregard all other kinds of information (typically voluntary information). For these reasons, for our survey the following relation has been hypothesized:

H₄: the level of voluntary environmental disclosure tends to diminish with the growth of leverage.

The leverage has been measured through the relationship between financial debt and equity (Cormier et al., 2005; Déjean and Martinez, 2009; Malone et al., 1993; Tri Setyorini and Ishak, 2012).

Age

Generally speaking, it can be affirmed that a firm being on the market since much time has consolidated its control and reporting structures, and it can focus more on the enhancement of additional informative systems. In this sense, it can be hypothesized also that it could add to the ordinary and voluntary information a production which concerns general social responsibility and specifically environment. For these reasons, there should

be a higher environmental disclosure due to a more long-lasting permanence of the firm on the market (Monteiro and Aibar-Guzman, 2010).

Furthermore, without doubt the attention of public opinion on environmental effects increases especially when the firm joins the capital market. In fact, listed firms have a higher visibility and are continuously at the centre of the attention of mass media, money savers, etc. (Brammer and Pavelin, 2008; Cormier et al., 2005; Dawkins and Fraas, 2011; Fraser and Fraser, 2008; Guthrie and Parker, 1990; Reverte, 2009; Stanny and Ely, 2008; Tagesson et al., 2009). Therefore, the hypothesis to be verified will be the following:

H₅: the level of voluntary environmental disclosure of firms tends to increase with the increase of quotation age.

The firm's age is measured as the number of years from the first IPO (Liu and Anbumozhi, 2009; Xianbing and Anbumozhi, 2009; Zeng et al., 2012).

Foreign Markets

The studies concerning environmental disclosure have ascertained that the quotation in more financial markets produces the benefit of transferring the best practices on all the documents concerning the firm (Watts and Zimmerman, 1978; Ahmad et al., 2003). In particular, it has been verified that the quotation in those countries which joined the Kyoto protocol has favored the level of environmental disclosure (Freedman and Jaggi, 2011). Therefore we expect firms listed even on international markets more developed than the Italian market to produce wider environmental information (Reverte, 2009). The hypothesis to be verified will be the following:

H₆: the relationship between the quotation in international markets and firms' voluntary environmental disclosure is positive.

As what concerns quotation in foreign markets, a dichotomic variable has been introduced; its value is equal to 0 if the society is listed only in the Italian financial market; its value is equal to 1 if the society is listed even in other foreign markets.

Public Shareholders

Surveys on environmental disclosure have focused their attention on the different propensity of public firms to provide voluntary disclosure compared with private firms (Tagesson et al., 2009; Zeng et al., 2012). In particular, it can be affirmed that firms listed by the government or other public administrations should have a higher level of

disclosure compared with firms without any government shareholdings (Secchi, 2006; Tagesson et al., 2009; Zeng et al., 2012). In fact, in these firms there is a deep conflict among the parts which often represent unconverging interests. Politicians could be more interested in social issues, while managers and other shareholders are often focused exclusively on profit and value. In order to solve this conflict, managers tend to provide information useful to satisfy the needs of information of the different investors' categories.

Therefore the hypothesis to be verified will be the following:

H₇: the level of voluntary environmental disclosure tends to increase with the growth of public partners in the ownership structure.

The presence of public investors has been measured in terms of percentage of shareholding to the ownership structure.

Company Ownership

According to some authors, the level of disclosure is influenced by the level of concentration or diffusion of capital. In particular, in accordance with the agency theory, surveys have demonstrated that firms with a spread capital are more sensitive to external pressures, thus they tend to increase the level of voluntary reporting, in order to obtain the consensus and support of minority shareholders who don't participate actively to the firm and thus don't have any modality to know the listed society's activity (Cormier and Magnan, 1999; Cullen and Christopher, 2002; Cormier et al., 2005; Brammer and Pavelin, 2008).

The hypothesis to be verified will be the following:

H₈: the level of voluntary environmental disclosure tends to increase with the increase of the level of diffusion of ownership structure.

The incidence of minority shareholders has been measured through the relation between the third parties' equity and the group's equity (Patten, 1992).

Audit

The firms certified by big international independent audit firms tend to realize a higher level of disclosure compared with the firms certified by local independent audit firms (Zauwiyah et al., 2003). The reason is that big audit firms have many clients (contrarily to small firms which usually depend on few clients) and they do not fear

contraposition requesting additional information (Firth, 1979; Malone et al., 1993; Wallace et al., 1994; Wallace and Naser, 1995). On the other hand, even the relation with auditors can be considered in terms of agency theory: firms audited by big audit firms (which can afford some risks for their auditing and consequently make pressure so as to obtain information) can reduce the agency costs by increasing disclosure (Watts and Zimmerman, 1986). Finally, big international firms tend to transfer best practices (even those concerning environmental information) in all the documents of the companies certified by them.

Therefore, the hypothesis to be verified will be the following:

H₉: the relationship between the level of knowledge of audit firms and voluntary environmental disclosure of firms is positive.

In order to verify the influence of the audit firm, we have referred to a dummy variable which value is equal to 1 if the audit firm is among Big 4 (PriceWaterHouseCoopers, KPMG, Reconta Ernst & Young and Deloitte & Touche); its value is equal to 0 if the audit firm is not among Big 4 (Baroma, 2013; Zorio et al., 2013).

Legislation

As we have mentioned in the introduction, our analysis has focused on two specific years: 2006 and 2009. These years respectively precede and follow the adoption of the legislative decree n. 32/2007 which for the first time introduced in Italy – although in a voluntary form – environmental disclosure. In particular, the decree has partly accepted the Communitarian Directive n. 51 of 2003 by modifying the content of the Management Report, which is the document that is associated with the financial report and the consolidated financial report (composed of the financial annual report, the profit and loss account and the integrative note). The introduction of the legislative decree n. 32 of 2007 implied the modification of the article 2428 of the civil code (which in Italy regulates the writing of corporate documents); after the modification, this latter article implies that:

“the financial annual report must be accompanied by a relation of administrators with a reliable, balanced and complete analysis of the society’s situation and the management’s evolution and results [...] and also a description of the main risks and uncertainties the society is exposed to. The analysis [...] is coherent with the entity and complexity of the society’s affairs and it contains – asmuch as it is necessary for the comprehension of the society’s situation and the management’s evolution and results -

*the financial results indicators, and if appropriate, the non-financial results indicators which concern the society's specific activity, including the **information about environment and employees**".*

Therefore the following hypothesis shall be added to the previous:

H₁₀: the level of voluntary environmental disclosure has increased after the introduction of the legislative decree n. 32/2007.

In order to verify the effects produced by the introduction of the legislative decree n. 32/2007 which explicitly took into consideration for the first time in Italy the information about environment, a dummy variable has been introduced; its value is equal to 1 for 2009 and 0 for 2006.

Environmental performance

The last variable considered in our analysis is environmental performance (Ingram and Frazier, 1980; Wiseman, 1982; Freedman and Wasley, 1990). Generally, the lower is the level of pollution produced by a firm the better is its environmental performance. In literature and in praxis, this performance is configured in several ways (Azzone and Manzini, 1994; Gilley et al., 2000; King and Lenox, 2002; Klassen and McLaughlin, 1993; Tyteca, 1996). Unfortunately it is only provided by few firms in their documents; however nowadays in Italy there is no database which contains this indicator (for example a Corporate Social Responsibility Database). Finally, the results obtained from the studies which relate environmental variable and disclosure are not univocal.

By modifying the indexes of environmental performance of Al-Tuwajiri et al. (2004) and Clarkson et al. (2008), but keeping the same formulation, we expect that – with the decrease of the pollution level – there will be an extension of environmental information. In fact, it should be logical that if a firm improves its environmental performance throughout time, by producing a lower pollution level compared with the other firms, it is concerned about providing this and other environmental information. Therefore, the further hypothesis to be verified is the following:

H₁₁: the relationship between the level of pollution and voluntary environmental disclosure of firms is negative.

For the measurement of environmental performance in terms of pollution, we have calculated the relation between the total emissions of carbon dioxide (in tons) and the company sales¹.

In table 1 (see the Appendix) there are the variables examined in our study and the sign of the relation expected by the empirical verification.

Table 1 – Esplicative variables

Esplicative variables	Symbol	Measurement	Predicted Sign
Firm size	NLA	LN Total Assets	+
Business Industry	BI	Sensitivity of the sector (dummy)	+
Economic Performance	ROI	Return on Investment	+
Financial Situation	L	Financial debts/Equity	-
Age	AGE	Listing Age	+
Foreign Markets	MKT	Quotation in foreign markets (dummy)	+
Public Shareholders	GOV	Percentage of shares of public authorities in the ownership structure	+
Company Ownership	MI	Equity of third parties/Equity of the group	+
Audit	AUD	Big 4 (dummy)	+
Legislation	D	Year 2006 or 2009 (dummy)	+
Environmental Performance	EP	CO2/Sales	-

3 Sample selection

For the verification of the hypotheses developed in the previous paragraph, we have selected a sample of firms listed at Milan Italian Stock Exchange on 31/12/2006 and 31/12/2009. We started from the total of the firms listed at the Milan Stock Exchange in 2006 and 2009. We excluded financial brokers, insurance firms and soccer firms because they represent a different balance structure. We excluded also firms listed after 31/12/2006 and those which made the delisting during the period 1/01/2007-31/12/2009. We eliminated 4 firms which documents were not available for the periods considered. Finally, we eliminated all the firms which do not provide any note on environmental

¹Firms measure their pollution level in different ways. The level of carbon dioxide emissions is only one of them. We have chosen it because it is accepted by international literature as an objective measurement of atmospheric pollution by firms (Tyteca, 1996, 1997; Färe et al., 2004) and because it is the measurement used by most of the firms listed in Milan Stock Exchange in the period analyzed.

performance. In this way we have obtained a sample of 20 firms. For each of them we have calculated the disclosure index in 2006 and 2009

4 Descriptive statistics and univariate analysis

Before making the multivariate analysis on which the hypotheses introduced must be verified, we show in Table 2 (see the Appendix) the analysis of descriptive statistics and in table 3 the univariate analysis of dependent and independent variables.

Table 2 – Descriptive statistics

Panel A 2006										
	IAG	IQN	IQL	LNA	ROI	L	AGE	GOV	MI	EP
Mean	0.289919	0.263710	0.316129	15.99027	10.02400	119.4280	14.10000	12.45000	15.04682	0.891026
Median	0.290323	0.250000	0.298387	16.05929	8.555000	105.6900	8.000000	0.000000	4.732076	0.301904
Maximum	0.854839	0.854839	0.854839	18.29902	32.05000	279.5300	33.00000	51.00000	114.5186	8.233544
Minimum	0.000000	0.000000	0.000000	11.99112	-1.320.000	24.13000	0.000000	0.000000	0.000000	0.008334
Std. Dev.	0.234455	0.215904	0.260304	1.477992	9.045068	74.24241	12.43467	18.75458	26.90255	1.896217
Skewness	0.668763	0.941372	0.476838	-0.592843	0.060743	0.741968	0.643962	1.029672	2.877982	3.474671
Kurtosis	3.133791	4.115626	2.466518	4.043618	4.730331	2.701929	1.806447	2.454109	11.06368	14.02518
Panel B 2009										
	IAG	IQN	IQL	LNA	ROI	L	AGE	GOV	MI	EP
Mean	0.414919	0.357258	0.472581	16.17171	6.058000	140.8240	17.10000	10.30000	10.59234	0.934216
Median	0.419355	0.330645	0.491935	16.07126	6.450000	129.5750	11.00000	0.000000	5.195248	0.345829
Maximum	0.854839	0.854839	0.854839	18.85388	22.17000	307.5000	36.00000	55.00000	39.93510	7.337439
Minimum	0.016129	0.016129	0.016129	12.05558	0.210000	25.95000	3.000000	0.000000	0.000000	0.020751
Std. Dev.	0.217096	0.216285	0.238550	1.578157	5.132405	74.50307	12.43467	18.18067	12.65599	1.690887
Skewness	0.133298	0.603867	-0.225875	-0.432845	1.520127	0.659222	0.643962	1.491001	1.131332	2.948389
Kurtosis	2.678367	2.885105	2.253807	3.748264	5.913105	2.818831	1.806447	3.772817	3.006599	11.52490

IAG is the general disclosure index; IQN is the disclosure index in the quantitative version; IQL is the disclosure index in the qualitative version; LNA is the natural logarithm of assets; ROI is the return on investment; L is the leverage (financial debts/equity); AGE is the number of years of quotation; GOV is the percentage of shares of public authorities in the ownership structure; MI is the percentage of minority interests (Equity of third parties/ Equity of the group); EP is environmental performance (CO2/Sales).

From the analysis of descriptive statistics, first of all it can be noticed that from 2006 to 2009 there is: an improvement of three average disclosure indexes ($IAG_{20,2006} = 0.290$; $IAG_{20,2009} = 0.415$; $IQN_{20,2006} = 0.264$; $IQN_{20,2009} = 0.357$; $IQL_{20,2006} = 0.316$; $IQL_{20,2009} = 0.473$); an increase of average debt ($L_{20,2006} = 119.430$; $L_{20,2009} = 140.824$) and a reduction of average profitability ($ROI_{20,2006} = 10.024$; $ROI_{20,2009} = 6.058$). In substance, it would

seem that, despite a period of economic crisis and the introduction of the new legislation, firms improved their voluntary information even with reference to environmental issues.

Furthermore, this has been carried out despite a worsening of environmental performance ($EP_{20,2006} = 0.891$; $EP_{20,2009} = 0.934$); this datum would make us reflect on the will to motivate some productive and strategic choices. Finally, it must be highlighted that in the passage from 2006 to 2009 there is (on average) a reduction of the participation of both minority shareholding ($MI_{20,2006} = 15.047$; $MI_{20,2009} = 10.592$) and government shares ($GOV_{20,2006} = 12.450$; $GOV_{20,2009} = 10.300$).

The Table 3 shows the correlation matrix (see the Appendix).

Table 3 – Correlation matrix

Correlazione														
Prob.	IAG	IQN	IQL	NLA	BI	ROI	L	AGE	MKT	GOV	MI	AUD	DY	CO2
IAG	1.000000													

IQN	0.959054	1.000000												
	0.0000	----												
IQL	0.970089	0.861615	1.000000											
	0.0000	0.0000	----											
LNA	0.235617	0.305899	0.160061	1.000000										
	0.1604	0.0656	0.3440	----										
BI	0.131057	0.214979	0.050608	0.128518	1.000000									
	0.4394	0.2013	0.7661	0.4484	----									
ROI	-0.252965	-0.191999	-0.288775	-0.049616	0.096817	1.000000								
	0.1309	0.2549	0.0830	0.7706	0.5686	----								
L	0.087900	0.152907	0.026468	0.382506	-0.034027	-0.271572	1.000000							
	0.6049	0.3663	0.8764	0.0195	0.8415	0.1040	----							
AGE	-0.053977	-0.124764	0.010203	0.389219	-0.404841	-0.230306	0.029158	1.000000						
	0.7510	0.4619	0.9522	0.0173	0.0129	0.1703	0.8640	----						
MKT	-0.370853	-0.471698	-0.260312	-0.281206	-0.197386	0.004071	-0.113120	0.240707	1.000000					
	0.0238	0.0032	0.1197	0.0918	0.2416	0.9809	0.5050	0.1513	----					
GOV	0.432271	0.474538	0.367943	0.058290	0.377959	-0.140717	0.010306	-0.224126	0.062233	1.000000				
	0.0075	0.0030	0.0251	0.7318	0.0211	0.4061	0.9517	0.1824	0.7144	----				
MI	-0.135886	-0.171702	-0.096355	0.182675	0.035667	-0.216650	0.221749	0.033464	0.054406	0.299446	1.000000			
	0.4226	0.3096	0.5705	0.2792	0.8340	0.1978	0.1872	0.8441	0.7491	0.0718	----			
AUD	0.045508	0.076334	0.016128	0.461847	0.293972	-0.155214	0.244030	0.108494	-0.058026	0.111109	0.105006	1.000000		
	0.7891	0.6534	0.9245	0.0040	0.0774	0.3590	0.1455	0.5227	0.7330	0.5127	0.5362	----		
DY	0.172007	0.114490	0.210123	0.001160	-0.017082	-0.232469	0.115273	0.091694	0.028322	-0.117443	-0.132558	0.180775	1.000000	
	0.3087	0.4998	0.2119	0.9946	0.9201	0.1662	0.4969	0.5894	0.8678	0.4888	0.4342	0.2843	----	
CO2	0.099469	-0.018122	0.193790	0.023378	-0.272080	-0.051377	-0.150343	0.165596	-0.067104	-0.106103	0.341540	0.074133	-0.002263	1.000000
	0.5581	0.9152	0.2504	0.8908	0.1033	0.7627	0.3744	0.3273	0.6931	0.5320	0.0386	0.6628	0.9894	----

IAG is the general disclosure index; IQN is the disclosure index in the quantitative version; IQL is the disclosure index in the qualitative version; NLA is the natural logarithm of assets; BI (business industry) is equal to 1 if the sector is considered as sensitive and 0 in the opposite case; ROI is the return on investment); L is the leverage

(financial debts/equity); AGE is the number of years of quotation; MKT is equal to 1 if the society is listed even in other countries and 0 if the society is listed only in the Italian financial market. GOV is the percentage of shares of public authorities in the ownership structure; MI is the percentage of minority interests (Equity of third parties/ Equity of the group); AUD is equal to 1 if the audit firm is one of the BIG 4, and 0 in the opposite case; Dt is equal to 0 for 2006 and 1 for 2009; EP is environmental performance (CO2/Sales)

The correlation matrix analyzed with reference to the disclosure indexes calculated highlights the following situation. The general disclosure index (IAG), contrarily to expectations, has a negative and statistically significant relation with the presence of the firm even in foreign markets. The same index highlights also a positive and statistically significant relation with the presence of government shareholdings in the firm. The quantitative index (IQN) and the qualitative index (IQL), similarly to the general index, have a positive and statistically significant correlation with the presence of government shareholdings in the firm.

Furthermore, only the quantitative index (again similarly to the general index) shows a negative and statistically significant relation with the presence of the firm even in foreign markets. Furthermore it is interesting to remark that the quantitative index always highlights a positive and statistically significant relation with the firm size measured by the natural logarithm of assets; while the qualitative index shows a negative and statistically significant relation with return on investment (ROI).

Finally, with reference to explicative variables, the correlation matrix would seem to exclude possible situations of collinearity. For each case, in the following multivariate analysis the collinearity test (VIF test) has been carried out.

Obviously the univariate analysis does not consider the potential impacts produced from explicative variables examined as a whole. For this purpose, in the following section a multivariate analysis has been carried out.

5 Multivariate analysis

In order to verify the hypotheses introduced in paragraph 2, a multivariate analysis has been carried out by relating environmental disclosure indexes (general, quantitative and qualitative) with the explicative variables identified. The regression can be synthesized with the following multivariate model:

$$\begin{aligned} \text{IAG, IQN, IQL} = & \alpha + \beta_1 \text{NLA} + \beta_2 \text{BI} + \beta_3 \text{ROI} + \beta_4 \text{L} + \beta_5 \text{AGE} + \beta_6 \text{MKT} + \beta_7 \text{GOV} \\ & + \beta_8 \text{MI} + \beta_9 \text{AUD} + \beta_{10} \text{Dt} + \beta_{11} \text{EP} + \epsilon \end{aligned}$$

where:

IAG is the general disclosure index; IQN is the disclosure index in the quantitative version; IQL is the disclosure index in the qualitative version; LNA is the natural logarithm of assets; BI (business industry) is equal to 1 if the sector is considered as sensitive and 0 in the opposite case; ROI is the return on investment; L is the leverage (financial debts/equity); AGE is the number of years of quotation; MKT is equal to 1 if the society is listed even in other countries and 0 if the society is listed only in the Italian financial market; GOV is the percentage of shares of public authorities in the ownership structure; MI is the percentage of minority interests (Equity of third parties/Equity of the group); AUD is equal to 1 if the audit firm is one of the BIG 4, and 0 in the opposite case; Dt is equal to 0 for 2006 and 1 for 2009; EP is environmental performance.

Before making the regressions, the multicollinearity among the explicative variables has been verified through the use of VIF (variance inflation factor). In addition, also robust standard error clustered at firm level (HAC) has been used. Even the normality of the sample has been verified, in relation to its size, through the Jarque-Brera test. Regressions have been done by using OLS model. In fact, the Breush-Pagan test has verified that this model is preferable to the random-effects panel model; the Hausmann test has verified that random-effects panel model is preferable to fixed-effects panel model (the test's results are indicated in the following table).

Table 4 highlights the results of the regression (see the Appendix).

Table 4 – Multiple regression Pooled OLS

$$(1) IAG = \alpha + \beta_1 NLA + \beta_2 BI + \beta_3 ROI + \beta_4 L + \beta_5 AGE + \beta_6 MKT + \beta_7 GOV + \beta_8 MI + \beta_9 AUD + \beta_{10} Dt + \beta_{11} Co2_S + \epsilon$$

$$(2) IQN = \alpha + \beta_1 NLA + \beta_2 BI + \beta_3 ROI + \beta_4 L + \beta_5 AGE + \beta_6 MKT + \beta_7 GOV + \beta_8 MI + \beta_9 AUD + \beta_{10} Dt + \beta_{11} Co2_S + \epsilon$$

$$(3) IQL = \alpha + \beta_1 NLA + \beta_2 BI + \beta_3 ROI + \beta_4 L + \beta_5 AGE + \beta_6 MKT + \beta_7 GOV + \beta_8 MI + \beta_9 AUD + \beta_{10} Dt + \beta_{11} + Co2_S + \epsilon$$

	<i>Coefficient(1)</i>	<i>Coefficient(2)</i>	<i>Coefficient(3)</i>	<i>p-value(1)</i>	<i>p-value(2)</i>	<i>p-value(3)</i>
const	0.122448	0.0340749	0.210821	0.69793	0.90642	0.55315
NLA	0.0402548	0.0428054	0.0377042	0.0504*	0.03019**	0.09928*
BI	-0.0100453	-0.00897307	-0.0111175	0.90452	0.89129	0.91544
ROI	-0.0062329	-0.00438501	-0.00808078	0.13325	0.24692	0.07939*
L	0.00020249	0.000324953	8.00E-05	0.52687	0.19905	0.8503
AGE	-0.000831828	-0.00117411	-0.00048955	0.77581	0.56629	0.90401
MKT	-0.194705	-0.243011	-0.1464	0.13727	0.05041*	0.29667
GOV	0.00721309	0.00727943	0.00714675	0.00004***	<0.00001***	0.00076***
MI	-0.00497369	-0.00493943	-0.00500796	0.00031***	0.00001***	0.0028***

AUD	-0.284683	-0.240584	-0.328782	0.04005**	0.05527*	0.03383**
Dt	0.0740581	0.0511118	0.0970044	0.09521*	0.2102	0.0631*
EP	0.0393184	0.0257773	0.0528596	0.00121***	0.01955**	0.00063***
R-squared	0.620767	0.718171	0.521371			
Adjusted R-squared	0.453905	0.594167	0.310775			
P-value (F)	0.003132	0.000137	0.029348			
Akaike	-20.98989	-35.26164	-4.25493			
Test Breush-Pagan	LM = 1.686	LM = 1.285	LM = 1.365	0.194	0.257	0.243
Test Hausman	H = 39.657	H = 24.924	H = 49.444	1.947e-005	0.005	3.377e-007
Test Jarque-Brera	$\chi^2(2) = 0.138$	$\chi^2(2) = 0.215$	$\chi^2(2) = 0.356$	0.9333	0.898	0.837

*, **, *** indicate the significant at the 0.10, 0.05 and 0.01 levels respectively.

IAG is the general disclosure index; IQN is the disclosure index in the quantitative version; IQL is the disclosure index in the qualitative version; NLA is the natural logarithm of assets; BI (business industry) is equal to 1 if the sector is considered as sensitive and 0 in the opposite case; ROI is the return on investment; L is the leverage (financial debts/equity); AGE is the number of years of quotation; MKT is equal to 1 if the society is listed even in other countries and 0 if the society is listed only in the Italian financial market. GOV is the percentage of shares of public authorities in the ownership structure; MI is the percentage of minority interests (Equity of third parties/Equity of the group); AUD is equal to 1 if the audit firm is one of the BIG 4, and 0 in the opposite case; Dt is equal to 0 for 2006 and 1 for 2009; EP is environmental performance (CO2/Sales)

From the analysis of table 4 it can be noticed first of all the goodness of the adaptation of the model proposed. The three regressions in fact give a high value of r-square ($r\text{-sqIAG} = 0.620767$; $r\text{-sqIQN} = 0.718171$; $r\text{-sqIQL} = 0.521371$). Again, always at a general level, it must be reported that the values of P-value (F) attest the significance of the models used and considered on their whole (that is, all the variables simultaneously).

Looking at the analysis of the single variables, it is appropriate to focus on the variables which led to contrasting results (and statistically significant) compared with what is asserted by theories and empirical verifications carried out by previous studies, thus even by our hypotheses of signs prediction.

First of all there are three variables for which the coefficient is statistically significant with reference to all the three indexes realized, and it has a sign opposite to the one which has been hypothesized. The first one of these variables is *MI*; it measures the incidence of minority shareholding, and thus the diffusion of the equity. According to the main studies, it has been hypothesized that with an increase of minority shareholding, business management – coherently with the agency theory – would tend to provide more information so as to avoid external pressures. On the contrary, differently from the results of the previous studies (Cormier and Magnan, 1999; Cormier et al., 2005; Brammer and Pavelin, 2008), from our regressions the coefficient's sign is negative. An explanation

could be that the more information is provided to a multiplicity of investors mainly interested in the economic return, the higher is the risk that in a period of crisis these would liquidate their own investments or direct them toward other more profitable purposes. Even the variable *AUD* assumes a different sign from what hypothesized. It is a dichotomic variable which value is equal to 1 if the society which makes the external auditing belongs to Big 4; its value is equal to 0 in the opposite case. Even in this case, we would have expected a positive direct relationship with disclosure. In fact it can be hypothesized that firms certified by Big 4 suffer a stronger pressure for providing information, and that within it there is also environmental information in accordance with international best practices.

On the contrary, our regressions show a negative sign of the coefficient (despite a significance of 10%) in which the higher value is assumed by qualitative disclosure ($\beta_{IAG} = -0.285$; $\beta_{IQN} = -0.241$; $\beta_{IQL} = -0.329$). It can be hypothesized that this sign is due partly to the fact that during periods of crisis, firms certified by Big 4 are already sufficiently involved in providing only accounting information, which is useful to reassure investors and markets; for this reason they could tend to disregard environmental (voluntary) information. The third variable which assumes a sign different from the one hypothesized – with a level of statistical significance equal to 1% for the qualitative disclosure index and global disclosure index, and with a level of 5% for the quantitative disclosure index – is EP; this is measured by the relation between the carbon dioxide emissions and company sales ($\beta_{EP, IAG} = 0.039$; $\beta_{EP, IQN} = 0.026$; $\beta_{EP, IQL} = 0.053$). In this sense, it could be supposed that, differently from what has been hypothesized previously (par. 2.2), firms which improve their environmental performances (reduction of the relation CO_2/S) consider this information as sufficient and they do not recognize the need of providing other disclosure.

There are also variables with a coefficient's sign different from the one hypothesized but which is statistically significant only for one of the indexes calculated. With reference to foreign markets (MKT), for example, from the model it can be deduced that the presence of the firm even in foreign markets (MKT) has an inverse statistically significant relationship (this too at 10%) only with the quantitative disclosure index; this presumably indicates that firms listed in foreign markets are not interested in including voluntary environmental information in their documents because they do not need to appear attractive for the international market, which has been already conquered.

With reference to all the three indicators calculated, the sign hypothesized is confirmed by both the firm size and government shareholdings. Therefore the result related to the dimensional variable ($\beta_{LNA, IAG} = 0.0402$; $\beta_{LNA, IQN} = 0.0428$; $\beta_{LNA, IQL} = 0.0377$) seems to confirm both the hypothesis that bigger firms can make a wider non obligatory disclosure due to the scarce incidence of the disclosure in terms of costs on the overall amount of corporate costs (Patten, 1992; Gray et al., 1995; Deegan and Gordon, 1996; Adams et al., 1998; Al-Tuwaijri et al., 2004; Freedman and Jaggi, 2005; Brammer and Pavelin, 2008; García-Sánchez, 2008; Stanny and Ely, 2008; Reverte, 2009), and the hypothesis coherent with the theory of legitimacy that bigger firms have a higher propensity for provide information in order to satisfy the wide range of stakeholders (even environmental stakeholders) who require information (Bansal and Clelland, 2004; Hasseldine et al., 2005). The result of the variable GOV on the contrary seems to confirm both that firms with government shareholdings respond to the public sensitivity toward the issues concerning welfare, and that corporate management undergoes pressures of public partner to provide this information.

The dichotomic variable D_t (which value us equal to 0 in 2006 and 1 in 2009) is statistically significant with positive coefficient in relation to the global and qualitative environmental disclosure index; this shows that environmental disclosure improved qualitatively in 2009 after the introduction of the legislative decree n. 32 of 2007.

Finally, the belonging to an environmentally sensitive sector (BI), the corporate debt rate (L), and the quotation age (AGE) do not have any statistical significance with the three indexes calculated.

6 Conclusions and further possible developments of the survey

In the present study we have analyzed the level of voluntary environmental disclosure in Italian firms listed in Milan Stock Exchange. For this purpose, we have considered the two years after the introduction of International Accounting Principles IAS/IFRS for the firms listed: 2006 and 2009. The use of these specific two years has allowed us to verify not only the evolution of environmental disclosure throughout time, but also the effect produced by the introduction of the legislative decree n. 32 of 2007, which modified the article 2428 of the civil code and introduced for the first time in Italy the information concerning environment.

The results obtained confirm the positive and statistically significant effect produced on the level of voluntary environmental disclosure (except for quantitative disclosure) from the emanation of the legislative decree n. 32 of 2007. Afterwards we have verified – in contrast with the previous studies on the issue – an inverse (negative) and statistically significant relation between the three indexes of environmental disclosure and minority shareholding, the presence of international audit firms (Big 4) and environmental performance. The contrasting results compared with international literature have been confirmed also with reference to the relation between profitability and the qualitative environmental disclosure index, and between quotation in foreign markets and the index of quantitative environmental disclosure index. Finally, our analysis confirms the positive relation of environmental disclosure indexes with firm size and the presence of government shareholdings in the ownership structure.

Despite the contributions of the literature concerning environmental information described in paragraph 1, it is our duty to express some reflections about two limits of our analysis. Firstly, the number of the sample analyzed is quite scarce (only 20 firms). This problem could be solved by consolidating the praxis of providing information even on environmental performance. It has been chosen an indicator of atmospheric pollution (CO₂ emissions) which, despite it is accepted internationally as a measure of firms' environmental performance, is not provided by Italian firms yet, although they are listed. In addition, in Italy there is no database which could allow a ranking of the firms concerning Corporate Social Responsibility.

Also, our analysis describes the determinants of voluntary environmental disclosure of only listed Italian firms. In a future our work could be enriched with the contribution provided by comparative analysis, at least at the European level.

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Firm's Knowledge Creation Structure and New Product Development

Hong Y. Park *

Department of Economics
Saginaw Valley State University
University Center, Michigan 48710, USA

Hyejung Chang, Yong-Seung Park

School of Management
Kyung Hee University, Seoul, Korea

**Corresponding author*

Structured Abstract

Knowledge has many different characteristics and scholars in epistemology, economics and management have dealt with them ever since knowledge has emerged as the leading source of firms' competitive advantages. New product development requires new ideas and new ideas are stemming from knowledge. Knowledge originates from tacit knowledge (Polanyi, 1964). Therefore, firms need to enact tacit knowledge (Wieck, 1977). Enactment takes different forms depending on the context of knowledge and organizational characteristics. The paper is an attempt to integrate knowledge creation theory and practices. The paper conducts an in depth literature review on the nature of knowledge and knowledge creation structure and investigates how The Dow Chemical Company uses a knowledge creation structure to elicit tacit knowledge and exploit knowledge for new product development. The Dow Chemical Company is known as one of the leading innovative firms in the world. We believe that this case enriches research on knowledge creation and new product development although it has limitations in generalizing its findings and practices. In solidifying the knowledge-based theory of the firm we need a multi-dimensional approach such as a survey, case study and theory development as Nonaka (1994) advocated.

Design/methodology/approach - We propose an approach to investigate a practice of leading knowledge creating in terms of knowledge creation theories. The Dow Chemical Company is known for its innovation in new products and we use the example of knowledge creation in the Dow Chemical Company in the U.S.

Originality/value - This mythology provides evidence of effects of knowledge creation structure on the outcomes of knowledge creation and new product development.

Practical implications - Variations in structure of knowledge creation offer opportunities in selection of the market process. Investigating links between theories and practices will provide improvements in theories and practices. Therefore, this paper can offer opportunities for practitioners and theoreticians to improve practices and theories.

Key words - knowledge creation, knowledge management, knowledge-based theory of the firm, stakeholder management.

Paper type - Research and practical paper.

1. Introduction

Knowledge has emerged as the most important source of a firm's sustainable competitive advantage. Considering the importance of the subject, it is not surprising to witness a plethora of research, with a number of different perspectives from which researchers and practitioners have approached the management of knowledge. One notable recent development is that scholars in knowledge management began to study the nature of the firm from the perspective of the knowledge-based theory of the firm (Grant, 1996; Kogut and Zander, 1992; Nonaka, 1994; Spender, 1996).

Economic theories of the firm are concerned primarily with predicting the behavior of a firm's response to external market and internal agency-managerial issues. The knowledge-based theory of the firm, in particular, views the primary role of the firm as integrating the on-site knowledge resident in individual workers. The primary task of management, from the perspective of the theory of the firm, is establishing the coordination necessary for this knowledge integration. This over-emphasis and increasing focus on macroscopic structure and collective conceptualization ignores microscopic issues associated with individual workers' creation and sharing of knowledge.

Obviously managers have been making deliberate efforts to manage the knowledge of their organizations' work force. According to Hislop (2009), they use a wide range of methods in knowledge management, such as structuring organizations in particular ways, or using particular culture and people management practices and incorporating information and communication technologies (ICT). The choice of these methods may depend on the nature of knowledge, and the use of a particular ICT is applicable to explicit knowledge management. However, when different types of knowledge vary, the implication for organizational structure to integrate such knowledge is not a trivial issue.

This paper focuses on knowledge creation with an inter-active perspective between the structure and individual (agent) behavior in organization. Also, in particular, this study assumes that tacit knowledge is a key element in knowledge creation. Structures of organization and cultures are applied to knowledge creation, which converts tacit knowledge into explicit knowledge. Many studies on knowledge creation have focused on the effects of structures on knowledge outcomes. Recently, scholars are beginning to pay attention to knowledge creation at the micro level of individuals (Felin, *et al.*, 2009).

This micro approach to knowledge creation relies on the belief that knowledge is personal, subjective, context specific and embodied in individuals (Felin & Foss, 2006; Nonaka, et al., 2003). How do organizational structures and cultures affect an individual's behavior and interactions? How do they elicit tacit knowledge from individuals? Studies on the effects of structures and cultures on individuals' decisions about knowledge sharing/hoarding (macro-micro), interactions among individuals (micro-micro), and individuals' activities and knowledge outcomes (micro-macro) are proposed as micro foundations of knowledge creation. However, there is a dearth of research on the micro perspective (Felin & Foss, 2005, 2006) and the integration of the macro-micro (structure-agent) approach. This study is an attempt to study the micro foundation of knowledge creation and the integration of a structure-agent approach.

The study consists of 6 sections. Section two builds the theoretical background and section three discusses a structure-agent approach. We discuss the knowledge creation model in section four and section five evaluates The Dow Chemical Company's knowledge creation practice. Section six concludes the paper.

2. Theoretical Background: The Need for Integration of Organization and Individuals

Most knowledge scholars agree that knowledge has multi-dimensions such as tacit and explicit knowledge (Kogut and Zander, 1992; Lam, 2000; Nonaka and Takeuchi, 1995; Polanyi, 1964); ontology of knowledge (Lam, 2000); dispersed knowledge (Hayek, 1945; Tsoukas, 1996); individuals and the institution (Coleman, 1986, 1990; Felin and Foss 2005, 2006; Mahnke and Foss, 2007; Nelson and Sampat, 2001); knowledge sharing among

employees (Argote and Ingram, 2000); processes of reflexivity and direct social interaction (Bourdieu, 1977,1990; Nonaka and Takeuchi, 1995; Tsoukas, 2009); access costs to knowledge (Mokyr, 2000); communities of practice (Brown and Duguid, 1991; Cook and Brown, 1999; Gusman, 2009); and the evolution of knowledge creation practices (Bourdieu, 1977; Nelson and Winter, 1982; Popper, 1982).

Characteristics of tacit and dispersed knowledge have been discussed most frequently in knowledge and capability creation because understanding them is essential in knowledge management. Tacit knowledge is available and can become an important source of competitive advantage when the company mobilizes it for innovation in products, processes and services. Polanyi's (1966) statement on tacit knowledge tells the complexity of the issues in knowledge creation. He states that we can know more than we can tell (p.4). According to Schön (1983), tacit knowledge is rooted in action, procedures, routines, commitment, ideas, value and emotion. The embeddedness of knowledge in individuals and action is one of the central characteristics of tacit knowledge and this characteristic of tacit knowledge requires an approach, which integrates individuals and organizations.

Organizations create knowledge and convert the knowledge into organizational competence; individuals in organizations create knowledge. Felin and Foss (2006) introduce a new framework where the micro-level explanation improves on the collective level explanation by using Coleman's (1990) framework as a tool. Felin and Foss (2006) argue that the theory relies on individual factors, and potential intervention occurs at the individual level. They show one example of capabilities development by the hiring of particular individuals from other organizational settings (Song, Almeida and Wu, 2003). The model used in our paper is adopted from the Felin and Foss's framework as shown in Figure 1.

3. A Structure-agent integrative approach

Based on the general framework proposed by Felin and Foss (2006), we propose a comprehensive model of knowledge management with a macro-micro integrative approach. A Polanyi (1969) point out tacit knowing is indispensable in discovery of and all knowledge "is either tacit or rooted in tacit knowledge" (Knowledge and Being, 1969, p. 195). Personal knowledge is personal, subjective and context-specific (Argote and Miron-Spektor, 2011;

Hislop, 2009; Nonaka et al., 2000a, 2000b). A context includes the organization and the environment in which the organization embedded (Argote and Miron-Spektor, 2011; Nonaka et al., 2000a, 2000b). Knowledge creation involves knowledge conversion from tacit to explicit and combination of explicit and explicit knowledge. Knowledge creation also involves interactions (socialization) among individuals because firm's knowledge is often created by a team. Nonaka et al. (2000a, 2000b) argue that a firm creates knowledge through the spiral of socialization, externalization, combination and internalization (SECI), and a firm exists when the knowledge conversion rate of the firm is higher than that of the market in the long run. Figure 1 represents the framework which combines contexts, structure, interactions and reflections of knowledge creators. Each component of the model is explained in the following sections.

We modified Felin and Foss' (2006) framework and Figure 1 is a modified version of Felin and Foss model. Our model includes factors affecting knowledge creation from individual, organizational and external environmental levels.

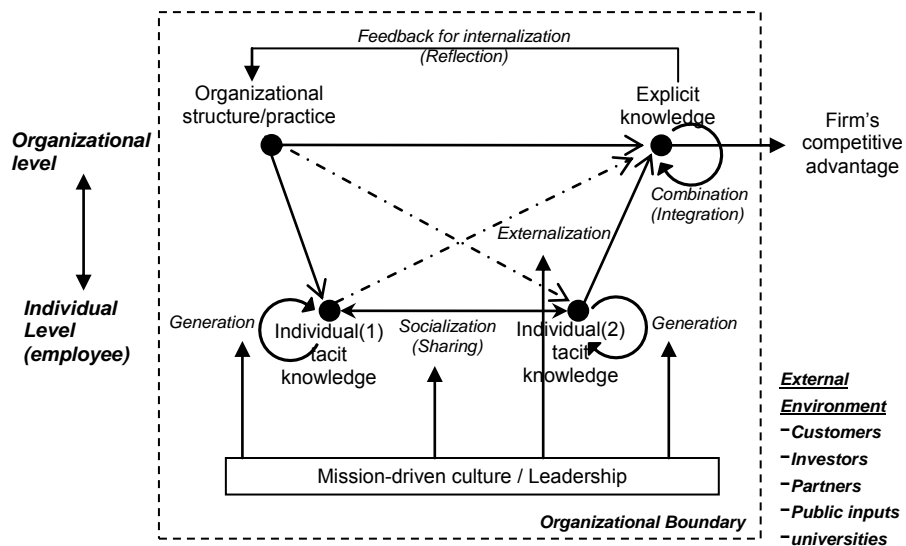


Figure 1. Conceptual Framework: Micro-Macro Integrative Approach to Knowledge Creation

3.1 Organizational structure

Organizational structure is an important component of knowledge management. The primary goal of any economic organization is to produce the output customers want at the lowest possible cost (Brickley et al., 2001). Firms need to change products, processes, services and management systems as customers' demands and technologies change rapidly in the global economy. A key input for these changes is knowledge. One of the propositions in knowledge management is that knowledge is abundant, but the ability to use it is scarce. The firm's ability to capitalize on the available knowledge is a major source of sustainable competitive advantage.

However, there are two challenging complications for making use of the available knowledge. First, knowledge is dispersed and embedded in individuals (Hayek, 1945; Polanyi, 1964, Tsoukas, 1996) and it is costly to wring out knowledge from individuals. Second, there are incentive problems for managers as well as agents in knowledge creation. Managers might not have the proper incentives to obtain true knowledge, and agents also might not have appropriate incentives to share and transfer their tacit knowledge. Hislop (2005) points out that the subjective, socially constructed and culturally embedded knowledge is open to dispute. He argues that managers might exert power or influence over different groups/individuals to develop incompatible and contradictory analyses of the same event. The organizational structure, organizational culture and trust among agents can influence agents' knowledge sharing/hoarding decisions. Therefore, the organizational structure is a control variable for knowledge creation.

Knowledge creation involves the conversion of tacit knowledge into explicit knowledge and a combination of explicit knowledge (Kogut and Zander, 1992; Nonaka and Takeuchi, 1995). Thus knowledge creation needs to address problems of dispersed knowledge and incentive incompatibilities. Knowledge scholars such as Foss and Mahnke (2005) raise the following questions:

How can employees be induced to make their human capital firm-specific when this puts them at risk? What are the complications of knowledge creation in teams? Do individual incentives enable or impede knowledge creation in teams? (Foss and Mahnke, 2005, p. 86).

Organizations need to effectively address these problems when designing their organizational structures for knowledge creation. There are numerous alternative structures to solve these problems and firm's knowledge outputs may differ depending on organizational structures: functional, divisional, matrix structure and/or project team. Brickley et al. (2001) includes three important components of organizational design that are determinants of the success or failure of the firm: 1) The assignment of decision rights, 2) The method of reward, and 3) The structure of systems to evaluate the performance of both individuals and business firms (Brickley et al., 2001, p. 281).

The appropriate organizational structure depends on the types of knowledge the firm needs to create. In general, the organizational structure of knowledge creation tends to be a project team. This project team or community of practice is self-organized, voluntary and less hierarchical. The structure of the team tends to vary among organizations, and research needs to investigate how organizational structures affect individuals' knowledge sharing/hoarding decisions and interaction among individuals.

The research that focuses on links between the organizational structure and individuals' behavior has been drawing more attention from scholars lately (Weick 1977; Coleman, 1986; Felin and Foss, 2005, 2006; Foss and Mahnke, 2005; Nelson and Sampat, 2001). Bourdieu's structure and habitus framework (1977, 1990) might be appropriate in establishing a relationship between the organizational structure and individual behavior. The objective structure might encourage individual agents to develop dispositions of imagination, empowerment and creative thinking if the culture of the firm is conducive to developing such dispositions. An integrative approach to governance and competence as proposed by Felin and Foss (2005, 2006) can be tested empirically by examining Foss and Mahnke's (2005) ten refutable propositions. Nelson and Sampat (2001) argue that physical and social technologies co-evolve. Their view on shared culture for economic progress might be applied to the relationship between structure and individual behavior in knowledge creation.

Our view involves a strong belief in the importance of shared culture in molding what people think is appropriate to do, but at the same time a belief that in many cases at least individual and group process winnow out grossly inferior or self destructive practices, and when new challenges or opportunities arise, there can be major changes in institutions which allow significant economic progress (Nelson and Sampat, 2001).

Social technologies in Nelson and Sampat are akin to organizational structure. The importance of social capital in the formation of intellectual capital is well documented by Nahapiet and Ghoshal (1998). Therefore, both cultural capital and social capital (Bourdieu, 1977, 1990) can be mobilized in knowledge creation.

Organizational practices, embedded in the given organizational structure, play a critical role in effective and efficient management of the entire knowledge creation and sharing processes within a firm. They may include knowledge-enhancing human resource management programs, such as training and selection, participative work design, performance appraisal and feedback, and incentive schemes that promote active learning initiatives. Generally, these organizational practices are designed to provide employees with ownership rights to remedy agency-managerial costs and to maximize their initiative behaviors, such as active participation in knowledge creation and sharing at the workplace.

Ownership of an asset or a firm entails two rights: 1) the right to participate in the control of the asset or the firm, and 2) the right to appropriate the residual earnings for the asset or the firm (Hansmann, 1988; Hart and Moore, 1990). Based on this notion of ownership, Ben-Ner and Jones (1995) suggest that employee participative work organization is defined in terms of rights employees hold to claim for financial returns and/or to participate in decision making within the firm. These two rights vary in degree and level, depending on the nature of employee participation arrangements.

We suggest that a given company's knowledge creation processes are strongly supported by those organizational practices that provide employees with these two participatory rights (i.e., ownership in control and financial returns) and those supportive practices which make them complete and genuine.

3.2 Individual identity: knowledge generation

At the individual worker level, given the structural setting within the organization, we suggest that such variables as personal traits, work attitude including job satisfaction and organizational commitment, trust among organizational members, and pre-existing knowledge may play a critical role in facilitating generation of knowledge for the organization. This self-learning process either may remain tacit or become externalized into an explicit state of

knowledge which promotes knowledge-sharing behavior. Among these variables, trust in particular enables cooperative behavior, promotes collaborative-based forms of organization, reduces interpersonal conflict, facilitates rapid formulation of an ad hoc work group, and encourages effective reactions to crises (Rousseau et al., 1998).

3.3 Mutual interaction at the individual worker level: sharing & integration

In order to identify management practices that may encourage and sustain such knowledge sharing, we first analyze the socio-psychological nature of this behavior. The concept of the collectivistic tendency of the employees could be defined as the social tendency of in-group perception in the workplace (Earley, 1993; Hofstede, 1980; Wagner and Moch, 1986). Specifically, the collectivistic tendency means that “individuals view and identify themselves through a small number of memberships in groups” (Earley, 1993, p. 321).

Once successfully completed the self-learning process will in turn successfully transfer to mutual learning in which groups of individual workers promote elements of individual and group characteristics based on personal traits and organizational culture and climate.

3.4 Organizational reflection: organizational feedback

The organizational structure is remade by the success or failure of previous actions and the organization improves organizational structure by reflexive feedback from individuals. Bourdieu's Notion of habitus (1977, 1990) provides the practical skills and dispositions necessary for individuals to navigate the knowledge creation process within a given organizational structure. Thus it resolves the antinomy between objective structure and individual subjective structure (see Figure 1). Problems in organizational structure will surface as individuals engage in knowledge creation under a given organizational structure. In this way firms accumulate knowledge about problems of the organizational structure. Popper's evolutionary epistemology (1982) offers a theoretical framework for changes in organizational structure; he argues that “all organisms are constantly, day and night, engaged in solving-problems” (p. 110). He states that problem-solving is always preceded by methods of trial and error; his fundamental evolutionary sequence of events is $[P1 \rightarrow TS \rightarrow EE \rightarrow P2]$, where P1=initial problem, TS=tentative solutions, EE=error elimination, P2=new problems.

Tentative solutions eliminate errors for the initial problem, but new problems might appear as individuals engage in knowledge creation under the new organizational structure. Therefore, a new organizational structure emerges as individuals in the company interact and eliminate errors in the current organizational structure. Giddens' structuration theory (1984) offers a good framework for feedback between structures and agents. We expand Giddens' theory in the discussion section.

3.5 Mission, culture, and values

Organizational mission, culture, and values may complement the structural setting for the knowledge management process of the given company. Organizational culture is believed to be the most significant input to effective knowledge management, and organizational learning in that corporate culture determines values, beliefs, and work systems that could encourage or impede learning and knowledge creation, as well as knowledge sharing (Alavi and Leidner, 2001; Gold, Malhotra, and Segars, 2001; Leonard, 1995; Schein, 1985).

Particularly in the age of the knowledge-based economy, where information asymmetry problems prevail, cultures and values may work as secret ingredients for the final success of the entire organizational learning process.

3.6 Leadership

The long tradition of leadership theory and research has only recently begun to address the role of leadership in knowledge management, despite its importance to organizations in the information age. Consequently, with very few exceptions (e.g., Berson et al., 2006; Lakshman, 2007; Viitala, 2004), information and knowledge management as key leader functions have not been systematically explored until recently (see also Bryant, 2003; Politis, 2001).

We suggest the importance of the role of leaders in knowledge management, as their role directly affects the strategic organizational support system as well as member behavior in association with various aspects of knowledge management within the organization. In particular, a leader's genuine character, which provides members with trust and vision, will play a critical role in shaping effective leadership for the knowledge management process within a company.

3.7 Stakeholder perspectives: relationship with external environment

Knowledge creation and integration also emerges from the collaboration of organizational participants and stakeholders such as customers, investors, partners, suppliers, public agencies, local community, etc. Nonaka and Toyama (2003, p. 8) emphasize the importance of boundary crossing in their analysis of knowledge “Ba”:

Ba is not limited to the frame of a single organization but can be created across the organizational boundary [. . .] as a joint venture with a supplier, an alliance with a competitor, or an interactive relationship with customers, universities, and communities. (Nonaka and Toyama, 2003, p. 8)

When expanding strategic perspectives from an internal organization to an external environment, many studies have shown that an organization managing for stakeholders results in better performance (Berman et al., 1999; Hillman and Keim, 2001; Sisodia et al., 2007). However, not much research systematically studies how a particular type of stakeholder strategy leads to the firm’s competitive advantage. Recently, Harrison et al. (2010) provided a rationale for including stakeholder theory in the discussion of firm competitiveness and performance. Specifically, it explained factors that facilitate acquisition of knowledge about stakeholder utility functions and offered a knowledge-based analysis of how firms with stakeholder management strategy can enjoy sustainable competitive benefits. Therefore, this paper follows the roadmap of stakeholder management provided by Harrison et al. (2010), including four perspectives: 1) Primary stakeholders, 2) Relationship characteristics, 3) Knowledge about stakeholders’ utility functions, and 4) Potential advantages.

Table 1. An Integrative Model of Knowledge-Creation: List of major macro or micro components and corresponding measurement variables

Components	Measurement Variables
organizational structure	Employee investment in firm-specific capital Team size, shirking and free ride Team-based incentive, individual incentive or combination Organization of team: self-selection or assigned? Evaluation system Reward system Ratio of specific to general learning investment Use of high-powered incentives to firm specific learning Effect of up-or-out rules versus up-or-stay rules for investment in firm-

	<p>specific capital</p> <p>Resolving incentive conflicts in knowledge creation by means of incentives, and/ or promotion rules and / or deferred payment and / or access</p> <p>Firms' sponsoring certified acquisition of general skills as a form of merit pay to induce higher employee investments in firm-specific human capital</p>
Organizational practices	<p>Employee participation in decision-making (e.g., Suggestion System, Team, TQM, QC, etc.)</p> <p>Employee participation in financial returns (e.g., Incentive Pay, Merit Pay, ESOP, Profit Sharing, Gain Sharing)</p> <p>Supportive programs (e.g., Training and Development, Job Design (Job Enrichment, Job Enlargement, Job Rotation, Performance Appraisal, Information Sharing, Technological Support)</p>
Individual worker characteristics	<p>Level of consciousness of own work process</p> <p>Job commitment and motivation</p> <p>Organizational commitment</p> <p>Pre-existing knowledge</p> <p>Personality</p> <p>Trust (self and others)</p>
Individual worker level mutual interaction	<p>(Perceived) <i>instrumentality</i> of mutual learning</p> <p>(Perceived) <i>valence</i> of mutual learning</p> <p>Social ties (spirit of cooperation)</p> <p>Culture</p> <p>Group identification (value)</p> <p>Communication</p>
Conversion of tacit to explicit knowledge	<p>Technology</p> <p>Motivation and inspiration</p>
Reflection of explicit knowledge	<p>Technology</p>
Organizational culture	<p>Sense of community (e.g., growing together)</p> <p>Admitting making mistakes</p> <p>Caring for human relationships</p> <p>Valuing stakeholder relationships</p> <p>Emphasizing triple bottom line (i.e., financial, social, and environmental performance)</p> <p>Thickness of culture</p>
Leadership	<p>Charisma</p> <p>Passion and Compassion</p> <p>Vision</p> <p>Lived value and consistency</p> <p>Humility</p> <p>Forgiving and love</p>
Stakeholder Relationship	<p>Trustworthiness</p> <p>History of fair distribution of value: Distributional justice, reciprocity</p> <p>History of stakeholder influence on management decisions (salience, procedural and interactional justice)</p>

4. Discussion

Despite its theoretical contribution, the study of Knowledge Management has suffered in its applicability to the real world. The relatively unknown mechanism concerning how knowledge creation actually happens within a given macroscopic organizational structure and culture, with microscopic individual worker attitudes and behavior, and interactive processes at the macroscopic organizational level each warrant further study.

This paper develops an integrated model which incorporates both the macro and micro levels of components, providing a relatively more complete picture of the knowledge creation process at the workplace. The long debated issue of “methodological individualism” versus “methodological collectivism” carries a profound question: “What is the relationship between the micro and macro levels? Do we always need to invoke micro-level explanatory mechanisms when trying to explain some macro-level phenomenon?”

Our proposition is that the knowledge creation process is a classical example which requires an integrative approach. Indeed, the literature in strategic management and organization theory has made significant contributions in its focus on the firm’s rational choice regarding design of organizational structure, and corresponding managerial practices provide a systemic view of how an organization as an entity should behave. However, organizations are made up of individual human beings. Knowledge is inherent in individuals initially; thus all knowledge creation starts with an individual employee’s self-learning process. This elementary truth has been lost in the increasing focus on structure, with negative consequences for theory-building, empirical work, and managerial practice.

We also believe that addressing the integrative frame of the structure-agent approach (or, multiple level analyses) presents some advantages, especially in the post-industrial knowledge based economy. With the increased risk of information asymmetry and agents’ moral hazard behavior in this era of complex technology and environment uncertainty, it is rather naive to believe that structural arrangement alone will provide perfect control and monitoring. Therefore, understanding the microscopic individual worker level is necessary to complete the macroscopic structural analysis of the knowledge creation process.

Extending the analysis to the microscopic individual worker level should also include external stakeholders as well. Our model in that sense is an open and dynamic system approach, which includes interactive participation in knowledge creation and sharing from external stakeholders such as customers, investors, partners, academic community, and others. We believe that knowledge management is going through a new era which includes active external stakeholder participation; thus knowledge management warrants further study in line with the stakeholder management paradigm.

We employ several theoretical frameworks for our discussions. First, Polanyi's (1966) tacit and explicit knowledge are the basis for discovery of knowledge. Second, Whitehead's (1929) process and reality offer a framework for the knowledge creation process. Third, the social theory (Bourdieu, 1977, 1990; Giddens, 1984; Coleman, 1986, 1990; Sewell, 1992) is suitable for the analysis of the relationship between the structure and individual (agent) behavior. Fourth, dynamic managerial capabilities integrate theories and practices to create and maintain a firm's competitive advantage (Bourdieu, 1977; Helfat et. al, 2007) and develop a knowledge creation model (Nonaka and Takeuchi, 1995; Kogut and Zander, 1992).

4.1 Tacit and explicit knowledge

The traditional definition of knowledge is "justified true belief" (Nonaka, 1994; Kimball, 1999). Belief is personal and private. We therefore need justification for knowledge and this justification is external (Kimball, 1999) and objective. Polanyi (1962) recognizes the indispensable role belief plays in all knowing.

We must recognize belief once more as the source of all knowledge. Tacit assent and intellectual passions, the sharing of an idiom and of cultural heritage, affiliation to a like-minded community: such are the impulses which shape our vision of the nature of things on which we rely for our mastery of things. No intelligence, however critical or original, can operate outside such a fiduciary framework (Personal Knowledge, 266).

Polanyi's statement includes many important aspects of current knowledge creation debates, such as belief, sharing and vision. How does a knower form belief? Polanyi (1966) argues that "our body is the ultimate instrument of all our external knowledge" (p. 15). We may probe things outside by a sentient extension of our body. Our awareness of our body for

attending to external things comprises focal and subsidiary awareness. Focal awareness, the object of our attention depends on subsidiary awareness. Polanyi (1969) pointed out that “focal and subsidiary awareness are not two degrees of attention but two kinds of attention given to the same particulars” (Knowledge and Being, 128). He uses recognition of a countenance as an example. Mitchell (2006) summarizes Polanyi’s example: the particular features of the physiognomy are subsidiarily known, and the integration of the particulars such as the nose and eyes produces the recognizable face, which is the focus of our attention. According to Mitchell (2006), “Polanyi’s most significant insight concerns the basic operation of mind: all knowing consists of the integration of subsidiary and tacitly sensed particulars into a focal and articulated whole” (p. 70). Polanyi identifies the object of our attention, the subsidiaries of our attention, and the knower as the triad (three components) of his tacit knowing. The knower integrates the subsidiary and the focal awareness into the active process that constitutes tacit knowing. However, the triad is not permanent and the knower can dissolve the triad by looking differently at the subsidiaries.

Polanyi (1969) pointed out that tacit knowing is indispensable in discovery of knowledge and all knowledge “is either tacit or rooted in tacit knowledge” (Knowledge and Being, 1969, p. 195). If all knowing is either tacit or rooted in the tacit, the knower is indispensable in knowing. The knower integrates subsidiary elements within a focal whole; therefore, explicit knowledge is rooted in tacit knowledge and tacit knowledge is the origin of knowledge. The knower acquires tacit knowledge by experience (indwelling) and engages in discovery of knowledge. Individuals’ efforts contacting hidden reality leads to a discovery of new knowledge. Polanyi (1966) argues that indwelling is the proper means of knowing (p. 16). An individual in Figure 1 is indwelling in her job and is gaining experiences, acquiring intuition for a discovery of new knowledge through her experiences. For Polanyi, intuition is making a guess and guessing correctly. He uses the notion of intimation of hidden reality. Individuals who are indwelling in their jobs develop a good intuition and easily detect the intimation from the hidden reality. As the knower (employee) cumulates tacit and explicit knowledge, the knower improves the discovery of knowledge. In the same vein, Cook and Brown’s (1999) generative dance between knowledge and knowing explain how the interplay between knowledge and knowing can generate new knowledge and new ways of knowing. Polanyi

(1966) indicates that there are many particulars of hidden reality; they are inexhaustible. Therefore the discovery of knowledge from the hidden reality can be continuous. The discoveries of Nonaka and Takeuchi's (1995) kneading for bread making and Orr's (1996) knowledge sharing among service workers for Xerox copy machines provide paradigmatic examples of this discovery of knowledge.

The organization needs a process that can wring out tacit knowledge and encourages employees to engage in the discovery of knowledge.

4.2 Process of knowledge creation

We can adopt Whitehead's process philosophy for the process of knowledge creation. Whitehead's philosophy is known as very complex. Scholars help us comprehend his main themes (Mesle, 2008; Sherbune, 1966). Whitehead (1929) contends that our world and our lives are dynamic and interrelated. Reality itself is a vast macro process embracing a diversified manifold of micro processes, novelty, innovation, and the emergence of new focus as inherent features of the cosmic scene. Whitehead, known as the philosopher of organism focuses on "becoming" and sees the world as organic. Reality in Whitehead's universe is interconnected, relational, and dynamic.

For Whitehead, "all knowledge is conscious discrimination of objects experienced" (Whitehead, 1933, p. 176). He argues that knowledge is the subjective form of the interplay of knower with known. Whitehead also indicates that the notion of mere knowledge is a high abstraction, and that conscious discrimination itself is a variable factor present only in more elaborate occasions of experience. The basis of experience is emotional and sensual. He accepts that "all knowledge is derived from, and verified by, direct intuitive observation" (Whitehead, 1933, p. 177). According to Desmet (2009) "Whitehead's analysis of sense experience stems from the idea that our experience is a stream of experiential moments in which each moment is initially determined by its past" (p. 4). Desmet points out that a vague feeling of all past things exercises a causal influence on the present moment, so that the past is preserved in the present and the past affects the future.

Whitehead attempted to integrate the theory, experiment and sensual experience (Desmet, 2009). He places emphasis on experience and distinguishes three modes of perception in each

of our perceptual moments of experience: the pure modes of causal efficacy, presentational immediacy and the mixed mode of symbolic reference (Whitehead, 1929, pp. 120-121). Applying this model employees perceive immediate presentation and efficient cause for their observations, forming perceptions on the interplay between causal efficacy and presentational immediacy. As there are possibilities of errors in symbolic reference on the interplay between causal efficacy and presentational immediacy, employees' conscious reflexive monitoring of errors can be valuable for knowledge creation. Therefore, new knowledge based on employees' experience requires verification and sharing experiences among employees. Employees' experiences present many selection alternatives for knowledge creating firms.

Creativity in Whitehead (1929) likewise has a parallel in knowledge creation. Knowledge scholars such as Nonaka and Takeuchi (1995) follow Whitehead's philosophical tradition of integrating the phenomenal and noumenal world. Mesle (2008) points out that Kant distinguishes between the noumenal worlds – the world as it is itself - and the phenomenal world - the world as actually experienced by us. The question is this: if we cannot know anything about the noumenal world, how can we know that the noumenal world exists or that it does or does not include space, time, causality, and substance? According to Mesle, Whitehead argued that the world “out there,” the world “in itself” does have space, time, and causality and that we can know this because we experience ourselves as part of that larger causal world through perception in the mode of causal efficacy (Mesle, 2008, p. 61). Our sense experience is unique and involves interpretation, as Mesle (2008) makes it clear:

Every act of experience has its own unique perspective, its own “actual world.” No two events arise out of exactly the same spatial-temporal situation. Much less do any two moments in a human life arise out of exactly the same context? Certainly, no two people share the same biography. Furthermore, each new experience involves interpretation of the received data. Mesle (2008, p. 59)

From this perspective, every employee's experience offers a perspective on the actual world, and every interpretation involves an interpretation of that world. Thus diversity of employees' experience and interpretations of the actual world are sources of creativity, and as Whitehead states creativity is the principle of novelty:

Creativity is the universal of universals characterizing ultimate matter of fact. It is that ultimate principle by which the many, which are the universe

disjunctively, become the one actual occasion, which is the universe conjunctively. It lies in the nature of things that the many enter into complex unity. "Creativity" is the principle of novelty. (Whitehead, 1929, p. 21)

Whitehead's concept of concrescence illustrates how the new entity becomes concrete by many entities growing together. Fiser and Stumpf (2012) point out that Whitehead visualized reality as a continual process in which actual entities are constantly becoming. Creativity then is the ultimate principle by which the many enter into complex unity.

The experiences of employees, customers, and competitors, reported as data, can be a basis of new knowledge creation. The experiences of these stakeholders present many possibilities (eternal objects for Whitehead), and the organization needs to establish a process to identify and select the relevant possibilities. When a good selection is made, the result is profitable for the organization. For Whitehead, "there are two species of process, macroscopic process, and microscopic process. The macroscopic process is the transition from attained actuality to actuality in attainment while the microscopic process is the conversion of conditions which are merely real into determinate actuality [i.e., it is concrescence]" (Whitehead, 1929, p. 326). However, current scholars argue they are species of one process. According to Sherburne (1966), Whitehead's process is the creative thrust from many to one, producing a novel entity that is other than the many that gave rise to it, and thus part of a new many that in turn is productive of new novel entities. This rhythmic alteration between many and one is a process. Experiences of many stakeholders in the organization contribute to the creation of a novelty. Therefore, the stakeholders in knowledge creation (see Figure 1) need concrescence because they are all connected, as in Whitehead's philosophy of organism or process.

Argote's (2011) organizational learning model includes the task performance experience as sources of knowledge. She states that "experience is what transpires in the organization as it performs its task" and "experience interacts with the context to create knowledge" (p. 1124). The context has two dimensions: environmental context and latent organizational context. Our model in Figure 1 includes both dimensions. A new innovation in product, process and service may require knowledge from employees, suppliers, customers and competitors, as well as other relevant stakeholders. In the long-run the organization cannot grow at the cost of stakeholders. This requires the formation of a network with relevant stakeholders and

collaboration among stakeholders has become increasingly important in knowledge creation and new product development.

One must understand the principle of creativity to see how concrescence and transition of fluency are species of one process. Sherburne (1966) points out that the notion of creativity is crucial to an understanding of process. Whitehead (1933) states that “creativity is the actualization of potentiality, and the process of actualization is an occasion of experiencing” (p.179). The basic presupposition of Whitehead’s system is becoming and ongoing. In this framework, an organization’s knowledge creation is becoming of its new product, process and service that make the organization ongoing. Thus the process of knowledge creation is actualization of the experiences of stakeholders in the organization.

Similarly, the knowledge and dynamic capabilities creation models by Nonaka and Takeuchi (1995), Kogut and Zander (1992) and Zollo and Winter (2002) have some common characteristics of becoming, and methods of converting experiences to new products/processes/services. Hargadon and Fanelli (2002) argue that “the conversion of latent knowledge to empirical knowledge refers to the application of knowledge latent in individuals to generate a physical or social artifact” (p. 295). They further explain that “the conversion of empirical knowledge to latent knowledge refers to the reflexive experience of individuals within the organization” (p. 295), arguing that the generation of new knowledge or the successful replication of old knowledge depends on the cyclic interaction between latent knowledge and empirical knowledge. This cyclic interaction continues in the ongoing process of knowledge creation.

In a similar vein, Bhaskar (2008) introduces two dimensions in knowledge production: the transitive dimension (the production of knowledge from and by means of knowledge) and the intransitive dimension (the independent existence and activity of causal structures and things). Bhaskar (1975) points out that knowledge in the transitive dimension is socially produced and the objects of knowledge in the intransitive dimension exist and act independently of men although their existence and/ or activity depend implicitly or explicitly upon men. He argues that scientists try to discover the reasons for things and events, patterns and processes, sequences and structures and they need to understand both ‘a concept of the transitive process of knowledge-production and intransitive objects of the knowledge they

produce: the real mechanisms that generate the actual phenomena of the world, including as special case our perceptions of them (p. 62)'. Bhaskar argues that science must be conceived as an ongoing process of transformation, continually or essentially in motion, in an attempt to capture (i.e. penetrate and describe) the stratification of the world. In capturing the concept of the ongoing process of transformation Nonaka and Toyama (2003) propose dialectics in knowledge creation. According to them dialectics is a method of thinking and acting and a way/process to approach a reality to find truth in it. They point out that the dialectic tries to approach the elusive 'absolute truth' through the process of examining and denying the series of 'relative truth,' although the absolute truth may never be found or may never exist. They emphasize the process is more important than reaching the absolute truth or not. Therefore, knowledge creation is dynamic and in motion.

4.3 Structures and agents

The sources of new knowledge elucidated by Polanyi (1966) and Whitehead (1929) are tacit knowledge and lived experience; personal knowledge and employees' experiences are sources of this knowledge. Knowledge is created by a team in an organization as team members interact in the knowledge creation process. This raises several issues in team production. The structure of the organization is designed to address these issues because it has effects on their behavior. Giddens' structuration theory (1979, 1984) may offer a framework for explaining the relationship between structure and agent in knowledge creation, as it is concerned with understanding the activities of knowledgeable human actors and the structuring of social systems.

We argue that Giddens' duality of structure (1979, 1984) can be adopted for the analysis of the actors and structure of knowledge creation. For Giddens (1979, 1984), structures are rules and resources. He regards the rules of social life as "techniques or generalizable procedures applied in the enactment/reproductions of social practices" (1984, p. 21), considering three dimensions of social structure in his structuration theory: signification, legitimation and domination. In knowledge creation, the signification (meaning) structure is shared rules, concepts and theories which actors can draw on to make sense of knowledge creation; each actor makes sense of what others say and do in his interactions with other

members by interpreting them. Each actor also receives intimation from reality, as stated by Polanyi and Whitehead. Sharing and communicating with team members can be helpful in making sense of and drawing meaning from each actor's experience and the intimation that each actor is receiving from the hidden reality. As interactions with team members clarify concepts and theories, they help create new knowledge.

Macintosh and Scapens (1990) draw on Giddens' structuration theory as their framework for management accounting. According to Macintosh and Scapens, legitimation involves the moral constitution of interaction. They argue that the legitimation structure is mediated through norms and moral codes which sanction particular behaviors, and they further point out what comprises the legitimation structure:

It comprises the shared sets of values and ideals about what is to be regarded as virtue and what is to be regarded as vice; what is to count as important and what is to be trivialized; what ought to happen, what not to happen (Macintosh and Scapens, 1990, p. 460).

Since Knowledge is tacit and lived experience (Polanyi, 1962; Whitehead, 1929) and locked in the human mind (Kim and Mauborgne, 1998), the decision to share or hoard knowledge has been the classical dilemma for exploiting knowledge in an organization. Therefore, creating shared sets of values and ideals among actors in an organization is crucial for organizational knowledge creation. This legitimation structure lays a theoretical ground for the importance of inter-personal trust among members in a knowledge creation team.

Giddens argues that domination depends upon the mobilization of two distinguishable types of resources (1984, p. 33): Allocative resources and authoritative resources. Allocative resources refer "to material resources involved in the generation of power, including the natural environment and physical artifacts; allocative resources derive from human domination over nature" (Giddens, 1984, p. 373). Authoritative resources refer to "non-material resources involved in the generation of power, deriving from the capability of harnessing the activities of human beings; authoritative resources result from the domination of some actors over others" (Giddens, 1984, p. 373). According to Macintosh and Scapens (1990), both types of resources facilitate the transformative capacity of human action (power in the broad sense), while at the same time providing the medium for domination (power in the narrow sense). They further point out that power in its broad sense is the ability to get

things done and to make a difference in the world. Because employees or subordinates can exercise significant power in the knowledge creation process managers' domination over employees tends to be more congenial than domineering because of this nature of knowledge. A study by Srivastava et al (2006) found that empowering team leaders and employees relates positively to both knowledge sharing and team efficacy.

Giddens' focus on the understanding of human agency and social institutions uses human agents and actors interchangeably. According to Sewell, Jr. (1992), Giddens places a great deal of weight on the notion that actors are knowledgeable, defining knowledgeability as "everything which actors know (believe) about the circumstances of their action and that of others, drawn upon in the production and reproduction of that action, including tacit as well as discursively available knowledge" (p. 375). Actors become knowledgeable about knowledge creation structures as they develop a set of dispositions on structures, which Bourdieu (1977) refers to as habitus. For Bourdieu (1977), habitus is a system of dispositions (lasting, acquired schemes of perception, thought and action). The individual agent develops these dispositions in response to the objective structure that the individual encounters. He argues that agents inculcate objective social structures into the subjective, mental experience of agents. Because a habitus tends to favor the particular social arrangement of society and reproduce the very structure of society, Bourdieu insists that sociologists must pay conscious attention to the effects of their own position on distortion or prejudice. This reflexivity can impel sociologists to correct their biases and prejudices. Ösbilgin and Tatli (2005) review Bourdieu's work and argue that his work can contribute to organization and management studies in three substantial ways:

- through (1) offering a conceptual framework for a multilevel research agenda in organization
- and management studies, (2) presenting an epistemological and methodological framework
- for tackling issues of reflexivity in the research process, and (3) proposing a methodological
- and epistemological way to overcome the dualities between structure and agency and

- objectivism and subjectivism (Ösbilgin and Tatli, 2005, p.855).

Therefore, the reflexivity of individuals can be a key factor contributing to knowledge creation.

Similarly, Giddens addresses issues in the interplay of agents' action as well as social structures in the production, reproduction and regulation of social order. For Giddens (1984), the duality of structure means that structures shape actors' practices, and their practices reproduce structures. Reflexive monitoring of an agent's action and interaction helps recognize intended and unintended consequences. Agents address problems of adverse unintended consequences that can lead to changes in structures.

Giddens refers the actions taken by individuals to agency. These actions taken by individuals (agency) take place as a continuous flow of action. Macintosh and Scapens (1990) sum up Giddens' agency and structures and present them as a figure (see Figure 2). Agents are purposive and know a great deal about why they act in the way they do. They can and do provide rationales for their actions and interactions. However, although many of the consequences of agents' behavior are intended and known, other consequences may be both unintended and unknown. In their reflexive monitoring of action in social settings, agents rely on both their discursive and practical consciousness and are motivated by an unconscious need for ontological security. (Macintosh and Scapens, 1990, p. 4)

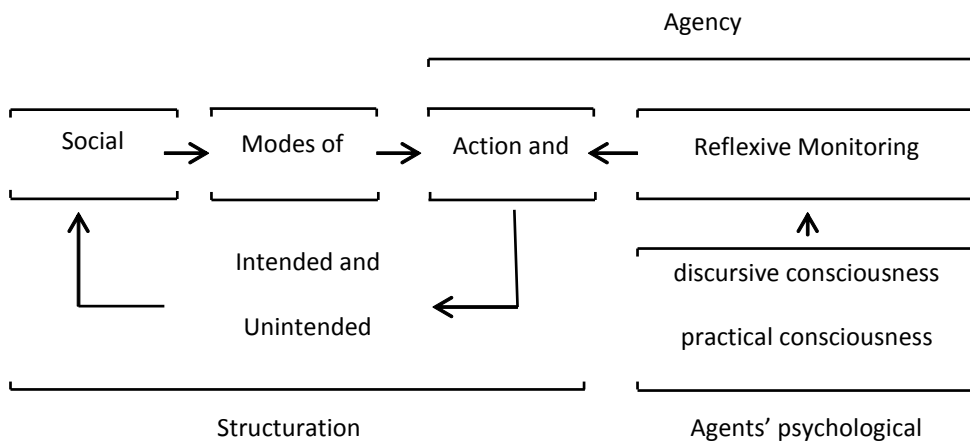


Figure2. Agency in structuration. Macintosh & Scapens, 1990

At the discursive level of consciousness, agents are able to give reasons for their behavior, and at the practical level of consciousness, agents understand what to do in social situations based on stocks of knowledge they acquired. The practical level of consciousness has an affinity to Bourdieu's habitus. Acts have unintended consequences and unintended consequences may systematically feed back to the unacknowledged conditions of further acts. Therefore, structure is dynamic, a continually evolving outcome and matrix of a process of social interaction (Sewell, Jr. 1992). Agents are empowered by structures, both by knowledgeability of structures and by the access to resources that enable agents to enact structures. Therefore, reflexive monitoring of actions and interactions leads to making changes in structures and agents' behavior.

Giddens uses the concept of routine in organizations to provide a sense of ontological security and trust on the actions and interactions among agents. Giddens (1984) refers to routinization as "the habitual, taken for granted character of the vast bulk of the activities of day-to-day social life; the prevalence of familiar styles and forms of conduct, both supporting and supported by a sense of ontological security" (p. 376). Actors' reflective monitoring and organizational routine make the transformation of structures in social settings dynamic and stable. The organization needs to make continuous changes, but at the same time needs to maintain stability to stem the flux and uncertainty of actions. Fuchs (2003) attempts to integrate Giddens' structuration theory to the theory of social self-organization, Fuchs (2003) pointing out that "Giddens' structuration theory fits well into the framework of a theory of social self-organization that stresses the role of human actors as creative beings" (p. 133). Fuchs argues that "the interactions between components result in new properties of the system that cannot be fully predicted and cannot be found in the qualities of the components. Microscopic interactions result in new qualities on the macroscopic level of the system" (p. 135). Changes in structures on the macroscopic level of a system are caused by actions and interactions of conscious knowledgeable actors.

Giddens' structuration theory provides a framework for knowledge creation structures and agency. If we assume that there are two employees in a knowledge creation team, both have tacit knowledge and lived experiences from their respective jobs. They have acquired knowledge from customers, investors, partners, competitors and the scientific community.

Therefore, individuals engaged in knowledge creation are knowledgeable, conscious and reflexive. Individuals can also anticipate possible future states, based on their abilities to detect intimation from the hidden reality in their fields (Polanyi, 1969). They can anticipate change in technologies, markets and regulations. A knowledge creation team consists of individuals with these traits who participate in knowledge creation. According to Fuchs (2003), creativity is the ability to create something new that seems desirable and helps to achieve defined goals. Based on anticipation of the future, the knowledge creation teams design/create new products, processes and services and provide solutions to problems. Individuals' participation in knowledge creation can be regarded as a micro-foundation; their interactions result in new knowledge. Thus a new knowledge creation structure may emerge from actions, interactions and reflexive monitoring of individuals.

Structures enable and constrain actions and interactions of individuals. In Figure 1, the knowledge creation structure affects individuals 1 and 2. Individuals are affected by mission, culture and leadership in the organization and take purposeful and strategic actions to enhance their utility, forming dispositions to navigate structures (Bordieu's habitus). Individuals further develop dispositions for enhancing their knowledgeableability in organizational structures as well as organizational environments.

4.4 Structures and agents' personal traits

According to Borghans et al. (2011), "there is a growing interest by economists in personality psychology to better understand the diversity of responses of agents to similar circumstances" (p. 315). We have discussed the possible effects of diverse structures on agents. Borghans et al. argue that agents may respond differently within the same structure, as responses depend on personality traits. Psychologist Roberts defines personality traits as follows:

Personality traits are the relatively enduring patterns of thoughts, feelings, and behaviors that reflect the tendency to respond in certain ways under certain circumstances. (Roberts, 2009, p. 140)

Psychologists measure five big factors of personality traits: extraversion, agreeableness, conscientiousness, neuroticism and openness to experience. Almlund et al. (2011) show that

personality plays a powerful role in predicting life outcomes; they also argue that personality changes over time and personality changes are influenced by structures. This result is in line with Bourdieu (1977, 1990) and Giddens (1984). Knowledge management studies should examine these carefully. Structures of knowledge creation may change the personality of employees over time, and management plays a key role in guiding personality traits to a positive and productive direction.

Baer et al. (2008) have shown that personal traits of team members affect team creativity.

They argue that teams composed of individuals high on extraversion, openness to experience, neuroticism, and agreeableness, and low on conscientiousness should be more likely to possess the potential to experience creative synergies. Their arguments suggest that personality traits can be an important factor in forming knowledge creation team.

5. Practice of knowledge creation

Feldman and Orlikowski (2011) point out that practice theory as it is practiced in relation to organizational phenomena is an emerging field. They situate practice theory in relation to three ways of studying practice: “an empirical focus on how people act in organizational contexts, a theoretical focus on understanding relations between the actions people take and structures of organizational life, and a philosophical focus on the constitutive role of practices in producing organizational reality” (p. 1240). According to Bourdieu (1977) “practices are no more than executions Or the implementing of plans” (p. 96). Executions or implementing plans involve activities and Hislop (2009) defines practice as purposeful human activity. How does a firm implement knowledge creation plans? We can study practices of a firm to answer this question. We examine a knowledge creation practice of The Dow Chemical Company from a theoretical knowledge creation perspective. It would be interesting to learn how a leading innovative firm creates knowledge and competency. This section is based on an in-depth interview with Mr. Whiteman who is the president of Dow Global Technology, Inc.

5.1 Knowledge creation structure

Knowledge creation structures may vary depending on organizations (place) and time. However, knowledge creation structures today converge more easily because of the globalization of the world economy as well as information and communication technology. The currently emerging knowledge creation structure, called “ideation”, is defined as “the process of generating or conceiving ideas and concepts that may be useful for attaining some desired state or outcome” (Briggs and Reinig, 2007, p. 1). Simpson (2008) defines it more simply and concretely: “Ideation is the systematic search for targeted opportunities, and new markets, and new services” (p. 1). Park et al. (2011) have illustrated typical processes that knowledge creating companies follow in developing new competency.

The Dow Chemical Company, a leading innovative firm in the world, offers a practice for knowledge creation. Section five examines a knowledge creation practice based on the case of The Dow Chemical Company (Whiteman, 2013).

5.2 Structure in Mobilization of Tacit and Explicit knowledge

Argote and Miron-Spektor (2011) point out that experience interacts with the context to create knowledge. They categorize the context into two categories: organizational and environmental. We adopt their framework with some modification as shown in Figure 1. According to Argote and Miron-Spektor (2011) the organizational context includes structure, culture, technology, identity, memory, goals, incentives, and strategy. The environmental context includes outside of the organization such as competitors, clients, institutions, and regulators. We discuss The Dow Chemical Company’s knowledge creation from the organizational and environmental context.

Structure in Internal knowledge Mobilization (organizational context)

The Dow Chemical Company has established an Idea Central, which is a database. When an employee or a group of employees has an idea, he/she can post it to the Idea Central. All employees are encouraged to propose ideas. Dow believes that no ideas are bad ideas; it creates the culture that all ideas are appreciated and valued. Employees who work for Dow learn from their daily experiences in dealing with customers and suppliers or in their labs. Dow obtains tacit knowledge from them and from all functions, ages and regions in the world,

since it is a global company. Variations and diversity of ideas are crucial sources of knowledge creation, because they can be combined to create new knowledge. Therefore, Dow management encourages employees to express diverse ideas and create an environment for diversity. The variations in experiences by Dow employees in all functions, regions and ages are key sources of knowledge creation.

Tacit knowledge is a prime source of new knowledge creation, as Polanyi (1966) argued. Tacit knowledge is acquired through lived experiences and employees receive intimation from the realities of their daily job. Tacit knowledge of their experiences can be momentarily realized, but will be lost if employees do not capture it at that moment. The process of Idea Central helps employees capture tacit knowledge. When the Idea Central is placed in the organization, employees develop dispositions, as Bourdieu (1977, 1990) advocated. The Idea Central of Dow Chemical is also a device to utilize dispersed knowledge (Hayek, 1945), since Dow's employees are dispersed around the world.

Structure in External Knowledge Mobilization (environmental context)

Dow Chemical also has scouting departments whose jobs are obtaining knowledge from outside sources such as academic journals, conferences, universities and government agencies (NIH). Employees in a scouting department also search out information and knowledge from suppliers, customers and competitors. Dow Chemical arranges a license agreement with those who have patents, if the patent is deemed necessary for Dow. Scouting, designed to obtain knowledge from outside of Dow Chemical, is divided into many different specialties, such as engineering and science, and acquires external knowledge from various sources (see Figure 1). This knowledge creation practice of Dow provides evidence of Nonaka and Toyoma's (2003) boundary crossing. Chesbrough (2003) refers to this as the open innovation system which is the use of purposive inflows and outflows of knowledge to accelerate innovation. Chesbrough (2003) argues that open innovation saves time and costs compared to closed innovation.

External sources of knowledge have been gaining importance in the knowledge economy. Apple Company, for example, is known for offering strong incentives to small companies and individuals with new knowledge. If knowledge from external sources is adopted in Apple products, a significant portion of the additional profit generated by adopted external

knowledge is offered to the firm or the individual who supplied the knowledge. This is a strong incentive to the supplier of knowledge, because Apple Company has a large market and this creates value for both Apple and knowledge suppliers. Apple Company acquired multi-touch sensing capabilities from FingerWorkks (Isaacson, 2011) and Google acquired Android.

5.3 Screening

Screening at Dow Chemical is done on a monthly basis. A cross-functional team consisting of four or five members from various functions goes through all proposals posted in the idea central. This team makes judgments on ideas, based on deeper analysis of diverse proposals placed by employees from all over the world. The team initially selects the ten best proposals from the Idea Central and then narrows the list down to a few ideas for funding. Dow saves all proposals for future use. Some proposals may not be buyable at the time of screening, but they may become value generating ventures in the future, as the economic environment changes (e.g., technologies and market conditions). Since all proposals are stored in the Idea Central and they are accessible by Dow employees, the Idea Central serves as effective organizational memories. Therefore, costly knowledge assets that Dow created are not lost ‘on the spot,’ and the Idea Central mediates the problem stemming from the lack of coherence, over time decision making raised by Nonaka et al. (2006). Dow can also make use of knowledge assets stored in the Idea Central by combining with future proposals for creating new products, processes or services. Screening can be regarded as a validation process of new knowledge because knowledge is “verified true belief”.

5.4 Basis for screening (how to screen)

The way that Dow Chemical screens proposals is interesting. Dow’s screening method is like putting pieces of a puzzle together. Dow maintains that sustained profitability of any business is only possible with all three advantaged positions. The first piece of the puzzle is technology advantage. Does Dow have a patent or patents for the proposed idea? Patents that need to be evaluated are composition, process, and application patents. If they do not have

them, they need to solve that puzzle by contacting patent holders for license agreements or a joint venture. The second piece of the puzzle is operations advantage which includes low cost raw materials, low capital options, process experience, synergistic cite, supply chain and regulatory constrains such as environmental health and safety regulations. They assess raw material requirements as well as accessibility of required raw materials and facility and capital. Costs of acquiring them need to be competitive. The third piece of the puzzle is market channels, which includes customers, brand names, reputation, synergistic sales, channel partners, market sales forces and meeting requirements of regulatory agents such as Environmental Protection Agency (EPA) and Food and Drug Administration (FDA).

There are smaller puzzle pieces within the three large pieces. In assessing each piece of the puzzle, limitations or constraints are analyzed. If Dow is missing technology pieces, they may develop them within the organization or acquire them from outside. Dow needs to assess the availability of raw materials, facility and capital as well as missing pieces of the operations puzzle. When they find missing pieces (constraints) they have to solve them. The market channel piece of the puzzle is figuring out customers, brand names and sales forces. They also examine market penetrability; some markets are very difficult to penetrate because newcomers have insurmountable barriers to overcome. When all the missing pieces of the puzzles are found, they put them together to create value for Dow. Dow will benefit from the entire value pie when Dow put together all pieces of the puzzle. Figure 3 is a graphical presentation of this screening process.

Once Dow has established the new competency at competitive levels, competitive advantage depends on recognizing new business opportunities and recombining these capabilities and unexploited proposals at the data central as emphasized by Helfat et al. (2007) and Argyres (2011). Argyres argues that “organizational economics can offer insights into features and processes that can promote or hinder opportunity recognition within organizations (p. 1141).” According to Argyres “governance choices are endemic to any capability development process, because such processes involve structuring incentives, allocating authority, and stimulating information flow (p.1142)”. Structuring incentives and allocating authority can influence knowledge creation and sharing knowledge.

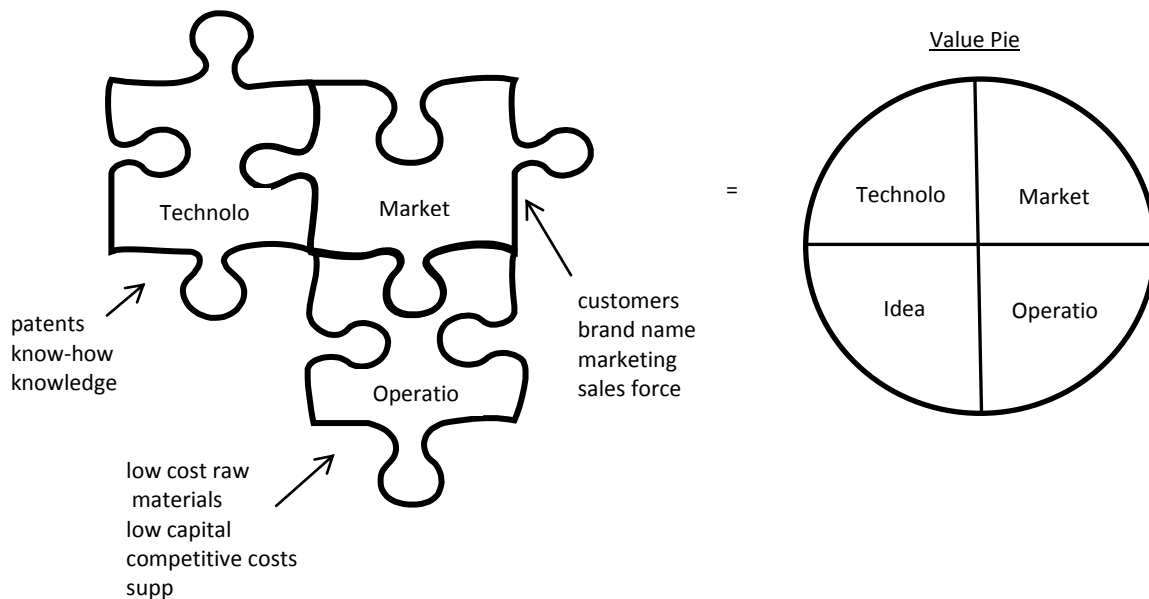


Figure 3: Screening process

It is hard to make judgments about what pieces of the puzzle can or cannot be found, and even if the pieces are found, the cost structure may not be competitive enough to embark on the project. They learned the hard way not to waste time and resources for a project that has missing pieces, or is too costly or impossible to find. Appropriate structures are established based on experiences of failures to prevent future failures. This establishment of structures is an example of the realization of theories of Giddens' structures and agents (1984) and Bourdieu's reflexive feedback and self-monitoring (1977, 1990). Therefore, the knowledge creation process is emerging and ongoing, as Whitehead advocated (1929). This process also supports the proposal made by Spender (1996) that knowledge is the basis of a dynamic theory of the firm.

5.5 Collaboration

What can Dow Chemical do with ideas when they cannot overcome constraints or find missing pieces of the puzzle? Dow figures out factors that the company is missing in the puzzle. Dow then decides to make them internally or to fill them from outside. They license

out (sell) ideas to those who have the capabilities to use them or form a joint venture. Dow Chemical searches for a firm that needs the knowledge that Dow has and negotiates a license agreement. A joint venture agreement is another solution for utilizing their ideas. They form a joint venture by connecting a network of companies which have pieces of the puzzle (technologies, ideas, and operation). They can find small companies who have good ideas or Dow's missing puzzle pieces and establish joint ventures. This example shows that innovation capabilities are distributed across firm boundaries, and managers combine distributed innovation capabilities to create a new capability through structures which coordinate the contributions of the various participating firms (Coombs and Metcalfe, 2002). Coombs and Metcalfe (2002) argue that we need to consider how the capabilities perspective can be extended to embrace a multi-firm perspective on innovation. They further argue that capabilities themselves become an important unit of analysis which is not coterminous with the firm. Madhok (2002) points out that "the reasons for collaborations between firms is to combine synergistically two sets of complementary but dissimilar resources and capabilities in a manner which will generate returns that will either create a market transaction or complete internalization"(p.277). Dow Chemical recognizes that advantages frequently occur in different organizations. Therefore, collaboration is critical because each organization has a unique pile of "advantaged" puzzle pieces. There are many possibilities in finding matches with other collaboration partners who have technology, operations and/or market advantage that Dow Chemical does not have. Dow can buy, sell, create, and trade pieces with collaboration partners. Possible collaborations partners are universities, large companies, small and startup businesses, market specialists and incumbents. Finding optimum partners is crucial for the success of collaboration. Dow has developed good strategic mixes for acquiring advantage in collaboration (Whiteman, 2013). The practices of Dow's scouting, collaboration and joint venture can be regarded as an of open innovation system (Chesbrough, 2003). The openness of technology sharing economizes costs in new product development by accomplishing the economy of scale and scope as Chesbrogh (2003) argues. According to Chesbrough (2003) open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of

innovation, respectively. We can see that Dow's practice is a good example of open innovation.

However, the cross-firm structures for new capabilities innovation need to address governance issues on opportunism. Firms need capabilities to write contracts that efficiently deal with opportunistic behavior. Joint ventures among many firms require trust among the participating firms. Past experiences help build trust and reputation within the industry. Once a firm is known for taking advantage of participating firms and not sharing ideas, other firms are likely to avoid future joint ventures. Building a good reputation can be a strategic asset in the long run, because business dealings are ongoing and repeating.

Once the value pie is created, they split it based on contributions or strengths of each participant (see Figure 4 for a value pie). The initiating or proactive company can secure a better share of the value pie. This example shows that the governance choices of the firm (Williamson, 1991, 1999; Argyres, 2011) are involved in any capability development.

Dow forms over 100 joint ventures in a year, and having good intuition for what consumers would like to have is a key factor for success in joint ventures, as well as in Dow's new product development. Firms can search to find an addressable market and its size and explore market needs based on voices of customers (VOC). As von Hippel (1988) indicates, customers and suppliers are the most important sources of innovation. Voices of customers provide information on market needs. However, managers' intuition on what consumers want plays a key role in the success of a new product. The cofounder of Apple Company, Steve Jobs, was known for his good intuition on consumers' preferences and Steve Jobs and his designer, Ive, worked to simplify new design. Apple's first brochure proclaimed "Simplicity is the ultimate sophistication," and Steve Jobs had aimed for the simplicity that comes from conquering complexities, not ignoring them (Isaacson, 2011, p. 343). Samsung (a Korean chaebol) is taking a different track and values consumers' knowledge and experiences (Chen, February 11, 2013). Knowledge about what consumers want is a hidden reality and managers/knowers capture intimation from that hidden reality. Their intuition is a key element for the success of a new product. Dow's success rates are known to be 20-30 percent. This example shows how the network form of organization emerges as an adaptation to

changes in the environment for knowledge creation (Hana and Freeman, 1984; Leventhal, 1997).

Dow Chemical's practice for new product development illustrates an integration of macro-micro approaches. The Idea Central (macro level) structure is designed to solicit tacit knowledge from individuals (micro level). The variations in knowledge creation structures among organizations may have a different impact on individuals, and individuals' responses to the same structure may differ based on personal traits. If an Individual's ideas are verified by a team and the project proposed by an individual becomes a new competency by team efforts (meso level), interactions among individuals result in new qualities on the macroscopic level of the system (Fuchs, 2003). Interactions among individuals from cross-functions lead to new knowledge and competency creation in Dow. Variations of ideas offer opportunities for the organization to recombine them for new competency (Schumpeter, 1934; Kogut and Zander, 1994; Nonaka, 1994; Nonaka and Takeuchi, 1995). This example of Dow's knowledge creation illustrates how to engage in knowledge creation activity and how this knowledge evolves over time (Levinthal, 2006; Winter, 2006). Dow Chemical's idea central can be seen as a *ba* (a knowledge creating place: Nonaka and Kono, 1998, Nonaka et al., 2000a, 2003). *Bas* may vary depending on the contexts of knowledge creating firms and the market selects a good *ba* and the selected *ba* retains good characteristics of the *ba*. Variations in knowledge creating *bas* will continue in the market and the knowledge creating firm is, therefore, dynamic. According to Nonaka and Toyama (2003) *ba* can transcend time, space, and organization boundaries to create knowledge. A knowledge-based view of the firm regards the firm as a knowledge creating entity and a firm in this view is changed from an entity of being to an entity of becoming (Nonaka and Toyama, 2002, 2003) as seen in Prigogine's scientific view of the world (2003).

Collaboration saves precious time in developing new products, processes and services. Collaboration may be a better practice in a high-velocity economic environment because firms can bring new products to the market quickly. Nonaka et al. (2000b) point out that building one's own knowledge comes with cost, i.e. time. Building up knowledge assets through a firm's own knowledge creating process takes time, and hence costly (Nonaka et al. 2000b). Teece (2000) argues that the opportunity cost is especially high when the industry

that the firm is in is a high velocity economic environment. If the firm develops the missing puzzle pieces by themselves, they may fall behind the market competition.

Incentives

The intervention of managers to create knowledge can be made at both institutional and individual levels (Abell et al., 2008). First, managers need to provide opportunities for agents to interact. Managers and individuals together design an institution to be conducive for dialogue and interactions. Second, for diversity of ideas, managers need to hire individuals from many different universities and institutions and provide incentive systems for individuals and groups to acquire and share knowledge. When agents acquire useful knowledge (genotype) and skills, firms develop technology (phenotype) based on useful knowledge and knowledge sharing (intensity of knowledge), as Mokyr (2000) argues. When agents accumulate more knowledge and develop dispositions of imagination and creativity, the firm will have easy access to knowledge and creativity (Mokyr, 2000), because knowledge is stored in agents who supply knowledge and skills to the firm. Therefore, developing an incentive system for agents to constantly acquire knowledge and skills is crucial in building the dynamic capabilities of the firm. Individuals' choice of the organization, and their acquiring and sharing knowledge, depends on firm characteristics. As discussed before structuring incentives and allocating authority are important in knowledge creation and sharing.

Because managers at Dow appreciate diversity and create a culture for employees to supply many different ideas, it rewards those who produce the most ideas as well as the best ideas.

6. Conclusion

This paper attempts to integrate structure-agent approaches in knowledge creation. As firms design structures to create knowledge, individuals develop a set of dispositions in response to these structures. Thus structures influence individuals, and based on these structures knowledge outcomes may depend on individuals' actions, interactions and creativity.

The Idea Central has emerged as a model knowledge creation structure to elicit tacit and dispersed knowledge from employees and stakeholders. The Idea Central continues to change as knowledge creation teams reflect and consciously self-monitor structures and knowledge outcomes (see Figure 1). As actions and interactions of members in knowledge creation teams generate nonlinear knowledge outcomes, individuals in such teams tend to develop dispositions to acquire new knowledge through their work experiences and interactions with stakeholders. When they become conscious of knowledge creation, the reflexive self-monitoring employees in today's knowledge economy are valuable in both knowledge creation and changing organizational structures.

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The role of knowledge management in the creation of social capital and sustainable development of organizations. Evidence in tourism enterprises

Mercedes Raquel García Revilla *

Department of Tourism
Universidad a Distancia de Madrid UDIMA
Carretera de La Coruña, KM 38.500. 28400 Collado Villalba. Madrid.

Eduardo Javier Bueno Campos

Vicerrector de Investigación y Catedrático de Economía de la Empresa
Universidad a Distancia de Madrid UDIMA

* *Corresponding author*

Structured Abstract

The objective of this paper is an analysis of the strategy of gaining knowledge through social capital and sustainable development in tourism companies so they can modernize and compete with constant improvement. We will see how effective this strategy is for the benefit of companies in terms of reducing costs, leveraging technology while feeding knowledge of indirect or direct customers. Aspects of social capital and sustainable development as the approach of several authors are briefly mentioned.

Purpose – The purpose of this paper is to conduct a critical analysis of the importance in the twenty-first century presents a new approach to strategic management based on knowledge from the perspective, of resources and dynamic capabilities, as an explanation of the role critical that these intangible assets presented in today's organizations from the implementation of a particular model of governance of existing knowledge on those, Grant (1996), Spender (1996), Bueno and Salvador (1996), Bueno et al (2006), to overcome the current economic crisis affecting many countries, areas and organizations in the global economy.

Design/methodology/approach – We propose an approach work is carried out with a proposal for a study of exploratory character. Social responsibility and commitment to the ecosystem as a social strategy to assist in the socioeconomic development of the organizational environment and as a facilitator for its own sustainable development. Eljkington (1994), Bueno (2011), Leon (2011a), Leon (2011b), Parrish (2010). The exploratory analysis in the tourism sector and in hotel companies that compose it, as evidence of the importance of the new management approach considered, given the nature and character of the business model and its relation to environment performance of this industry and its companies. Bueno (2011).

Originality/value – This methodology puts in evidence the methodology carried out will show that this knowledge based on their relationship to socioeconomic sustainability, its still emerging approach given its character by emergence time, requires more research efforts and empirical evidence, therefore work shows a value of exploratory character and originality evident within current approaches of strategic management and the knowledge economy, although it emergente. Por results will corroborate the formulated inductive approach, leading rebuttal to some of the guesswork exposed and organizations concerning the tourism sector.

Practical implications – The outcomes of the application as indicated, regardless of the overall importance of an analysis of intangible assets and dynamic capabilities that facilitate sustainable economic development in organizations, especially the variables that make up the main concepts the capital of the same, focusing on corporate social responsibility and environmental commitment, stresses that the results are important for designing a management model oriented entity mentioned sustainable development based on existing knowledge in the same in their strategic application in the hotel industry, for example the Tourism sector as previously indicated.

Keywords – economic sustainability, environmental sustainability, intellectual capital, knowledge management, social capital.

Paper type – Academic Research Paper

1 Introduction

Knowledge is the primary resource and the ability to create value in today's economy and that is basically related to the human capital of the organization, so that tourism can be seen, given its value chain and production processes, as a human capital intensive sector and generator of social capital which lay a solid foundation on how it facilitates sustainable development of organizations in the sector. Similarly, social capital benefits the collective learning and innovation in order to protect the cultural and natural heritage, facilitates access to markets, strong confidence of tour operators achieving greater intervention and control thereof, as well as power their economic, social and cultural dynamics.

The World Commission on Environment and Development (Brundtland Report, 1987) provides a catalog of "Requirements for Sustainable Development", in this exposes a political and institutional system to ensure the effective participation of citizens in decision-making. In turn, the World Tourism Organization in 2001, poses in which success depends on the community of interest between business, civil society and

governments. In this sense, it is justified that the strategic direction based knowledge facilitates sustainable economic development organizations. (Leon, 2011a y 2011b).

According to Spender (1996) knowledge is a complex concept when building a dynamic knowledge-based theory of the business concept. In addition, if the knowledge of the company is the most essential resource and in turn resides in a specialized form among members of the organization, then the essence of organizational capability is the integration of the expertise of individuals (Grant, 1996).

In general, by social capital theory we know that people use their social resources in order to obtain mutual cooperation, achieve goals without them would be very difficult to achieve.

Regarding sustainable development, the tourism industry must be familiar to some extent market forces competing and betting on responsible tourism. Sustainable development contributes significantly to employment generation and productive occupations. The idea of using indicators of sustainable development is the purpose of using them for policy, planning and management in the destinations. Keep in mind that sustainable management practices are applicable to all forms of tourism in all types of destinations, as well as to ensure durability should ensure harmony between the three principles of tourism development: environmental, economic and sociocultural. In summary should give optimal use of environmental resources, respect the socio-cultural authenticity of host communities, and ensure long-term economic activities.

2 Preliminary Issues

Tourism is one of the sectors which has been affected by the New Technologies of Information and Communication, I touched by meeting all impositions brought about the so-called Knowledge Society.

Thus, it should be noted that the tourism sector is facing today a new context, a different scenario was used, since the demands of the market are now completely new. Therefore, companies and tourism organizations have found it necessary to reorient their way of managing your business and also the method to capture new customers.

The capital, established social networks, have a special role here that try to develop through these pages.

In this new context, which has been a paradigm shift from the previous dominant model, companies and tourism organizations need to have a rigorous quality information on the activities performed.

In summary, the information and knowledge about the client (your current customers and your potential customers) are factors that must be known to be increasingly competitive in the market. To assume success and competitiveness all these new factors characteristic of the knowledge society and business tourism organizations (just as has happened in other companies) have adopted a model of knowledge management.

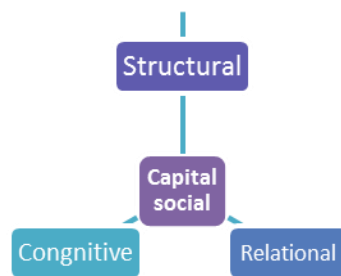
3 The importance and relevance of social capital in companies and tourism organizations: a sociocultural approach to tourism business within the knowledge society

As mentioned by Lozano, (2008), one of the defining characteristics of humans is that by nature is a social species, and therefore makes the individualistic behaviors that increasingly characterize our society and culture tends to create imbalances and conflicts between individuals, groups and organizations.

From a purely economic perspective , companies and tourism organizations operate as a criterion of competitiveness. A while now , these organizations have been including in its model address the growing role of social capital. This concept is relatively new. We say it is relatively new for the old theories about this concept have been made in the last two decades of the twentieth century. The so-called Theory of Social Capital has given great results in the study of businesses and organizations. Among the early research on this topic would include those developed by Leana & Van Buren , 1999; Tsai & Ghoshal , 1998) and can also be noted that of Nahapiet & Ghoshal (1998 : 243), the authors defined social capital as " the sum of the actual and potential resources derived from the relationships in a network." Thus, these thinkers analyzed how social capital makes facilitator for the creation of new companies and organizations intellectual capital. This is a very extensive process , since as the social capital is more important and has more networking , more benefits may be obtained , as has been seen performing tourism businesses currently.

There are three dimensions of social capital, which thereupon apply to tourist organizations (Giraldo, A et all 2013) as shown in Figure 1.

- structural: it implies the connection between the actors, the social interaction. Enjoy certain advantages those contacts that have an actor belonging to a social structure. Bueno and Merino (2007) express the structural capital refers to a body of knowledge and intangible assets arising from action processes which are owned by the organization and who stay in it when people leave.
- Relational: relates to interpersonal relationships such as trust and reliability, ie, the assets related to social interaction. Bueno and Merino (2007) state that relational capital is a set of skills that are added to the organization and the people as a result of derivative that preserves relationships with market players and society value.
- cognitive: According to Bueno and Merino (2007) Knowledge and ability to generate it by the people, they are useful for the mission of the organization. Furthermore, according Ribeiro et al (2005) would be shared meaning systems (corporate culture). With regard to corporate culture, it should be noted that there are many theories and many contributions by the authors. Point out here for Hofstade and Hofstade (2005) who mentioned that the factors that are part of or included directly in the organizational culture (and can be applied to organizations in tourism) are those mentioned below:
 - Organizational culture is broad, it is global, that is, is holistic..
 - Organizational culture is heavily influenced by history.
 - Organizational culture is also related disciplines, eg anthropology.
 - Organizational culture is socially constructed, so that is in some way a product of the society in which the concrete is immersed Tourism Organisation.
 - Organizational culture is, to some extent, difficult to change, it is difficult to transform.



Source: Prepared

Figure 1. Aspects of Social Capital.

Meanwhile, Putnam (2000) believes that social capital are the features of social organizations, and this has a special role as trust, norms and networks that can improve the efficiency of society by establishing the possibility of perform coordinated actions of character.

4 The management of knowledge in a tourist organization

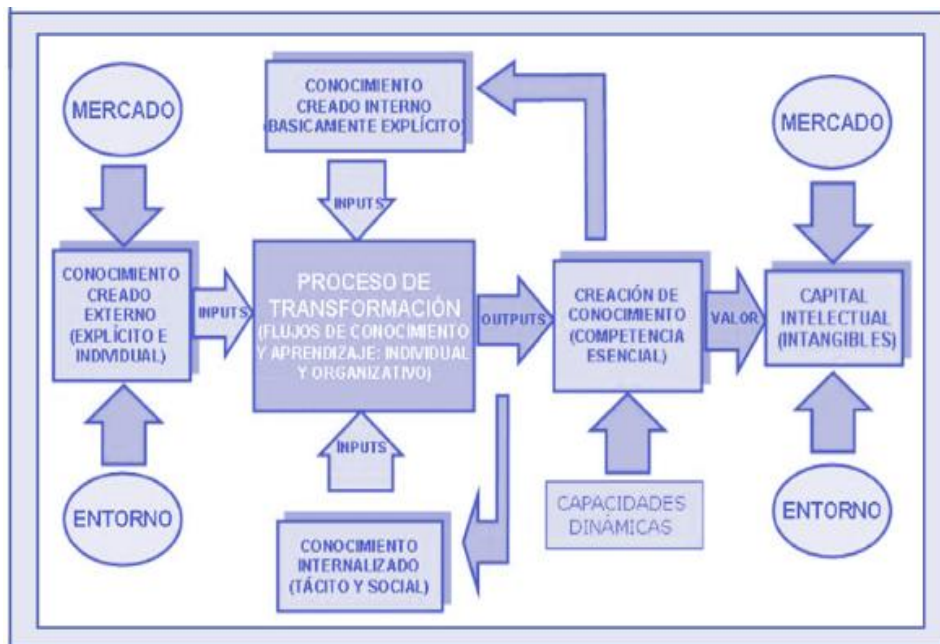
The management of knowledge can be effectively applied to all branches of the economy, economic activity, and how could it be otherwise also organizations in tourism. This is because organizations especially in tourism and hotels are immersed in an environment increasingly changing.

The management of knowledge is responsible for effectively take advantage of using the knowledge gained by the organizations (in our case analysis tourism businesses such as hotels). This knowledge is a valuable raw material, hotels and tourism in general organizations can use to your advantage to increase efficiency and profitability. They can use it, in short, to attract more customers or to retain customers who already have.

It is therefore absolutely necessary to sharpen and enhance organizational learning, where it has a special role technology and a specifically peculiar way the New Technologies of Information and Communication. In fact, the world of hotels in the XXI century could be understood but a detailed study of the impact is, for example, Internet.

To retain customers, hotels and tourist organizations usually need to know thoroughly what the tastes of the customers are, with the aim to propose a business strategy. So, offer a quality service, which will allow the customer loyalty and have, ultimately, more market presence.

Bueno (2003) presents "The Knowledge Creating System" which includes the new creation system based on knowledge value and represents a "knowledge factory". Overall, the entries are the kinds of knowledge absorbed in the company or the market, then there is a transformation of external and internal knowledge of the organization; Finally, where the outputs are the result from the creation of new knowledge is exhibited in figure 2.



Fuente: Bueno (2003).

Figure 2. Creating Knowledge System.

5 Empirical analysis

As mentioned above, due to the changing environment faced by organizations character from recent years, especially in technological achievement, they must be guided according to organizational knowledge management to achieve significant product innovation processes and services; so that their organizational structures make changes in their thanks to the knowledge they get from their customers asking for some innovations and business needs. Also, due to the economic crisis facing the tourism sector Racing obtain high occupancy rates high without lowering its cost, so the only tool you have is to

offer great customer service from obtaining knowledge about their tastes, needs and preferences (Journal of Research in Innovation Management and Technology 2008).

These changes have affected you from the point to the more general in the tourism industry, primarily in hotels. This can easily be seen to remember that since the act of opening the hotel room, such as finding hotel have changed radically. Currently, for these activities are used magnetic cards to open room, used the GPS to get to the hotel, among other things; this thanks to the New Technologies of Information and Communication (Rodríguez 2011).

However, it was also notable that some of these emerging changes have not been supported by certain changes in the organizational structure of the companies, and this can create a weak foundation in your organization. So to achieve these become more competitive with the requirements of the sector, should enjoy flexible organizational structures.

A series of studies on the new organizational structures focused on the tourist sector, were adopted as a measure to prevent the above (Bueno, Salmador y Rodríguez, 2004; Bueno, y Salmador 2006 y 2008; Bueno y Merino 2007; Bueno, Salmador y Reyes 2011).

The key to creating a new organizational structure in the tourism sector is to consider an analysis of the value chain and the same customer and the benefits that businesses can get from their customers (Rodríguez 2011).

Analysis of the value chain, consider the activities that makes a company but may be made by others that are more efficient when done by and in turn reduce costs and variables. Also, take into account the activities that can be performed by a self-service by customers thanks to new technologies, and thus rid the company of the same.

In terms of learning and knowledge management, organizations need to perceive and understand the needs and customer relationships. In this way, this would contribute significantly to the company because now the competition is huge, thus increasing the offer of hospitality services and products such as low demand due to the crisis. Therefore, according to Bueno and Merino (2007) in a complex society and knowledge-based economy, innovation is your goal and challenge, and for that we must know and learning to do and also know how to manage intangible and knowledge that generates them. Figure 3 shows most clearly.



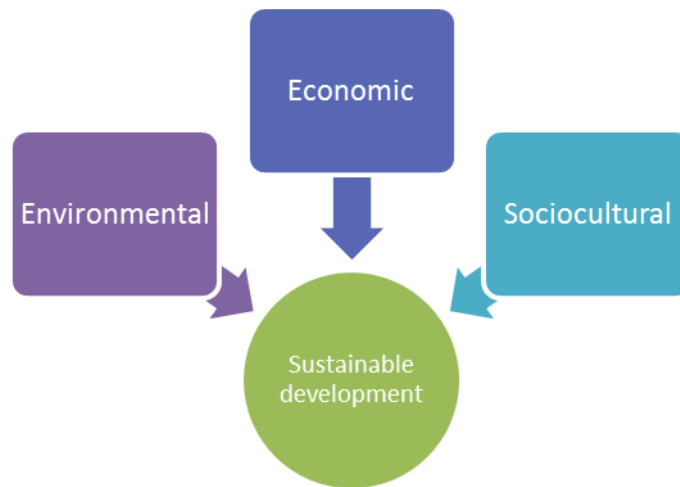
Source: Prepared

Figure 3. Competitive Strategies.

Knowledge can be obtained through opinion polls aimed at customers or based on an analysis of the history of the extras hired by clients which reflect the tastes and preferences of both the same generic type or medium. Moreover, knowledge can also be obtained through a process of learning specific tastes, needs and preferences of customers as they return to enjoy the amenities (Rodríguez, J. 2011).

In relation to sustainable development in tourism organizations, sustainable management practices can be applied in any field of tourism. According to the World Organization Turimo (OMT) the sustainability encompasses the basics of tourism development: environmental, economic and sociocultural.

1. Environmental Resources: You must give optimum use so that conserve natural resources and biodiversity.
2. Economic activities should ensure viable economic activities in the long term as well distributed which stable employment opportunities and income benefits and social services are obtained for host communities.
3. Sociocultural Authenticity: must maintain cultural assets and traditional values.



Source: prepared.

Figure 4. Sustainable Development.

Parrish (2010) discusses research on organizational design necessary for sustainability-driven entrepreneurs to succeed in a competitive market context. This, because it is expected that more entrepreneurship contributes to sustainable development as a general purpose social.

Thus, the new organizational structure demonstrates its importance, given the nature and character of the business model and its relationship to the performance setting of this industry and its companies. The following table summarizes generally the objectives and expected results.

Table 1. Objectives and expected results.

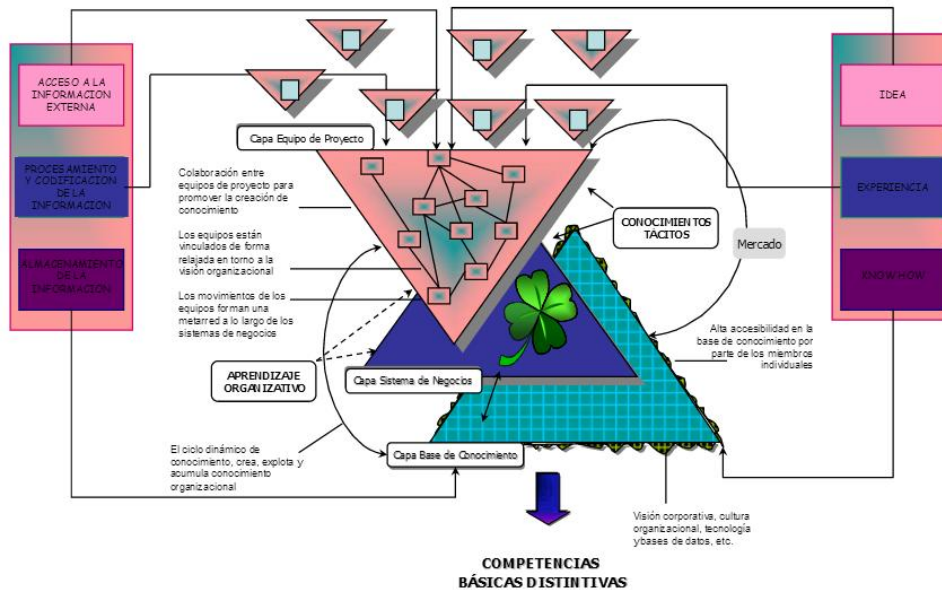
Expected goals	Dissemination of information and tacit knowledge
	Collective learning
	Competitive advantages
	Trust, cooperation and solidarity
Expected Results	Innovation
	Sustainable development
	Improved productivity levels
	Cost reduction and economic growth

Source: Prepared

As already noted, tourist organizations operate in changing environments and have to constantly adapt to change. Therefore, Leon, R. (2011) establishes the importance of an early warning system in the process of developing a strategy at a time of uncertainty.

Here is to briefly reflect a structural example of a tourism organization. Some authors, for example, Rodríguez Antón et al (2000) that said the tourism organizations can adopt a hipertrébol structure, which is the result of a combination of the latest innovations in organizational structures that are concerned, ie the hypertext structure (Nonaka and Takeuchi, 1995) and cloverleaf structure (Handy, 1995). Thus, the structure combines both hipertrébol character organizational structures, but is more advantageous. Thus, in the tourism sector in addition to obtaining customer knowledge, considers knowledge of employees to achieve an interaction between their bodies, and in turn filling sustainable development to preserve all the natural, social and intellectual aspects of tourism development.

In this regard, note that a business system (and, therefore, also a system of business tourism) is flexible in nature, as the figure shows forth below:



Source: Rodríguez (2011)

Figure 5. Organizational Structure Hipertrébol

In relation to the structures of hypertext nature, and again according to Rodríguez A., Rodríguez P. Morcillo and Casani (2010) are designed or planned taking into account the importance of the project teams, in order that companies (in our if tourist organizations) have the ability to constantly adapt to change and especially to the specific needs and variables of different types of customers.

6 Conclusions

Analysis of the concept and role models and intellectual capital management processes were observed known knowledge, that in order to make manifest an analysis model and address the basic variables or intangible assets that make up the main elements the social capital of the organization, if the corporate social responsibility and commitment to the ecosystem or relations with the social partners in response to how to take responsibility for protecting the environment in which the company competes.

An exploratory analysis in the tourism sector and in hotel tourism companies that compose it, as evidence of the importance of the new management approach considered, given the need to adapt to the new demands of technological innovations in products and services by was performed customers as of the same companies.

The hipertrébol structure was exposed Nonaka et al. As a case or empirical approach to knowledge management for sustainability of organizations or tourism enterprises.

In general, it is beneficial for the tourism industry to adapt to these new series of studies on the new organizational structures of companies created but obviously focusing on the tourism sector. Therefore, it is useful to design procedures that automatically increase the transmission of knowledge in order to create a solid foundation to contribute to business performance strengthen the quality of its services and products to turn your customers fidelicen. Finally, it was observed that social capital greatly favors the tourism industry mainly in its skill base value in the form of innovation; all this in the context of sustainable development in the sector, where there is a relationship between the tourist and the community with equanimity benefits for both

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The Triple Helix of Knowledge and the Sustainable Firm Development

Constantin Bratianu

Department UNESCO of Business Administration
Faculty of Business Administration
Bucharest University of Economic Studies
Calea Grivitei 2, Sector , 010731 Bucharest, Romania

Structured Abstract

Purpose – The purpose of this paper is to present a new paradigm for knowledge structure and understanding, based on *the triple helix* metaphor. This new perspective departs from *the known-unknown* paradigm based on *the iceberg* metaphor of explicit and tacit knowledge. Also, we would like to demonstrate the power of the new paradigm in promoting organization sustainable development.

Design/methodology/approach – My approach is based on a metaphorical analysis of the knowledge concept, and on a theoretical construct based on a new perspective. Cognitive science demonstrated that our thinking and understanding of the real world is based on conceptual metaphors. Knowledge has no referent in the real world and requires metaphors to be conceptualized, defined and used. Today, the most frequently used metaphors are the following: *knowledge as a resource*, *knowledge as flow*, and *knowledge as an iceberg*. These metaphors are based on rational knowledge and Newtonian thinking. The new paradigm is based on the metaphor *knowledge as energy*, and on thermodynamics.

Originality/value – This new paradigm is much more powerful than the previous ones since it allows transformations of different forms of knowledge into other forms of knowledge in an interactive way. The construct of the triple helix of knowledge is not just an extension of the iceberg model but it represents a completely new vision. The new paradigm has got an increased practical value since it correlates better with the knowledge management and leadership, and as a consequence, with the sustainable development of organizations.

Practical implications – Since *the known-unknown* paradigm focuses on rational knowledge, it is best suited for managers in their decision making. Leadership implies not only rational knowledge but also emotional knowledge and spiritual knowledge, and thus it correlates much better with the new construct of *the triple helix* than *the iceberg* model. Also, organizational culture is based mostly on emotional and spiritual knowledge and its role in promoting sustainability can be better understood by using the new model of the triple helix of knowledge.

Keywords – Knowledge metaphors, Explicit knowledge, Tacit knowledge, Emotional knowledge, Spiritual knowledge.

Paper type – Academic Research Paper

1 Introduction

Lakoff and Johnson (1999) demonstrate that human mind is intrinsically metaphorical, based on the recent findings of cognitive sciences that can be summarized as follows: a) the mind is inherently embodied; b) thought is mostly unconscious; c) abstract concepts are largely metaphorical. “The fact that abstract thought is mostly metaphorical means that answers to philosophical questions have always been, and always will be, mostly metaphorical. In itself, that is neither good nor bad. It is simply a fact about the capacities of human mind” (Lakoff and Johnson, 1999, p.7). Thus, metaphors use human experience and our mind imagination in explaining the reality that is our environment. “They guide our perceptions and interpretations of reality and help formulate our visions and goals. In doing these things, metaphors facilitate and further our understanding of the world” (Cornelissen et al., 2008, p.8). Applying this assertions to the concept of knowledge Andriessen (2008; 2011) showed that *knowledge* is an abstract concept whose structure and meaning depend on the metaphor used in explaining it. Since there is a practical infinite spectrum of potential metaphors we can use for knowledge, we may understand the large variety of interpretations for this concept. People coming from different fields of activity, with different individual experience and theoretical background try to explain knowledge from their own perspective.

The purpose of this paper is to present a dynamic perspective on knowledge based on a new metaphor – knowledge as energy, and on a new theoretical background – thermodynamics. In the next section I will present some of the most used metaphors in explaining the concept of knowledge, i.e. *knowledge as a resource*, *knowledge as flow*, and *knowledge as an iceberg*. Then, I will present the attributes of the new metaphor, *knowledge as energy*. Based on this latter metaphor I will introduce the concept of multifield structure of the organizational knowledge, and the concept of triple helix of knowledge. Finally, I will show how the new perspective on knowledge enhances the contribution of knowledge management to the development of a sustainable firm.

2 Knowledge metaphors

The relevance of knowledge metaphors comes from our interpretation of knowledge, organizational knowledge, and knowledge management. “The fact that we can only reason about knowledge through metaphors is not a bad thing (or a good thing), it is inescapable; that’s how the human mind works” (Andriessen, 2008, p.5). A simple

metaphor is composed of two semantic domains that are partially overlapped. The *source domain* contains the known concept and its attributes, while the *target domain* contains the less known concept and its attributes. The intersection of these semantic domains represents the common attributes the metaphor highlights and transfers from the source domain to the target domain. Not all attributes from the source domain can be transferred to the target domain, and not all attributes from the target domain can be found in the source domain. However, constructing and using a metaphor is rather fuzzy since it is up to the user to decide how much of the source domain can be transferred to the target domain, and to draw the semantic interface between the two domains (Lakoff and Johnson, 1980; Andriessen, 2006; Andriessen, 2008; Andriessen and Van den Boom, 2007; Gentner et al., 2001).

2.1 Knowledge as a resource

This is the most frequently used metaphor, since it is a direct extension of managerial experience and understanding of the organizational assets. Knowledge is considered a physical resource, with some of the attributes of physical objects. Some examples from literature will illustrate this metaphor. For ease of interpretation I will emphasize the knowledge metaphors by using italics.

“A somewhat less structured form of *accumulated knowledge* is the discussion database, in which participants record their own experience on an issue and react to others’ comments” (Davenport and Prusak, 2000, p.146).

“The realization that *knowledge* is the new *competitive resource* has hit the West like lightning” (Nonaka and Takeuchi, 1995, p.7).

“Codification can be defined as a process of *storage, indexation and distribution of formal knowledge* independently of any context” (Janicot and Mignon, 2012, p.6).

“Just as food and manufactured goods can be packaged and sold, there are ways *to package knowledge* for commercial benefit, using the intellectual property laws” (Sullivan, 1998, p.143).

It is evident that managerial thinking assigns to *knowledge* attributes transferred from the physical resources. Thus, knowledge can be *accumulated, stocked, stored, distributed* and *packaged*, although knowledge has no physical attributes. Knowledge is an intangible resource, yet it is considered like being tangible and separated from the knowledge worker (Bolisani et al., 2012). Unfortunately, in many practical situations managers with

less theoretical understanding of the metaphorical thinking extend towards the knowledge domain the attributes of tangibility and linearity, reflecting this way an extension of the Newtonian logic.

2.2 Knowledge as flow

There are two metaphors closely related: *knowledge as a fluid* and *knowledge as flow*. Both of them reflect a Newtonian logic applied to fluid flows. Objects are static and have fixed geometries, while fluids that flow are dynamic and have changeable geometries. Fluids can be accumulated and stored in reservoirs, and then they can be distributed through channels or piping systems. The most important attribute that is transferred to knowledge is the fact that fluids flow naturally downward, from a higher altitude toward a lower altitude. They may flow upward through pipes, but only as a result of some mechanical work done by pumps. These attributes of *fluid flows* have been transferred to *knowledge*, as we can see in the following examples from literature. I emphasized the metaphors through italics.

“This idea, describing the movement of knowledge from tacit to explicit, begins to depict *knowledge as a fluid* and dynamic realm” (Allee, 1997, p.45).

“For this free *flow of knowledge* to prevail, the organizational culture must be extraordinary” (Davenport and Prusak, 2000, 109).

“By addressing *the knowledge flow* process at this point, you can assess where the *flow of knowledge* is breaking down. People who don’t know anything about KM suddenly get it when they see how *knowledge should flow*” (O’Dell and Hubert, 2011, p.31).

The mechanical model of fluid flows have inspired many authors in explaining the concept of knowledge and how organizational knowledge actually works. For instance, Nissen (2006, p.XX) conceives knowledge as a fluid flowing through an organizational piping system: “To the extent that organizational knowledge does not exist in the form needed for application or at the place and time required to enable work performance, then *it must flow* from how it exists and where it is located to how and where it is needed. This is the concept *knowledge flows*”. There are at least two important differences between the metaphors *knowledge as a resource* and *knowledge as flow*:

- a) In the first metaphor the source domain is composed of discrete objects that are with given and fixed geometries. In the second metaphor, the source domain contains a fluid that represents a continuum with a changing geometry.
- b) In the first metaphor the source domain is static. In the second metaphor the source domain is dynamic, an important attribute that is transferred to the target domain where knowledge is defined.

2.3 Knowledge as an iceberg

The dyad of tacit knowledge-explicit knowledge developed mostly by Nonaka (1991; 1994), and Nonaka and Takeuchi (1995) shows that knowledge is not like a homogeneous object or flow. Knowledge is composed of two parts: a visible part reflecting the explicit knowledge and a hidden part reflecting the tacit knowledge. This conception comes from *the knowledge as an iceberg* metaphor. Explicit knowledge is represented by the part that is above the water and can be seen. Tacit knowledge is represented by the iceberg part that is under the water and it cannot be seen by an observer that is not in the water. As explained by Nonaka and Takeuchi (1995, p.8), “Tacit knowledge is highly personal and hard to formalize, making it difficult to communicate or to share with others. Subjective insights, intuitions, and hunches fall into this category of knowledge. Furthermore, tacit knowledge is deeply rooted in an individual’s action and experience, as well as in the ideals, values, or emotions he or she embraces”. Explicit knowledge is the rational knowledge people can communicate and share with others based on a certain language and culture. Explicit knowledge can be codified, stored in knowledge bases, retrieved, transferred, and disseminated through different communication channels.

The iceberg metaphor could be also an excellent visual representation of the *known-unknown* paradigm. The *known* component is represented by explicit knowledge since that is the knowledge an individual is aware of, while the *unknown* component is represented by the tacit knowledge. The unknown knowledge is larger than the known knowledge, like the two parts of the iceberg separated visually for an external observer by the water surface. However, the iceberg is just a huge physical object, without any inner dynamics or transformations. That means that explicit knowledge cannot transform itself into tacit knowledge or vice versa as the Nonaka model of knowledge creation shows (Nonaka and Takeuchi, 1995).

2.4 Knowledge as energy

Both previous metaphors were based on the Newtonian logic and linearity. However, knowledge is intangible and nonlinear. This new metaphor was proposed by Bratianu and Andriessen (2008), and further developed by Bratianu (2011). This metaphor contains *energy* in the source domain and *knowledge* in the target domain. Energy has totally different attributes than objects. First, energy is a field that means a non-substantial and continuous entity. Such a field cannot be seen and cannot be touched, which means that it is intangible. Also, the energy field is nonlinear and non-homogeneous. Second, energy manifests in several forms that have the property of transforming one form into another. For instance, mechanical energy can be transformed into heat, and vice versa. These transformations are based on thermodynamics principles, and not anymore on the Newtonian logic. However, we have to emphasize the fact that thermodynamic principles state that energy cannot be created and cannot be destroyed. It can be only transformed from one form into another one based on the conservation laws. This attribute of energy will not be transferred to the knowledge domain since knowledge can be created, can be destroyed, and does not remain constant with respect to any transformation. The metaphor *knowledge as energy* is a complex metaphor, composed of the following four metaphors:

Metaphor 1: *Knowledge as energy*.

Metaphor 2: *Cognitive knowledge as mechanical energy*.

Metaphor 3: *Emotional knowledge as thermal energy*.

Metaphor 4: *Knowledge dynamics as energy thermodynamics*

I will explain each of these above metaphors in the followings.

Metaphor 1: Knowledge as energy. The source domain contains energy that is not anymore an object. Energy is a *field*, that means a non-substantial, nonuniform, and nonlinear entity spread as a continuum in space. This attribute of being a field is very important since it is not anymore related to tangible things. Just think at the gravity field. We cannot see and cannot touch the gravity field, yet we feel it any time we jump. In conclusion, the main entailment from the source domain is *the field* characteristic of knowledge.

Metaphor 2: Cognitive knowledge as mechanical energy. The source domain contains mechanical energy, and the target domain contains cognitive knowledge. Mechanical energy contains both potential energy and kinetic energy, and cognitive knowledge contains both tacit and explicit knowledge. The dynamics between potential

energy and kinetic energy from the source domain can be mapped upon the target domain, where we have tacit knowledge and explicit knowledge.

Metaphor 3: Emotional knowledge as thermal energy. This is a new element of the knowledge metaphor that changes the functional paradigm from dynamics to thermodynamics. That is because thermal energy has different properties than mechanical energy. It is a different form of energy. While mechanical energy is ruled by the Newtonian logic, thermal energy is ruled by the thermodynamics principles. Mechanical energy has only one dimension, while thermal energy has two dimensions: an *extensive* one that is a quantitative property, and an *intensive* one that is a qualitative property. To measure the intensity of a thermal field we define *the temperature* as the main property, and use thermometers as measuring instruments. *Emotional knowledge* is a new form of knowledge that is different than the cognitive knowledge. I will discuss about emotional knowledge in the next section of this paper.

Metaphor 4: Knowledge dynamics as energy thermodynamics. This is the most difficult metaphor to explain since it requires a very good understanding of thermodynamics. The main idea is that in the source domain we have the transformation of mechanical energy into thermal energy, according to thermodynamics principles. That means that we can map this characteristic from the source domain upon the target domain, and admit that cognitive knowledge can be transformed into emotional knowledge and vice versa. This constitutes a very important idea that differentiates this metaphor from all the other metaphors that have been used in knowledge management so far. We will discuss more about the practical implications of this metaphor in the next section of the present paper.

3 The triple helix of knowledge

3.1 Fields of knowledge

The most important entailment transferred to the target domain in the metaphor *knowledge as energy* is the attribute of *field*. Energy is a field, and thus knowledge can be conceived as a field. When we analyze and map all the knowledge from an organization, we may distinguish between different fields of knowledge.

Introducing a new metaphor for knowledge based on analogy with energy, Bratianu and Andriessen (2008) changed the explicit knowledge-tacit knowledge dyad into the

cognitive knowledge-emotional knowledge dyad. Furthermore, this dyad can be transformed into a triad composed of *cognitive knowledge*, *emotional knowledge*, and *spiritual knowledge*. Thus, organizational knowledge may be conceived as being composed of three fields of knowledge: *the field of cognitive knowledge*, *the field of emotional knowledge*, and *the field of spiritual knowledge*. These fields are non-substantial, nonlinear, nonuniform, and have the property of transforming from one form into another form of organizational knowledge in a certain context. That means that any organization has a multifield structure of knowledge (Bratianu and Orzea, 2013a). This multifield structure is a helix composed of cognitive, emotional and spiritual fields of knowledge that are in a continuous interaction and transformation. Thus, we can discuss about a triple helix of knowledge.

3.2 *The field of cognitive knowledge*

Cognitive knowledge is “the most important component of the organizational knowledge since it represents all the explicit knowledge from employees and the embodied knowledge in the organizational documents, processes and intellectual property. It is the knowledge that fuels the managerial decision making process, and the knowledge used for data bases creation“ (Bratianu, 2013, pp.214-215). Many philosophers considered that it is the only form of knowledge we have, and that is fully rational knowledge. We may recall the Cartesian expression *Cogito ergo sum!* that made history. Rational knowledge became the source of all scientific knowledge and technology development. European education has been developed on this objective and scientific knowledge. Even today many university courses and textbooks base decision theory on mathematics and logic, which means rational knowledge. Cognitive knowledge has been also heavily supported by experts coming from information theory and information technology since they operate with data and information that is grounded in the rational mind.

Aristotle is one of the firsts philosophers that made a difference between rational knowledge (*episteme*), operational knowledge or know-how knowledge (*techne*), and process knowledge or know-why knowledge (*phronesis*). “The concept of *phronesis* is generally understood as the ability to determine and undertake the best action in a specific situation to serve the common good.... It goes beyond analytical, scientific knowledge (*episteme*) and technical knowledge or know-how (*techne*) and invites judgments and

decisions made in the manner of a virtuoso social actor” (Nonaka, Toyama and Hirata, 2008, p.14). Ryle in his seminal book *The concept of mind* published in 1949 made a clear distinction between knowing *how* and knowing *that*. Knowing *how* is related to learning by doing and getting experience, which quite different than rational thinking. Polanyi extended the concept of knowing how to *tacit knowing*: “My search has led me to a novel idea of human knowledge from which a harmonious view of thought and existence, rooted in the universe, seems to emerge. I shall reconsider human knowledge by starting from the fact that we can know more than we can tell” (Polanyi, 1983, p.4).

A dominant theory in knowledge management developed mainly by Nonaka (1991; 1994), Nonaka and Takeuchi (1995), and Nonaka, Toyama and Hirata (2008), based on findings of Ryle and Polanyi, is that of the knowledge dyad composed of tacit knowledge and explicit knowledge.

Thus, cognitive knowledge contains both rational knowledge as explicit knowledge and tacit knowledge. For this dyad the most suited metaphor is that of *an iceberg*, as previously discussed.

3.3 The field of emotional knowledge

Unlike the European tradition based on the Cartesian dualism of body and mind, the Japanese tradition is based on the theory of oneness of body and mind. “For the Japanese, knowledge means wisdom that is acquired from the perspective of the entire personality. This orientation has provided a basis for valuing personal and physical experience over indirect, intellectual abstraction” (Nonaka and Takeuchi, 1995, p.29). That means that emotions and feelings carry with them a specific type of knowledge we may call *emotional knowledge*. In the Nonaka theory, emotional knowledge is a part of tacit knowledge without any individualization. However, cognitive science demonstrated that emotional knowledge is an important component of our knowledge structure, and that it plays an essential role in making decisions (Damasio, 1999; Damasio, 2003; Damasio, 2012; Goleman, 1995; Goleman, 1998; Hill, 2008; Kahneman, 2011; LeDoux, 1999).

Kahneman (2011) states that our mind works with two thinking systems: System 1 – is a fast body reaction system, which has been developed during human being history for survival; System 2 – is a slow thinking system based on rationality. The first system represents an emotional processing of all incoming sensorial signals, through emotions and feelings. Being very fast, this system has an important impact on the decision making.

As Hill (2008, p.2) remarks, “Breakthroughs in science have revealed that people are primarily emotional decision makers”.

Damasio (1999) explains the biological support of emotions and feelings and their relation to our conscious mind. “For the purpose of investigating these phenomena, I separate three stages of processing along a continuum: *a state of emotion*, which can be triggered and executed nonconsciously; *a state of feeling*, which can be represented nonconsciously; and *a state of feeling* made conscious, i.e., known to the organism having both emotion and feeling” (Damasio, 1999, p.37). All of these states carry with them emotional messages towards the brain and the nervous system, that are processed by the emotional intelligence to find adequate solutions to environmental problems. Emotions are processed and remain within the nonconscious zone of our brain, but they manifest themselves in the body state and our facial expressions. The primary emotional states are the following (Hill, 2008, p.84): happiness, surprise, anger, fear, sadness, disgust. It is interesting to note the fact that there is only one positive emotion – happiness, and only one neutral emotion – surprise. All the others – anger, fear, sadness and disgust are negative emotions. Also, it is interesting to see how emotional states of happiness, anger and sadness influence our decision making and risk evaluation: “The difference between these three emotions, however, is that when we’re happy we tend to take a risk even if the reward is low. With *fear*, the risk is considered low because danger already exists. With *sadness* we feel like we’ve got nothing to lose” (Hill, 2008, p.85).

Emotional intelligence represents the class of *intrapersonal* and *interpersonal* intelligences in the multiple intelligences framework developed by Gardner (2006). In this framework, Gardner defines *an intelligence* as “a biopsychological potential to process specific forms of information in certain kinds of ways. Human beings have evolved diverse information-processing capacities – I term these ‘intelligences’ – that allow them to solve problems or to fashion products” (Gardner, 2006, p.29). In other words, rational knowledge is processed by linguistic and mathematical intelligences, while emotional knowledge is processed by emotional intelligence. This idea is very well expressed in the definition of *emotional intelligence* by Mayer, Salovey and Caruso (2004, p.197) as being “the capacity to reason about emotions, and of emotions to enhance thinking. It includes the abilities to accurately perceive emotions, to access and generate emotions so as to assist thought, to understand emotions and emotional

knowledge, and to reflectively regulate emotions so as to promote emotional and intellectual growth”.

3.4 The field of spiritual knowledge

Spiritual knowledge, spiritual intelligence, and spiritual intellectual capital are some new concepts researchers started to promote in the space of organizational dynamics and managerial thinking (Branson, 2011; De Geus, 1999; Zohar and Marshall, 2000; Zohar and Marshall, 2004). This type of knowledge has been integrated by Nonaka in his model of tacit knowledge, but without any identification characteristics. However, its importance for decision making and companies growth and learning makes it necessary to consider spiritual knowledge as a stand-alone knowledge field, and to consider it a third component of the triple helix of knowledge.

Spiritual knowledge is an important component of the spiritual capital of any organization. As Zohar and Marshal stated, “Our spiritual capital is our shared meaning, our shared purpose, our shared vision of what most deeply matters in life – and how these are implemented in our lives and in our behavioural strategies. It is the capital that is increased by drawing on the resources of human spirit” (Zohar and Marshal, 2004, p.27).

Spiritual knowledge represents the content of the vision and mission of any company, and employee aspirations and their social responsibility for their doing. International statistics show that many companies die before their 50th anniversary since their top management focuses only on the profit maximization and economic objectives. Profit should not be the purpose of any business, but a necessary limiting condition of its development. The purpose of any business should be to create value for society, and wellbeing for employees. According to Aries de Geus (1999, p.9), “corporations fail because the prevailing thinking and language of management are too narrowly based on the prevailing thinking and language of economics. To put it another way: companies die because their managers focus on the economic activity of producing goods and services, and they forget that their organization’s true nature is that of a community of humans”.

4 The triple helix of knowledge and sustainability

The triple helix is formed of cognitive knowledge, emotional knowledge and spiritual knowledge. Each form of knowledge can be transformed into another form of knowledge, similar to the thermodynamic transformation of one form of energy into another form of

energy. Spiritual knowledge contains shared values and beliefs, and a sense of meaning of the whole organization. It is knowledge about *what I am*, and *what my organization is*. It is about the existential purpose of any organization, and the role played by people in creating a future. Spiritual knowledge is processed by spiritual intelligence and the process yields spiritual capital. According to Zohar and Marshal (2004, p.4), “Spiritual intelligence’s sense of meaning, values, and purpose generates spiritual capital. Spiritual capital’s wealth of meaning, values, and higher motivation are necessary to sustainable capitalism and a sustainable society”.

Sustainability is based on strategic thinking (Bratianu, 2007) and a system of organizational values that drives the decision making process. The dynamics of the triple helix of knowledge oriented on the long term thinking by the organizational values is one of the main requirements for developing organizational learning, and finally of a learning organization (Örtenblad, 2011; Senge, 1999). For Senge (1999, p.14). The fundamental meaning of a learning organization is “an organization that is continually expanding its capacity to create its future”. That means to go beyond the *adaptive learning* and to develop a *generative learning process* that enhances the capacity of organization to renew its intellectual capital (Bratianu and Orzea, 2013b). By developing this dynamic capability, such an organization becomes a *sustainable organization*.

5 Conclusions

The purpose of this paper is to present a new paradigm of understanding knowledge – the triple helix of knowledge that is based on the metaphor *knowledge as energy* and on thermodynamics principles. The triple helix is a dynamic construct composed of three fields of knowledge: cognitive knowledge field, emotional knowledge field, and spiritual knowledge field. Cognitive knowledge field contains basically rational knowledge that represents the most important component today in managerial decision making. Emotional knowledge field contains knowledge generated by emotions and feelings, and becomes important in leadership and in organizational culture. Spiritual knowledge field contains knowledge about our existence and organization vision, mission and values.

The triple helix of knowledge is important not only because of its constituents, but also because there is an internal dynamics based on thermodynamics: each form of knowledge can be transformed into another form of knowledge. Due to these transformations the organizational entropy is increased and learning and innovation are stimulated. Learning

and innovations are two driving processes for intellectual capital renewal, which contributes directly to the firm's sustainability. Thus, the new perspective on knowledge can be related directly to the process of sustainability.

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Knowledge waste in organizations

Susanne Durst*

School of Business, University of Skövde
Högskolevägen, 54128 Skövde, Sweden

Helio Aisenberg Ferenhof

Federal University of Santa Catarina (UFSC)
Department of Production Engineering and Systems Campus Trindade
Florianópolis/SC, Brazil. Zip Code: 88.040-900.

Paulo Mauricio Selig

Federal University of Santa Catarina (UFSC)
Department of Engineering and Knowledge Management Campus
Trindade Florianópolis/SC, Brazil. Zip Code: 88.040-900.

** Corresponding author*

Structured Abstract

Purpose – In this paper, we are interested in the knowledge that is “wasted” in organizations, that is existing relevant knowledge that is overlooked in the process of knowledge conversion. Given the competitive pressure firms are facing in today’s business environment, a waste of knowledge is not only costly but also dangerous. This means that we consider knowledge from a knowledge at risk perspective. Having this in mind, the purpose of this paper is to review research on knowledge waste in organizations to establish our current body of knowledge regarding this topic.

Design/methodology/approach– The study consists of a systematic review of 77 peer-reviewed articles addressing knowledge waste in organizations.

Originality/value – To the best of the authors’ knowledge, no systematic literature review on this topic has previously been published or presented.

Practical implications– The topic seems to be a promising field for intensive research and offers a variety of future research avenues. In view of practitioners, the study’s finding may enable an increased awareness towards the areas where existing knowledge is at the mercy of “waste”. This can assist practitioners to better cope with risks related to this waste and, therefore, better exploit the (limited) knowledge base available.

Keywords – Knowledge waste, Intangible assets, Knowledge management, Systematic review, Knowledge loss

Paper type – Academic Research Paper

1 Introduction

Among the different knowledge management activities (e.g. knowledge identification, knowledge creation, knowledge dissemination etc.), it seems that knowledge creation is viewed as more important than the other activities. Markus (2001), however, stresses (she talks about reuse) that the effective reuse of knowledge should take a stronger role, as it is clearly associated with organizational effectiveness. In the same vein, researchers have highlighted the link between the reuse of knowledge and developing competitive advantage (Szulanski, 1996). Consequently, one can assert that a strong consideration of existing knowledge can help firms to improve performance and thus sustain competitive advantage. Having this in mind, in this paper we will focus on knowledge that is not used. More precisely, we are interested in the knowledge that is “wasted” in organizations, that is existing relevant knowledge that is overlooked in the process of knowledge conversion (Ferenhof, 2011). Given the competitive pressure firms are facing in today’s business environment, a waste of knowledge is not only costly (Bolisani et al., 2013) but also dangerous. As initiatives, which are, after all, repeating already existing knowledge instead of creating new knowledge or recombining it in new ways, can result in situations in which valuable resources and time are bound and thus not available to other more important business operations. Consequently, this may be damaging not only for the company concerned but also for the economy, as continuously reinventing the wheel blocks from developing. In sum we look at knowledge from a knowledge at risk perspective, i.e. addressing situations in which knowledge that is not used becomes a liability or a risk (Durst, 2012). Against this background, the purpose of this paper is to review research on knowledge waste in organizations to establish our current body of knowledge regarding this topic.

2 Theoretical background

The relevance of knowledge assets as fundamental strategic factors of business success has been widely recognized (Barney, 1991; Drucker, 1993; Grant, 1991). In fact, more and more organizations attribute their competitiveness to their knowledge assets and specifically their exploitation, and consider knowledge as their distinguishing feature

(Nonaka and Takeuchi, 1995). In such a situation, a suitable management of knowledge assets has become a strategic role for company success.

According to Wiig (1993), knowledge management consists of seven activities: 1) creation, 2) sourcing, 3) compilation, 4) transformation, 5) dissemination, 6) application and, 7) value realization. Thereby, many studies have described ways of converting knowledge into value for organizations. One of them is the SECI model proposed by Nonaka and Takeuchi (1997) that involves four main activities: externalization, socialization, combination and internalization. The aim of this model is to extract the tacit knowledge from the people, converts it into explicit knowledge, archive it in the company, then make other people learn it, internalize it, so that it becomes tacit again. This sounds simple in theory, but in practice these processes are not that straightforward. Indeed these processes are accompanied by mistakes and disruptions, so instead of taking advantage of the knowledge available it is “wasted”.

In order to improve this situation, particularly the activities of sourcing, compilation and application, many frameworks and models have proposed to use ontologies to address this issue. For example, Lee *et al.* (2006) state that ontology in conjunction with Semantic Web Technologies may help represent and share various types of engineering change-related knowledge in specific contexts. On the other hand, Sherimon *et al.* (2012) highlight that ontologies have the potential for enabling true knowledge sharing and reuse among heterogeneous agents, both human and computer. Picking up this idea, Zhang *et al.* (2012) suggest the use of ontology for modeling Product Service System (PSS) in order to perfect prototyping for design knowledge management and knowledge reuse, and to integrate more methods which are suitable for designers, such as the roadmap.

Others authors (e.g. Aubry *et al.*, 2011; Buttler and Lukosch, 2013; Komi-Sirviö *et al.*, 2002) applied the idea of lessons learned (LL) to deal with the issue. LL can be defined as documented knowledge gained from experience, successful or otherwise, for the purpose of improving future performance (Buttler and Lukosch, 2013). Komi-Sirviö *et al.* (2002) support the creation and maintenance of a LL database as an effective means to store and share knowledge in the organization. Aubry *et al.* (2011) confirmed that LL-related activities are a good means to transfer knowledge. In project-based organizations (PBOs), for example, the individuals collect and use LL in order to prevent reinvention of the wheel or repetition of mistakes (Aubry *et al.*, 2011; Buttler and Lukosch, 2013). Knowledge reuse is applied for knowledge sourcing, compilation and dissemination. It

focuses on the ability to locate and use knowledge previously generated (Watson and Hewett, 2006; Wee and Chua, 2013; Zhang *et al.*, 2013).

Consequently, different actions have been created to manage knowledge in a better way, but those actions could be improved (i.e. being more effective) if one would focus on the wastes of knowledge that occur during the life cycle of knowledge management (KM) as presented by Wiig (1993).

2.1 Knowledge Waste

According to Ferenhof (2011) knowledge waste can be described as any failure in the process of knowledge conversion, better known as spiral of knowledge creation of Nonaka and Takeuchi (1997). Thereby Ferenhof proposes that the waste can present itself in different ways: reinvention, lack of system discipline, underutilized people, scatter, hand-off, wishful thinking.

I) Reinvention is a type of waste that happens if the organization does not reuse the designed solutions, components, projects, experiences or knowledge acquired previously (Bauch, 2004). After project completion or expiry of maintenance contract, it is the knowledge that was not internalized and put in use, or it is simply forgotten over time. This may lead to efforts that can be equated with “reinventing the wheel” which reveals themselves as repeated projects, mistakes or recurring issues (Almarshad *et al.*, 2010). So instead of reusing good practices, supporting innovative practice, and preventing the reinvention of the wheel (Aubry *et al.*, 2011) rather likely outcomes are wasted activities and reduced project performance (Cheng, 2009; Dani *et al.*, 2006). As the effective transfer of knowledge is considered as one of the key success factors (Cheng, 2009), this knowledge reinvention must be avoided. Consequently, if an organization can succeed in reusing its knowledge assets, resources can be invested in continuous improvements of existing knowledge stocks instead of wasting them into efforts of reinvention (Fong, 2005).

II) Lack of system discipline covers a number of factors related to the clarity of objectives outlined in the organizations. More precisely it covers unclear goals and objectives; unclear rights, roles, responsibilities and rules; poor delivery dates; insufficient willingness to cooperate as well as incompetence or lack of training (Bauch, 2004).

III) Underutilized people refer to employees that are not using their skills and expertise in full. Often this is a consequence of missing roles and responsibilities given to them, when in reality, they could assume much more if the process was designed more effectively (Locher, 2008).

IV) Scatter refers to actions that make knowledge become ineffective because of flow disturbances, which is basically the disruption of interaction required for teamwork. This category can be divided into two sub-categories: communication barriers and poor tools. Communication barriers directly prevent knowledge flow occurrence. They include: a) physical barriers such as distance, computational incompatible formats, etc.; b) social barriers such as the corporate class systems and management behavior that prevent the flow of communication and knowledge, and c) skill barriers that are people who are not capable of transforming data into usable knowledge (Ward, 2007). Poor tools, on the other hand, refer to the assumption that tools should support the flow of knowledge and not stifle this flow, as users assume that these tools are the only solution. These users seek to take shortcuts, copy unsuitable operating modes, and therefore cause failures by forcing the use of tools without properly analyzing their relevance and suitability. By insisting on using these tools, processes end up in a death spiral, i.e. the more one tries to improve the processes the worse the failures (Ward, 2007). Or, to put it another way, the scattered knowledge results in knowledge leakage, and knowledge leakage results in organizational inefficiency (Hu, 2008).

One example of scatter is highlighted by Cheng (2009), who states that knowledge from one project can be separated and scattered in different phases and owned by different participants. This is imaginable in temporary virtual organizations as well as in consulting firms. Those firms normally fail to capture and transfer knowledge that is scattered on those phases and thus increases the likelihood of waste, such as "reinventing the wheel". According to Padova and Scarso (2012), large enterprises also scatter knowledge objects. For these authors, this is demonstrated by the number of documents the firms continuously create and store. It is difficult to access knowledge that is scattered across different projects, processes, trades, and people (Hu, 2008). In the same vein, Lijuan (2011) highlights that the main objective of KM implementation is to manage knowledge which is scattered throughout business activities or hidden in the minds of staff effectively.

V) Hand-off occurs when one separates knowledge, responsibility, action and feedback. It results in decisions made by people who do not have enough knowledge to make the decision effectively or do not have the opportunity to accomplish it. As subcategories we have useless information and waits can be specified (Ward, 2007). According to Ward (2007) information is useless if it does not help in understanding the customers, because the information would not add value to the flow, innovation, and improved decision-making. Instead it would actually be created to fulfill someone's own interests. Waits, on the other hand, normally occurs through the establishment of standard conventional sequencing of activities, which creates a batch processing and causes slow processes. A single path to follow, instead of multiple streams or paths of information and a large variation of work in the batch cause the waste of scatter (Ward, 2007).

VI) Wishful thinking means to follow the subject's own reasoning, based on interests, wishes rather than on facts or rationality, or decision-making is based on one's own perception of reality respectively. For Ward (2007) this means operating in the dark, blindly making decisions without consistent and backing data. This aspect can be divided into specification test and discarded knowledge. Specification test is a practical conventional pattern. It cannot highlight whether a good or service is ready for commercialization, it is statistically impossible to execute enough tests to be confident that there are zero defects (Ward, 2007). On the other hand, discarded knowledge happens for a number of reasons. For example, teams and superior focus on the product or service launch, thereby leaving aside the capture of knowledge; specification tests do not say much so the information can't be used next time and, above all, few people know how to turn the data into usable knowledge (Ward, 2007).

In conclusion, the authors of this paper believe that the (negative) consequences of knowledge waste are high. The organization is in a continued reinvention process and loses valuable financial and non-financial resources. For example, the waste of knowledge may reduce the time resources available to innovation, thus challenging firm's competitiveness (Baxter *et al.*, 2008). Another consequence could be that the firm fails to offer high quality solutions (Demian and Fruchter, 2009). Additionally, any investments in KM activities would be very difficult to justify, as one of the main reasons for disappointment regarding these investments is assigned to missing knowledge reuse (Liu *et al.*, 2013). Given the role of knowledge as the most important strategic factor for firms

(Spender 1996) such waste needs to be understood by both the academic and practitioner communities.

3 Methodology

In the review process, the authors adopted the principles of a systematic review as recommended by Jesson *et al.* (2011) namely: 1) Mapping the field through a scoping review, 2) Comprehensive search, 3) Quality assessment, 4) Data extraction, 5) Synthesis, and 6) Write up.

First, a research plan was developed comprising the research questions of interest, the keywords, and a set of inclusion and exclusion criteria. The paper's aim was to determine the current status of research on knowledge waste.

We conducted two different researches, the first one focused on understanding the definition of knowledge waste and loss that may occur in companies. The query of this research was "knowledge AND (waste OR discard OR fling OR toss OR "toss out" OR "toss away" OR "chuck out" OR "cast aside" OR "dispose" OR "throw out" OR "cast out" OR "throw away" OR "cast away" OR "put away" OR "missing" OR "squandered" OR "stray" OR "straying" OR lost OR loss OR "knowledge waste" OR "knowledge loss" OR "waste of knowledge". The second query used "knowledge management" AND (reinvention OR "lack of system discipline" OR "underutilized people" OR scatter OR hand-off OR "wishful thinking" OR "knowledge waste" OR "waste of knowledge" OR "knowledge reuse". Additionally, inclusion and exclusion criteria were specified. The inclusion criteria were: peer-reviewed academic papers, English language and the databases Compendex, Scopus and Web of Science. Grey literature such as reports, books and non-academic research; and other languages than English represented exclusion criteria. Moreover, an excel data sheet was produced consisting of key aspects related to the research aim. In the given case these were: name of author(s), year of publication, research aim/objectives, theoretical perspective/ framework, method, main findings, and name of the journal.

Second, once all relevant issues had been specified, two of the authors accessed the databases and looked for suitable articles. The first search had been carried out on June 04, 2013 and resulted in 139 hits. The second search took place on March 10, 2014 and resulted in 370 hits; resulting in total number of 509 hits.

The third step consisted of two procedures. Firstly, the authors jointly worked through the abstracts to make sure that they actually covered the pre-defined scope. This procedure yielded a final selection of 339 articles. Secondly, the 339 papers were divided among the authors. Subsequently the authors entered the relevant data regarding the research purpose in the excel sheet. Then the authors jointly went through each data entry and discussed the content. In the case of possible reservations on the part of the author who had not read the article, the authors went through the article in question. This procedure resulted in a further reduction of the number of papers. In the end, the authors reached a final selection of 77 articles, which fulfilled the criteria, set and thus represented the basis for analysis. This approach helped to alleviate the risk of any inconsistency in the analysis and the conclusion drawn from there.

Fourth, the final excel sheet was jointly discussed involving all authors. This discussion enabled the authors to categorize the findings under themes, which in turn, helped to clarify what is known about knowledge waste and to which areas the body of knowledge is limited. Fifth, the final stage of the review process was devoted to writing up the findings.

4 Presentation of findings

Among the 77 papers that formed the basis for our analysis, the oldest publication is from 1997 and the most recent ones are from 2013. Most papers were published in 2008, 2009, 2012 and 2013, which suggests that the topic is of great interest and relevance.

In the sections below we present our analysis concerning the following aspects: general observations which outline the research methods applied. After that, the study's main findings according to the themes identified are presented.

4.1 General observations

With regard to the methodology, the most common method applied is the case study approach. This is followed by surveys and model approaches. Other methods such as ethnography (e.g. Demian and Fruchter, 2006), mixed methods approaches (e.g. Aubry *et al.*, 2011) or experiments (e.g. Chakrabarti *et al.*, 2007) are less frequently used.

The 77 papers were published in different journals which can be assigned to the fields of operations, technology and management; information management; sector studies;

general management; entrepreneurship and small business management; and organization studies. This suggests the topic interests a broad audience.

4.2 Body of knowledge regarding knowledge waste

We summarized the main findings of the investigated studies under eight broad themes:

- Factors hampering/fostering knowledge reuse
- Framework
- Implementation/Best practice
- Knowledge management
- Knowledge reuse in different contexts
- ICT solutions
- Theory development
- Consequences of knowledge waste

Factors hampering/fostering knowledge reuse

Twenty-two papers can be assigned to this theme. Regarding factors hampering knowledge reuse the studies highlighted the financial situation of the organization and the management's too strong integration into day-to-day business (Durst and Wilhelm, 2012), failure to provide learning benefits (Chauhan and Bontis, 2004), novelty of problems, conditions within organizations (e.g. social norms), types of available knowledge, and methods of reusing knowledge (Petter and Randolph, 2009), overall costs involved (Watson and Hewett, 2006). As regards factors supporting knowledge reuse, social knowledge networks (Demian and Fruchter, 2006), development of social capital (Balatti and Falk, 2002), integration in the people's practices (Hsaio *et al.*, 2006), the contribution of the owner/managing directors as creator and driver of KM activities (Wee and Chua, 2013), existence of a knowledge manager (Adamson, 2005), motivated people and clear internal structures and communication channels (Nielsen, 2012), alignment of reusable knowledge items with company strategy (Liu *et al.*, 2013), willingness of people to contribute valuable knowledge (Watson and Hewett, 2006) were mentioned.

Framework

Seventeen papers were assigned to this theme. Based on their findings the authors of those papers proposed frameworks intended to improve knowledge reuse in organizations or knowledge management in general. For example, Ficet-Cauchard *et al.* (1999) propose a tool (CBR module) that aims at assisting knowledge reuse. Thereby the focus is on helping the individuals concerned to better retrieve existing data when addressing new but similar business tasks. Lettice *et al.* (2006) proposed a measurement framework to capture the importance of knowledge reuse in the new product development process. Sherimon *et al.* (2012) highlighted in their work the significance of ontologies for knowledge reuse.

Implementation / Best practice

Five papers were placed under this theme. Those papers report the implementation of certain knowledge management activities intended to reduce the danger of “reinvention” (e.g. Soon *et al.*, 2010) or to improve collaborative knowledge management which in turn can help in knowledge creation and transfer (Dave and Koskela, 2009).

Knowledge Management

Seven papers were assigned to this theme as they address issues aimed at improving knowledge management activities in organization in general. For example, Shang *et al.*, (2009) develop a model that shows the contribution of dynamic capabilities to knowledge management.

Knowledge reuse in different contexts

Two papers were assigned to this theme (O’Leary, 2001 and Majchrzak *et al.*, 2004). O’Leary (2001) investigated knowledge reuse for the matter of problem solving in the consulting field. Majchrzak *et al.* (2004) studied knowledge reuse in the context of radical innovations.

ICT solutions

Sixteen papers proposed ICT solutions to better cope with knowledge reuse. For example, Fruchter and Demian (2002) described a prototype corporate memory system that allows the finding of knowledge, the exploration of the knowledge’s evolution

history and the exploration of the project context. Barros *et al.* (2004) demonstrated the usefulness of risk archetypes and scenario models as suitable means to knowledge retrieval and reuse.

Theory development

Seven papers were aimed at developing a theory of reuse and related fields respectively. Markus (2001) highlighted the role of knowledge management systems and knowledge repositories. Daugeliene and Marcinkeviciene (2009) proposed the inclusion of the brain circulation phenomenon in the study of knowledge management and specific knowledge management activities. Whereas So and Bolloju (2005) discussed the contribution of the theory of planned behaviour to the study of knowledge sharing and reuse.

Consequences of knowledge waste

One paper was assigned to this theme. McQuade *et al.* (2007) highlight different areas where knowledge can be wasted or even worse lost. The authors mainly draw attention to a loss of expertise in interpersonal communication skill.

7 Conclusions

Against the background of the growing concern of both scholars and practitioners regarding the implementation knowledge management initiatives, the aim of this study was to pay particular attention to the knowledge that is “wasted” in organizations, that is existing relevant knowledge that is overlooked in the process of knowledge conversion. Even though many studies have focused on knowledge reuse but they have not highlighted the topic from a knowledge at risk perspective meaning situations in which knowledge that is not used becomes a liability or a risk (Durst, 2012). Accordingly, the purpose of this paper was to review research on knowledge waste in organizations to establish our current body of knowledge regarding this topic. To do so we conducted a systematic literature review to identify suitable articles. A final set of 77 articles formed the basis for our analysis.

Our review makes clear that the body of knowledge regarding knowledge waste in organizations is still limited. The main findings were categorised into eight broad themes: Factors hampering/fostering knowledge reuse, framework, implementation/Best practice,

knowledge management, knowledge reuse in different contexts, ICT solutions, theory development and consequences of knowledge waste

The findings suggest that the existing literature provides only fragmented insights into knowledge waste in organizations. Given the importance of knowledge to company, a better understanding of this aspect is very important. Our present study clearly underlines that the topic still calls for more research, which in turn offers scholars a variety of research avenues.

We consider the following future research directions as promising: 1) the development of method to measure knowledge waste in organizations, 2) the expansion of studies on the financial and non-financial impact of knowledge waste on companies, 3) the provision of more empirical work that demonstrate the impact of different approaches and techniques, e.g. lessons learned, ontology on the reduction of knowledge waste in organizations.

The present study is not without limitations. A complete coverage of all the articles considering the issue of knowledge waste could not have been achieved, given the search proceeding chosen. So it may have left out papers that also addressed the topic but used a different language. Yet, it seems reasonable to assume that the review process covered a large proportion of the studies available. Finally, this paper proposes some research directions which are not exhaustive but represent initial stages.

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Reporting of Intellectual Capital: evidence from the Italian Banking Sector

Romilda Mazzotta*, Giovanni Bronzetti

Department of Business and Law, University of Calabria
Via P. Bucci, 87036 Rende (Italy)

Maria Assunta Baldini

Department of Business and Economics, University of Florence
Via delle Pandette, 9 - 50127 Firenze (Italy)

** Corresponding author*

Abstract:

The transition from an economy based on production towards a knowledge-based economy has highlighted the crucial role of Intellectual Capital (IC) in the firm's financial performance. Intellectual Capital is a business resource that includes know-how, patents, internal and external relationships. IC is widely acknowledged as one of the most critical resources which organizations rely on to improve their efficacy and efficiency, and hence help to improve the value creation and competitive advantage (de Pablos, 2003). There are several empirical studies that examined the quantity and the nature of IC information disclosure in annual reports in different industries and countries (Guthrie and Petty, 2000; Olsson, 2001; Brennan, 2001; Bontis, 2003; Bozzolan et al., 2003, 2006; Abeyssekera and Guthrie, 2005), but few studies have analyzed the ICD in the financial sector. The choice to focus on the banking sector is linked primarily to the fact that it represents an interesting stream as these companies fall under high-intensive IC, just thinking of the use of highly specialized human resources in the economic and financial field. This study aims to analyze the nature and extent of information on intellectual capital in the sustainability reports of companies belonging to the banking industry with two main purposes: to observe a sector often set aside despite its important role in the economy and to reply to the growing demand for longitudinal analysis in the field of intellectual capital (Mention, 2011). The first objective is achieved by identifying the presence or absence of information on intellectual capital in the sustainability reports; while the extension (number of times of calling an item) of disclosure has measured with the frequency of reporting an item within the report with reference to a single banking institute. The second purpose of the paper is achieved by taking into account two years, 2006 and 2012. The industry in which the analysis is conducted is peculiar in that it is a knowledge-intensive industry that has undergone deep changes over the last decade, who have given more importance to intellectual capital as a resource source of value and competitive advantage. The empirical analysis is carried out by analyzing the social reporting of the listed banks on the Milan Stock Exchange through the content analysis for the years 2006 and 2012, in order to capture the effect of Basel II on the level of corporate information.

Design/methodology/approach – The content analysis is used to examine the level of Intellectual capital disclosure in the sustainability reports. The empirical data were drawn from of Italian listed companies that operate in financial sector in years 2006 and 2012.

Originality/value – This research expands on previous studies of voluntary intellectual capital disclosure (ICD), as it is the first study that focuses on measuring intellectual capital using the content analysis and an IC index in the banking sector.

Practical implications – This study helps management identify relevant intellectual capital elements to disclose.

Keywords – Intellectual capital, financial institutions, sustainability reports, banking

Paper type – Academic Research Paper

1. Introduction

The process of globalization and market integration, increasing competition, the development of IT and the internet, the prevalence of soft elements, intangible and human factors that have characterized the last few decades, have changed the sources of value and competitive advantage (Cordazzo, 2007; Tayles et al., 2007; Petty & Guthrie 2000; Goh, 2007) and have changed the way companies operate. The assets that create value and create a competitive advantage to the company are no longer the machinery and equipment as intangible assets (Roos et al., 1997; Teece, 2000; Bontis, 2002), such as knowledge, information, the skills and competences (Roos et al., 1997; Quinn 1992; Nonaka and Takeuchi, 1995; Edvinsson and Malone, 1997; Choo and Bontis, 2002). The value of a company, therefore, depends not only on what can be accounted for, but also the not capitalized intangible assets, such as intellectual capital (Swart, 2006; Bernard et al. 2003; Teece, 2000).

Intellectual capital (from now will be used IC) is now recognized as one of the most important sources of value and competitive advantage (Edvinsson and Sullivan, 1996; OECD, 2006; Ordonez de Pablos, 2003). Indeed, Pulic & Bornemann (1999) state that "this new economy [...] Intellectual capital. Has become the one and only competitive advantage of a firm". The value of companies, in other words, derived from intangible assets such as customer relationships, business agreements, procedures and processes adopted, organizational skills, know-how gained, brand.

The new international context has also influenced the banking sector deeply changing the competitive environment (Gardener and Molyneux, 1993; Matthews and Thompson,

2008). Banks appear special for several reasons. First, they offer a wide variety of services (Bhattacharya and Thakor, 1993), accept deposits and make loans, may purchase bonds (Matthews and Thompson, 2008); provide financial intermediation services similar to other financial institutions and offer service of liquidity and payment. It is the quality of services provided to customers that makes the difference and this depends on the intellectual capital within the bank (Giant & Previati, 2009). Financial industry is, in fact, intellectually-intensive (Mavridis and Kyrmizoglou, 2005) and the competitive advantage binds primarily to intangible assets and intellectual capital, because, as stated by Watkins (2000), banking products are easily replicable and lack of adequate forms of protection.

Factors for a long time underestimated and lightly managed, such as the strength of the relationship of the bank, its brand, the corporate culture and the values of human resources have become, with increasing competitive pressures and the progressive deterioration of profit margins, clear strategic priorities of these organizations. In such a context, the organizations, on one hand, and stakeholders, on the other hand, are interested in disseminating information on intellectual capital, the first, and to have information, seconds. External communication on intangibles, in fact, enhance the image, visibility and reputation of the bank, generating positive effects on performance.

In addition, through most complete and articulated disclosure, it complies with the provision of the law laid down in the third pillar of Basel II, which drives in order to increase the disclosure of both qualitative and quantitative nature for stakeholders. Given, therefore, the importance of intellectual capital, it is important to determine whether the companies have changed their practices in response to the disclosure of such changes.

The existing literature has analyzed the extent and nature of intellectual capital generally with a cross-country approach. Among these studies (Guthrie and Petty, 2000; Bukh et al, 2005; Bontis et al. 2003; Goh and Lim, 2004; Ordonez, 2003), those focusing exclusively on the financial sector and banks in particular are still limited (Khan and Ali, 2010; Mention, 2011; Abdifatah Haji and Mubaraq, 2012). The present paper fits in this last field. The aim of the contribution is, in fact, to study the nature and extent of the information of the components of intellectual capital (human capital, structural and relational) in the Italian banking sector companies.

The choice of the banking sector for the analysis has different motivations. In the first place, it represents an interesting field of research, given the type of activity, a high content of knowledge, which characterizes them. In addition, this sector, like others, has

been affected by deeply changes that have created the necessity to develop different skills than in the past, making the management of intellectual capital one of the vital aspects of these organizations.

The management of intellectual capital has become in the new context more complex and characterized by a high degree of uncertainty, one of the driver to deal with the negative results that have characterized the sector as a result of the profound changes in the competitive environment. Banks, in other words, were pushed to expand the range of its powers, to apply innovative approaches, as well as to adopt strategic and organizational structure more dynamic and oriented to the strategic management of intangible resources. Even an external element should have an influence on the level of disclosure or the advent of Basel II and specifically the third pillar entitled "Market discipline". The objective of Basel II is to increase the disclosure of both qualitative and quantitative nature of the stakeholders¹, in particular on issues related to the operational risk management (such as procedures and policies related to operational risk management processes and information systems aimed at monitoring operational risk, or aspects of structural capital). These characteristics mean that the banking sector will come up as an interesting area to conduct research on intellectual capital (Mavridis and Kyrmizoglou, 2005; Goh , 2005; Reed et al., 2009).

Italy was chosen for two reasons. First, banks are a central sector in the Italian economy and should develop their information on intellectual capital; second, knowledge on intellectual capital in Italian companies are limited (Bozzolan et al., 2003; Bozzolan et al., 2006) and absent knowledge on the banks.

The analysis is conducted using the method, most widely used in the literature of similar studies, of content analysis. The nature and extent of information on intellectual capital are analyzed by examining the social reporting. The information thus obtained were summarized in an indicator of disclosure at the corporate level and subcategories. The main objective of the analysis is to evaluate, over time, the nature and the extent to which firms in the banking sector publicly provide information on their intellectual capital as a whole and for sub-category.

¹ *More specifically, the purpose of the third pillar is to "Encourage market discipline by Developing a set of disclosure requirements wich allow market Partecipants To assess key pieces of information on the scope of application, capital, risk exposures, risk assessment procedures, and hence will the capital adequacy of the institutions "(Basel II, p. 226-228).*

Compared to the existing literature, this paper allows to get an overview of intellectual capital disclosure with reference to Italian banks, context not yet investigated in spite of its dominant role in the economy; answers the question of longitudinal type information in terms of intellectual capital reporting (Mention, 2011) and highlights the relationships between the different components of intellectual capital. The paper is complementary to the studies of Bozzolan et al. (2003) and Bozzolan et al. (2006), who analyse intellectual capital disclosure in Italy with the exception of the financial sector, thus bridging the gap in the literature.

This paper is organized into three parts. The first part consists of introduction, definition of intellectual capital and literature review. The second part examines the research objective and the methodology. The last part analyzes data and presents findings. Conclusion, limitation of study and ideas for further research are also described in the last part.

We used the methodology of multiple case studies to quantify the level and the quality of voluntary disclosure of intellectual capital of financial companies. The remainder of this paper is structured as follows: Section 2 focuses on definition of intellectual capital and literature review. The second part examines the research objective and the methodology. The last part analyzes data and presents findings. Conclusion, limitation of study and ideas for further research are also described in the last part.

2. Theoretical background

2.1 Defining Intellectual Capital

There are several definitions that try to explain intellectual capital, since the beginning of its research (Brooking 1996; Edvinsson and Malone, 1997; Sveiby, 1997; Lev, 2001; Lev and Zambon, 2003). Stewart (1997) defines intellectual capital as "knowledge, information, intellectual property and experience that can be put to use to create wealth", whereas Bontis (1998) describes intellectual capital as "a set of intangibles (resources, capabilities and competences) that drives the organizational performance and value creation". Sveiby (1997) asserts, instead, that "Intellectual capital includes all employees, organizational knowledge and their abilities to create value added and led to sustainable competitive advantage", whereas Edvinsson e Malone (1997) define intellectual capital as the own of knowledge, information, intellectual property, technology, organizational,

personal and professional skills that provide the company a competitive advantage in the market.

Numerous frameworks have been developed to classify and monitor intellectual capital (Brooking, 1996; Marr et al, 2004; Sveiby, 1997; Bontis, 1998) and the literature agrees in identifying intellectual capital as the combination of human resources (human capital), structural (structural capital) and relational (relational capital) of a company (Sveiby, 1997; MERITUM Project, 2002).

Human capital is the set of knowledge, skills, abilities, level of education, experience, talent, innovation, motivation, creativity, leadership, business skills, managerial skills, culture and business philosophy, managerial attitudes, individual and group experience, ability to face and solve problems. This section included skills (including knowledge and abilities); the attitude (motivation, leadership quality management) and intellectual agility (the innovative skills of the members of the company) (Bontis et al. 1999; Bontis, 2002; Daum 2003; Dubra, 2010).

Structural and organizational capital is know-how encoded within the corporate structure, the capacity for innovation, the efficiency of production processes and business consistency with the objectives of the corporate culture of the business, the degree of alignment and cohesion of the management and the structural capacity to meet and enhance their human resources, technologies, procedures, risk assessment methodologies, software, databases, patents, communication systems (Bontis, 2002; Daum 2003).

Finally, *relational capital* is the relationships established with the market and with their customers. It is therefore a wealth outside the company, is not inherent in the corporate structure. Included in relational capital are corporate image, network, long-term contracts, collaborations and cooperations (Bontis, 2002; Daum 2003).

The interaction of these three key elements generates value; management tends (more or less consciously) to enhance positive interactions between these elements extending the "area of value creation." In this sense the intellectual capital is more than the simple sum of these resources (Bontis, 1996; Bontis, 1998; MERITUM Project, 2002), in fact, closely interrelated with each other.

2.2 Why banking sector?

Banks are service companies with a high content of knowledge (knowledge-intensive) (Eurostat 2005), which essentially operate through human resources with high

professionalism and operational processes which involve a major effort in the development and transmission of information (Rebora, 2003). In Italy they play an important role and, in fact, dominate the Italian financial system, representing at least 85% of the entire financial system (International Monetary Fund, 2012).

The sector, as well as in other countries, has undergone a big change that began as a result of deregulation, technological change and globalization. The development of new technologies has reduced costs and has changed/improved the quality and variety of services that the bank can provide customers (Berger et al., 2010), facilitated the development of new products and new channels to provide services, new banking and management costs (Beccalli, 2007), but at the same time has encouraged the presence of new entrants (Gardener and Molyneux, 1993). On one hand, deregulation and financial globalization, opening up to the international flow of capital, have increased the competitiveness and led to the introduction of new virtual services. On the other hand, the progressive reduction of barriers to entry (direct consequence of deregulation) and the greater ease of specialization within the field, parallel to the standardization of financial products and the rapid evolution of demand, have contributed in decisive extent, to raise the threshold of profit financial intermediaries, making it more complex and critical management of banking. Banks have, therefore, had to deeply rethink themselves seeking new business strategies (from a balance-sheet activities to off-balance, greater involvement in the capital market), new models of doing business (e-banking, mobile banking, role of technology), new business models (subcontracting, outsourcing, strategic alliances) and M & A. These changes have affected the nature and activities of the banks and created the need to develop new skills and competencies (human capital), but also in terms of organizational change processes and technologies (structural capital) and relationships with stakeholders (relational capital).

Intellectual capital in banks has its own specific such as: high and strong relation with customers, trust and reputation as the basis of competitive advantage, the information component of the production and distribution processes; the relational nature of long-term relationship with customers; the necessity for a rapid adaptation of the behavior of people in the light of the new product/process; the relevance of the service and assistance in the competitive policies of differentiation; the centrality of the participation of people to service system of the industry (Campbell, 2010).

Increasing competitive pressures, arising from the phenomena mentioned above and

the increased complexity of the management of banking activity can thus be considered as determinants of the reasons for the increasing orientation to the strategic management of intangibles in the financial services. In banks, the main role is played by human capital. Human capital is difficult to develop and managers must always seek to motivate employees in order to reduce the propensity to leave the bank.

Aside from the human contribution, banks face other typical characteristics of knowledge-intensive activities, such as technology and the frequent interaction between employees and customers. Still, banking activity implies a close relationship with customers, which is largely based on the integration of information and communication technologies to the development of new products and services, as well as for automation of process. The increasing automation in the manage of banking operations has a direct impact on the role of technology and, at the same time, however, raises concerns about security issues (confidential information, information accessibility, etc.) and processes for managing operational risks (operational risk management process). Operational risk is defined by Basel II as the risk of losses achieved in inadequate internal processes, human error, failures in operating systems or due to external events.

Operational risk affects all the operations of banks and thus implies the need to pay due attention to structural capital (procedures, processes and information systems theory to identify, monitor and mitigate operational risk). Accordingly, we expect that banks provide an extensive information on these aspects in order to demonstrate their act to develop and use this form of capital. In the banking sector another important aspect is the central location of the customer, identifying it as a key success factor (Cabrita & Bontis , 2008). With the advent of new ways of carrying out the business activity, such as online banking, banks could benefit from this by developing new services and / or products. Still critical to the bank is the quality of relationships with the supervisor, with the supervisory bodies (Bank of Italy, Consob, with reference to Italy). The reputation and trust-based relationships are other intangible factors (Castelo Branco & Rodrigues Lima, 2006).

Finally, an external element, the advent of Basel II, and in particular, the third pillar entitled " Market disciplines ", should have an influence on the level of disclosure. The objective of Basel II is to increase the disclosure of both qualitative and quantitative nature for stakeholders. More specifically, the purpose of the third pillar is to " Encourage market discipline by Developing a set of disclosure requirements which allow Market participants to assess key pieces of information on the aim of application, capital , risk

exposures, risk assessment procedures, and hence will the capital adequacy of the institutions " (Basel II , p. 226-228). These changes are reflected in the structural capital , and in particular we expect a greater disclosure of those items that are more directly related to the *operational risk manangement* (such as procedures and policies related to operational risk management processes and information systems aimed at monitor operational risk).

Each element of intellectual capital is, therefore, a critical resource for banks that must be managed internally, but should also be disclosed in order to build a good reputation (Toms, 2002; Xifra and Ordeix, 2009). On the other hand a good reputation helps to maintain a sustainable competitive advantage.

2.3 Literature review

Essentially two are the main field of study related to intellectual capital: studies that measure intellectual capital in economic-quantitative terms and studies on intellectual capital disclosure directed to highlight information on intellectual capital in the same way that the economic-financial information can influence the decisions of a potential investor (Rees and Sutcliffe, 1994).

Focusing on the latter topic, as our contribution falls in it, the first study is Guthrie and Petty (2000). The authors develop a framework of characteristics/attributes of intellectual capital, derived from Sveby's Intangible Asset Monitor to encode and analyze the annual reports of 20 listed companies in Australia for the year 1998, with the purpose of determining the level of the IC discolsure (ICD) in the Australian context. From this study many others start, generally focused on a single country, some analyse the presence of information on intellectual capital, others also the extension and others the quality of disclosure (Guthrie & Petty, 2000; Abeyesekera, 2000; Brennan, 2001; Bozzolan et al., 2003). Generally the analyses are cross-industry even if sometimes the analysis focuses on a particular sector (Shareef and Davey, 2006; Scheneider and Samkin 2008). Limited are those that include banks in their sample analysis (Williams, 2001; Abdolmohammadi, 2005; Bontis, 2002; Goh and Lim, 2004; Guthrie and Petty, 2000; Oliveras et al., 2008; Vandemaele et al. 2005; Vergauwen and Alem, 2005; Oliveria et al., 2010; Khan and Khan, 2010) or focused only on the banking sector (Khan and Ali, 2010; Mention , 2011; Haji and Mubaraq , 2012).

Banking activity, in fact, is a high-knowledge business services and its characteristics are suitable to be analysed in terms of IC, which represents a critical resource in the process of corporate value creation. The activities of banks requires human resources with a good education, qualified and continuously updated (Alvesson, 2000), generally involves relationships with customers and rely, in large part, to the development of new products and services, integration of information and communication technologies (ICTs) (Mention & Bontis, 2012).

Khan and Ali (2010) are the first authors to present a study that analyses the annual reports to assess the ICD in 20 listed banks in Bangladesh in the period 2007-2008. The framework of analysis is Sveiby (1997) as modified by Guthrie and Petty (2000). The authors, in order to take into account the characteristics of the banking sector, insert other items, such as "banks recognition for services", "banks market share", "banks reputation for services" and "number of training for employooyee." The method of analysis is the content and the items used are 21. The data are qualified with the value of "0" if the information is absent and "1" if the information is present and the unit of analysis is the word count. The information that prevail are those on human capital (65%) followed by those on the relational capital (20.8%), and those relating to structural capital (14.2%).

The second study is Mention (2011), who examines the practices of voluntary reporting on intellectual capital by analyzing the annual report of five European banks. The analysis is conducted over a period of nine years (2001-2009) through the content analysis, that identifies for each of the three categories (human capital, structural capital and relational capital), five subcategories² and different indicators.

The framework used is Guthrie and Petty (2000) modified to take account of the peculiarities of the banking environment. The information acquired are qualified with the value "0" if absent, "1" if qualitative and "2" if quantitative in nature. The unit of analysis is the text unit. The analysis shows an increase in all categories of intellectual capital in the period and on average it should be noted that the category of majour interest is human capital (43 % of the information), followed by the relational capital (34%) and then structural capital (23%).

² *Human capital constitutes: knowledge, Skills, Attitudes, talent management e training policies; capitale strutturale: Intellectual property, information systems and infrastructure, management process, corporate culture, innovation capabilities; capitale relazionale: Bran, customers, distribution channel, business partnerships, corporate actions*

The third study deals with the ICD in the banking sector is Haji and Mubaraq (2012), who examines, for the period 2006-2009, the annual reports of 20 Nigerian banks. These authors do not adopt a specific framework of reference even if they adopt the classic division of intellectual capital. The researchers identified 44 items and qualify the information with "0" if absent and "1" if present. The most consistent information are those relating to structural capital (average 36%), followed by those on human capital (34%) and then by the relational capital (30%).

All studies above cited were conducted in other countries; the absence of previous research justifies exploratory approach of this study, recommended in those situations in which knowledge about a particular topic are limited (Selltis et al., 1976).

In the three studies mentioned, the method of research is content analysis³. This method, in fact, is the most appropriate in studies of disclosure of intellectual capital in annual reports, social reporting and other corporate documents (Yamagami & Kokubu, 1991; Guthrie & Petty, 2000; Unerman, 2000; Brennan, 2001; Bozzolan et al. 2003; Oliveira et al, 2006; Beattie and Thomson, 2007; Cordazzo, 2007; Vergauwen et al, 2007; Abeysekera, 2008 Abeysekera & Guthrie, 2005; Oliveras et al, 2008).

3. Research objective and methodological approach

Objective of this study is to investigate the amount and the type of intellectual capital information (human, relational and structural capital) reported in the sustainability reports of Italian banking firms.

The analysis is conducted on a voluntary reporting documents, such as new forms of corporate disclosure, that may be useful to provide information based on intellectual capital (Zambon, 2003; Cordazzo, 2005) for the years 2006 and 2012. Specifically, the analysis is carried on the sustainability reports.

The methodology of analysis, in line with the existing literature, is content analysis, which is a useful method to extract information (April et al., 2003), which allows to identify the different components of intellectual capital and to understand, analyze and describe information about the intellectual capital in the documents selected for the

³ Another common method of analysis in the study of intellectual capital is the VAICTM analysis. The methodology VAIC is instead used to measure the intensity with which a company produces value-added based on the efficiency of intellectual capital (P. Stale, Stale S., S. Aho) and its goal is to measure efficiency in 'use of intellectual capital (Pulic, 2000). The VAIC leads to determine a summary of the efficiency of the enterprise and efficiency of intellectual capital.

analysis. The objective of this method can be found to represent the behavior of organizations in terms of intellectual capital disclosure⁴.

This method consists in classifying the information contained within the document analyzed within a predefined category of items identified with the intent to capture aspects of intellectual capital that you want to analyze. The basic assumption of content analysis is that the amount of information available reflects the importance of the information (Krippendorff, 1980). The application of content analysis involves the classification of the information available in the various categories in line with a predefined schema or identified criteria (Guthrie and Petty, 2000; Abeyesekera, 2008). The application of content analysis involves reading the document of social reporting and coding of information based on the framework identified.

In the contribution we have chosen to examine the level and extent of information on intellectual capital in the documents of voluntary reporting, in particular in sustainability reports, available on the website of the banks. It is, in other words, interested in analyzing the voluntary disclosure on IC, as it is considered important in order to provide a complete view of the firm (Campbell and Rahman, 2009). The research analyzed the need for information to decision makers reveal that market participants consider important and useful information on the IC to make investments (Abhayawansa and Guthrie, 2010).

The items used to make the analysis follows the pattern for intangibles of Sveiby (1997), who identifies the internal structures (structural capital), the external structures (relational capital) and employee competence (human capital). To take account of the purpose and object of the analysis, the items of analysis have been modified according to the sector analyzed, in order to have a better convergence with the item that much more likely to be reported by banking institutions (Guthrie & Petty, 2000). In this context, useful references are Mention (2011), Shih et al. (2010) and Ordonez (2003), as will be specified. The content analysis, following the literature (Krippendorff, 1980; Weber, 1990), was developed in the following steps: a) definition of the unit of analysis; b) defining the categories and c) development of an unambiguous coding rules.

a) Definition of the unit of analysis

With regard to the first phase, the existing literature identifies as a unit of analysis a word, a sentence or paragraph. Milne and Adler (1999) believe the word is not reliable,

⁴ Krippendorff (1980) afferma che la content analysis è "research technique for making replicable and valid inferences from data according their context"

because it has a different meaning depending on the context of reference of the sentence and is therefore considered the most appropriate sentence for this type of analysis. However, since a sentence may contain more information, including on different aspects of intellectual capital in order to avoid bias in the analysis could be considered the unit of text as the unit of analysis; in this case, the different information needs to be captured for the different components of intellectual capital.

Items have been investigated focusing on information and not on the expression of the single word. Therefore the research has sought and counted the information expressed in the sustainability reports concerning each single item. Have been deleted the double information on the same item and information contained in the table and charts have been counted only in case if they supply an additional information not explained in the body of the report.

b) Defining the category

In this paper, intellectual capital is defined and analyzed using three broad categories: human, structural and relational capital.

Human capital consists of the set of skills and knowledge of employees which can be further improved with training. It includes also experiences that can be developed with training programs. Human capital can be analyzed at micro level (individual) or macro level (enterprise).

Relational capital is linked to the organization and its relationship with external elements such as customers, suppliers and shareholders. Examples of relational capital in banks are customers, brand loyalty, customer satisfaction, strategic alliance and coalitions.

The structural capital can be, instead, defined as a knowledge created by an organization and which can not be separated from the same.

Consistent with the existing literature (Bontis, 2003; Guthrie and Petty, 2000; Striukova et al. 2008) for each category were identified sub-categories (items) and indicators (Table 2), trying to capture the most important aspects with regard to context analysis.

The selection of items is the most critical aspect (Marston and Shrivess, 1991, Bukh et al., 2005) and in order to make this choice less subjective, items were selected taking into account the items identified in Mention's study (2011). Mention (2011) identifies a framework of analysis with reference to the study of Shih et al. (2010) on human capital

in financial institutions and the study of Guthrie and Petty (2000) for the structural capital and relational adapting the items according to the the banking sector. These items have been integrated with the indicators identified by Ordonez (2003) and subsequently with indicators derived from the study of some sample documents.

Table 1 – Framework for analyzing IC reporting

Human capital	Employee's profile	<ul style="list-style-type: none"> staff manager gender distribution country of origin of human resources average age of employee n. full-time employee n. contracts protected categories overtime
	Knowledge	<ul style="list-style-type: none"> education placement subdivision experience expertise seniority awards
	Skills	<ul style="list-style-type: none"> Teamwork language problem solving internal communication social communication creativity
	Attitudes	<ul style="list-style-type: none"> conscientiousness proactivity personal initiative customer centric commitment motivation managerial experience and abilities entrepreneurial behaviour Engagement index % promoted staff/tot. staff
	Talent management	<ul style="list-style-type: none"> integration process n. injury

		<p>n. lost days for injury</p> <p>n. disciplinary measure</p> <p>regular opportunity</p> <p>promotional initiative for gender balance</p> <p>support protected categories</p> <p>health and wealth of employee</p> <p>quality life of employee</p> <p>employee's satisfaction</p> <p>turnover</p> <p>diversity</p> <p>recruitment policy</p> <p>remuneration and incentive policies</p> <p>Performance Management</p> <p>appreciation of human resource</p> <p>career development</p> <p>absentee rate</p> <p>leadership development</p> <p>involvement initiative</p> <p>initiatives to support employees who return after long absence</p> <p>survey among employee</p>
	Training policies	<p>training program</p> <p>professional program</p> <p>induction program</p> <p>relationship manager program</p> <p>Manager program</p> <p>investment in training</p> <p>h of training</p> <p>methods of training</p> <p>typology of topic</p> <p>n. participants</p> <p>master</p> <p>head training</p>
Structural capital	Intellectual property	<p>patents</p> <p>trademark</p> <p>licenses</p> <p>copyright</p>
	information system and	<p>database</p> <p>systems, network, software</p>

	infrastructure	remote/online banking system security measurement certifications tecnology Investment for regulatory compliance intranet communties of practies virtual worplace
	Management process	quality process improvement operational risk management processes computerized processes
	Corporate culture/identity	identity vision mission corporate value information and communication in the company awareness of employees
	Innovation capabilities	research development and innovation product or service innovation
Relational Capital	Brand	brand awareness trust transparency credibility awards received image caution
	Customers	customer relationship management loyalty satisfaction retention tax ability to acquire new customers customized/personalized services segmentation of customers quality of service response time to credit client claim/complaint service n. claim/complaint customer assistance

		cross-selling index hearing tools for customers customer satisfaction index Greenwich quality index consumer protection
	Distribution channel	multichannel bank promotional and marketing initiative territorial expansion policy/plan for branches accessibilità for person with disability
	Business partnerships	collaboration cooperation outsourcing relation with media
		relation with università or research institute relation with suppliers shareholder satisfaction relation with other banks Relation with regulatory body relation with Public Administration dialog with investors
	Corporate action	community involvement environmental protection measures azioni filantropiche corporate sustainability actions and initiatives sponsorship guidance and training activities

Source: adapted from Mention (2011) and Ordenez (2003).

c) The coding process of intellectual capital information

Consistently with Oliveria *et al.* (2010), manual coding was preferred because software-assisted searches for words, sentences or portions of pages are insufficiently robust to capture the nature of the IC information disclosed (Beattie and Thomson, 2007). In order to collect the items on intellectual capital sustainability reports have been read in full, without resorting to the "Search" function in PDF documents analyzed.

The data was first coded by category and then by subcategory. In line with the purpose of this study to concentrate on the qualitative character of intellectual capital disclosure, repetitions were ignored.

In order to identify the level of disclosure, the information was coded in a dichotomous way, whose value was set at "1" if the item is present and "0" otherwise. It was made this choice in order to avoid areas of subjectivity that tend to be present when the assignment of the value includes a weighing (Williams, 2001).

The extent of disclosure was measured by counting the frequency of the presence of the three categories and their subcategories. The frequency, in fact, indicates the importance of a particular element (Krippendorff, 2004).

Finally we constructed a Disclosure indexes (ICI) (Haniffa and Cooke (2005); Ghazali (2007)). ICI calculate "the number of information-related items that a given report contains based on a predefined list of the possible items" (Bukh et al., 2005). The total disclosure score was computed as the unweighted sum of the scores of each item (Cooke, 1989). All items were considered relevant to all firms. The formula to calculate ICD_i is the following:

$$ICD_i = \frac{\sum_{j=1}^n D_{ij}}{n}$$

where D_{ij} assumes the value of 1 if were found information on the item and zero otherwise and "n" is the maximum number of items reported in the document.

The use of disclosure indices in studies of accounting and reporting of business practices is widely used (Marston and Shrivs, 1991, Guthrie et al., 2004), as these studies represent an aspect of the quality of disclosure that may be captured by a measure "sum" (Beattie, 2002; Bukh PN, 2005). To mitigate the main problem of content analysis (accuracy of information), the collecting data was conducted on sustainability documents separately by all the three authors and then compared where it showed discrepancies.

4. Sample and data

Listed banking sector firms in the Italian Stock Exchange are initially selected to represent the sample of the study. However data of some companies have been omitted because they are not fulfilling the sampling requirements of this study. Under such requirements, companies should have published their social reports for 2006 and 2012. In line with this requirements, thirteen firms have been excluded from the sample and four retained.

The selected document for the analysis is the social reporting. The banks listed on at 31/12/2012 were seventeen, but only six draw up documents of voluntary reporting in five years. None of the analyzed banks draw up a real intellectual capital reports. All documents used are freely available online.

Table 2 - sample

SAMPLE SELECTION PROCESS	NUMBER OF FIRMS 2006	NUMBER OF FIRMS 2012
Total financial firms listed in FTSE MIB	17	17
Firms with sustainability reports	5	10
Total sample	4	

The final sample consists of 4 companies, one (Monte dei Paschi Group) was excluded because of its Sustainability Reports 2012 could not be compared with 2006 because it consists only indicators and do not disclose narrative part.

Therefore our final sample consists of the following companies: 1) Unicredit Bank, 2) Credito Valtellinese, 3) Ubi Bank and 4) Carige Group.

5. Results

5.1 Descriptive Analysis

Only 24% of the companies draw up sustainability reports in the period time considered.

In banking sector, the main role is played by human capital and relational capital; in fact the examined companies disclosed information mainly on these type of resources while the lowest incidence occurs on structural capital both in 2006 and 2012.

Table 3 – Descriptive statistics for the sample

Number of sample companies	17
Number of companies that have a sustainability report	5
Number of intellectual capital attributes in model	136
Average number of attributes reported per company	60 in 2006 and 64 in 2012
Minimum number of attributes reported by any one company	47 in 2006 and in 2012
Maximum number of attributes reported by any one company	72 in 2006 and 91 in 2012

Source – our revision

Table 4 displays the number of human capital, relational capital and structural capital reported by the four aforementioned institutions over two-year period, 2006 and 2012. As illustrated in the table, the level of information disclosed follows an ascendant trend. To a certain extent, this observation supports the proposition that disclosure of intellectual capital increases over time, especially after the entry into force of the third pillar of Basel II (market discipline).

In absolute terms, relational capital consistently ranks first in this study, unlike what is reported in the study of Mention (2011), both in 2006 (716) and in 2012 (837); human capital holds the second place (261 in 2006; 488 in 2012), while structural capital lands on the third on (161 in 2006 and 168 in 2012). This result highlights the importance for the banking sector of the relational capital: this means trust and credibility from its customers and in general from its stakeholders.

In relative terms, the ranking indicates that relational capital is most disclosed, followed by human and then structural capital, which is consistent with prior studies (e.g. April et al., 2003; Guthrie and Petty, 2000; Oliveras et al., 2008; Striukova et al., 2008).

Table 4 – Intellectual capital in the examined reports.

	2006	%	2012	%
Human Capital	261	24%	488	33%
Structural Capital	161	14%	168	12%
Relational Capital	716	62%	837	56%
Intellectual Capital	1150	100%	1493	100%

Source – our revision

Taken a closer look at the importance of each subcategory (table 5), it can be observed that the top five subcategories are “Training policies” for human capital, just to show the importance in this particular sector of the professional and learning training, the updating of the employee; “corporate culture and identity” for structural capital, to indicate the importance of some values, as trust, credibility, etc.; “Customers”, “Business partnership” and “Corporate action” for relational capital, to highlight that the relationship with customers and stakeholders are crucial for an institution. Corporate action refers to all initiatives in which banks are involved in, especially in no-profit organisms, or to promote cultural and sport events.

It can be observed also a low level of disclosure of intellectual property, innovation capabilities and management process. A possible explanation for this may reside in the fact that banks may be hesitant to pursue patenting over their financial institutions in

Europe due to the legal uncertainty surrounding the patentability of business methods and computer programs.

Table 5 – Disclosure per subcategory, given in absolute term and relative disclosure level provided

Cat.	Subcategories	2006	%	2012	%
HC	Employee's profile	36	3,14%	32	2,14%
	Knowledge	21	1,83%	22	1,47%
	Skills	35	3,05%	39	2,61%
	Attitudes	19	1,66%	18	1,21%
	Talent management	92	8,00%	196	13,13%
	Training policies	70	6,10%	181	12,12%
SC	Intellectual property	6	0,52%	3	0,20%
	information system and infrastructure	30	2,61%	26	1,74%
	Management process	3	0,26%	0	0,00%
	Corporate culture/identity	115	10,02%	123	8,24%
	Innovation capabilities	7	0,61%	16	1,07%
RC	Brand	23	2,00%	37	2,48%
	Customers	128	11,15%	191	12,79%
	Distribution channel	83	7,23%	109	7,30%
	Business partnerships	125	10,89%	181	12,12%
	Corporate action	357	31,10%	319	21,37%
IC	Total	1148	100,00%	1493	100,00%

As regards disclosure per items, it could be observed, consistently with prior literature, that for human capital few and sometimes none information are reported for overtime, employee's experience, team work, language, problem solving, creativity or proactivity of the employee; whereas the most informations reported are gender distribution, internal communication, recruitment policies and training programs. As concerns structural capital, very few informations are reported for licenses, copyright; whereas the major informations disclosed are corporate value and vision. Finally, as regards relational capital information relates to shareholder value are not present, whereas informations relates on sponsorship, environmental protection measures, relation with suppliers, collaboration and multichannel bank.

Table 6 – Disclosure per indicators/items, given in absolute terms

Subcategories	Item	2006	%	2012	%	
Employee's profile	staff	3	0,26%	4	0,27%	
	manager	5	0,44%	4	0,27%	
	gender distribution	8	0,70%	8	0,54%	
	country of origin of human resources	1	0,09%	2	0,14%	
	average age of employee	5	0,44%	5	0,34%	
	n. full-time employee	4	0,35%	4	0,27%	
	n. contracts	5	0,44%	3	0,20%	
	Protected categories	5	0,44%	2	0,14%	
	overtime	0	0,00%	0	0,00%	
	education	6	0,52%	6	0,41%	
Knowledge	Placement subdivision	7	0,61%	5	0,34%	
	experience	1	0,09%	2	0,14%	
	expertise	2	0,17%	2	0,14%	
	seniority	5	0,44%	5	0,34%	
	awards	0	0,00%	2	0,14%	
	Teamwork	0	0,00%	0	0,00%	
	language	0	0,00%	0	0,00%	
Skills	problem solving	1	0,09%	0	0,00%	
	Internal communications	33	2,88%	26	1,76%	
	Social communication	0	0,00%	13	0,88%	
	creativity	1	0,09%	0	0,00%	
	conscientiousness	3	0,26%	3	0,20%	
	proactivity	0	0,00%	0	0,00%	
	Personal initiative	0	0,00%	0	0,00%	
	Customer centric	3	0,26%	1	0,07%	
	commitment	5	0,44%	2	0,14%	
	motivation	3	0,26%	3	0,20%	
Attitudes	managerial experience and abilities	3	0,26%	1	0,07%	
	entrepreneurial behaviour	0	0,00%	2	0,14%	
	Engagement index	0	0,00%	1	0,07%	
	% promoted staff/tot. staff	2	0,17%	5	0,34%	
	Integration process	2	0,17%	0	0,00%	
	Talent management	n. injury	2	0,17%	4	0,27%
		n. lost days for injury	1	0,09%	4	0,27%

	n. disciplinary measure	3	0,26%	3	0,20%
	Regular opportunity	11	0,96%	12	0,81%
	promotional initiative for gender balance	0	0,00%	8	0,54%
	Support protected categories	0	0,00%	8	0,54%
	Health and wealth of employee	8	0,70%	10	0,68%
	quality life of employee	0	0,00%	0	0,00%
	Employee's satisfaction	0	0,00%	0	0,00%
	turnover	3	0,26%	5	0,34%
	diversity	8	0,70%	7	0,47%
	recruitment policy	18	1,57%	18	1,22%
	Remuneration and incentive policies	13	1,14%	14	0,95%
	Performance Management	0	0,00%	27	1,83%
	appreciation of human resource	0	0,00%	11	0,75%
	Career development	13	1,14%	7	0,47%
	Absent rate	7	0,61%	5	0,34%
	Leadership development initiative	0	0,00%	24	1,63%
	involvement initiative	0	0,00%	15	1,02%
	initiatives to support employees who return after long absence	0	0,00%	6	0,41%
	survey among employee	3	0,26%	8	0,54%
	training program	19	1,66%	61	4,14%
	professional program	6	0,52%	19	1,29%
	induction program	7	0,61%	2	0,14%
	relationship manager program	0	0,00%	10	0,68%
	Manager program	11	0,96%	16	1,09%
	investment in training	1	0,09%	9	0,61%
Training policies	h of training	4	0,35%	12	0,81%
	methods of training	6	0,52%	12	0,81%
	typology of topic	7	0,61%	20	1,36%
	n. participants	6	0,52%	14	0,95%
	master	2	0,17%	1	0,07%
	head training	1	0,09%	5	0,34%
	Human Capital	273	23,8%	488	33,1%
Intellectual property	patents	0	0,00%	0	0,00%
	trademark	6	0,52%	3	0,20%

	licenses	0	0,00%	0	0,00%
	copyright	0	0,00%	0	0,00%
	database	1	0,09%	0	0,00%
	systems, network, software	11	0,96%	2	0,14%
	remote/online banking system	1	0,09%	0	0,00%
	security measurement	0	0,00%	3	0,20%
information system and infrastructure	certifications	12	1,05%	3	0,20%
	tecnology	5	0,44%	2	0,14%
	Investment for regulatory compliance	0	0,00%	3	0,20%
	intranet	0	0,00%	2	0,14%
	communities of practies	0	0,00%	11	0,75%
	virtual worplace	0	0,00%	0	0,00%
	quality process improvement	3	0,26%	0	0,00%
Management process	operational risk management processes	0	0,00%	0	0,00%
	computerized processes	0	0,00%	0	0,00%
	identity	0	0,00%	9	0,61%
	vision	11	0,96%	21	1,42%
Corporate culture/identity	mission	23	2,01%	7	0,47%
	corporate value	49	4,28%	43	2,92%
	information and communication in the company	25	2,18%	20	1,36%
	awareness of employees	2	0,17%	4	0,27%
	research	0	0,00%	2	0,14%
Innovation capabilities	development and innovation	5	0,44%	4	0,27%
	product or service innovation	2	0,17%	10	0,68%
Structural Capital		156	13,6%	149	10,1%
	brand awareness	2	0,17%	0	0,00%
	trust	2	0,17%	1	0,07%
	transparency	1	0,09%	7	0,47%
Brand	credibility	1	0,09%	1	0,07%
	awards received	3	0,26%	19	1,29%
	image	12	1,05%	3	0,20%
	caution	2	0,17%	6	0,41%
	customer relationship management	7	0,61%	22	1,49%
Customers	loyalty	3	0,26%	1	0,07%
	satisfaction	14	1,22%	15	1,02%
	retention tax	3	0,26%	0	0,00%

	ability to acquire new customers	0	0,00%	1	0,07%
	customized/personalized services	21	1,83%	47	3,19%
	segmentation of customers	11	0,96%	2	0,14%
	quality of service	11	0,96%	14	0,95%
	response time to credit	0	0,00%	2	0,14%
	client claim/complaint service	14	1,22%	7	0,47%
	n. claim/complaint	9	0,79%	15	1,02%
	customer assistance	16	1,40%	3	0,20%
	cross-selling index	4	0,35%	6	0,41%
	hearing tools for customers	5	0,44%	25	1,70%
	customer satisfaction index	4	0,35%	4	0,27%
	Greenwich quality index	0	0,00%	2	0,14%
	consumer protection	6	0,52%	25	1,70%
	multichannel bank	40	3,49%	65	4,41%
Distribution channel	promotional and marketing initiative	29	2,53%	7	0,47%
	territorial expansion policy/plan for branches	14	1,22%	9	0,61%
	accessibilità for person with disability	0	0,00%	28	1,90%
	collaboration	20	1,75%	58	3,93%
	cooperation	0	0,00%	0	0,00%
	outsourcing	3	0,26%	1	0,07%
	relation with media	11	0,96%	12	0,81%
Business partnerships	relation with universities or research institute	6	0,52%	25	1,70%
	relation with suppliers	43	3,76%	30	2,04%
	shareholder satisfaction	0	0,00%	0	0,00%
	relation with other banks	13	1,14%	11	0,75%
	Relation with regulatory body	12	1,05%	15	1,02%
	relation with Public Administration	17	1,48%	6	0,41%
	dialog with investors	0	0,00%	23	1,56%
	community involvement	33	2,88%	55	3,73%
	environmental protection measures	130	11,35%	147	9,97%
Corporate action	azioni filantropiche	44	3,84%	38	2,58%
	corporate sustainability actions and initiatives	29	2,53%	22	1,49%
	sponsorship	93	8,12%	52	3,53%
	guidance and training activities	28	2,45%	5	0,34%

Relational capital	716	62,53%	837	56,7%
Intellectual Capital	1145	100,0%	1474	100,0%

5.2 Intellectual capital in the four case studies

The case studies, as defined above, concern the analysis of sustainability/social reports of four financial listed companies. These reports have been prepared in accordance with the Global Reporting Initiative 2002 (GRI2) for 2006 and with the Global Reporting Initiative 2006 (GRI3) for 2012.

Unicredit, compared to the other banks' reports, can be used as an example of best practice in the field of sustainability reports, as it constitutes of many pages with a reach and detailed description of all chapters considered in the GRI, obtaining for all years a score of A+ as level of application.

The series of events over the past 10 years pushed countries and financial institutions to promote sustainable growth. The first years of the new millennium have been marked by an increasing attention to issues of sustainability. The last decade was marked by the subprime mortgage crisis and insolvency of many banks that have given rise to a unprecedented global recession. The next debt crisis European sovereign, together with the erosion of the reputation of the financial sector, has undermined public confidence in banks' ability to support the real economy. This has led to an increasing focus on long-term viability of the financial sector, as well as on professional conduct of banks and their ability to be responsible corporate citizens.

The research for information on intellectual capital according to the identified framework has identified the following results, articulated in human capital, structural and relational.

a) Human Capital

Human capital section of the Italian firms in sustainability report is sufficiently complete. Informations less widespread in the analyzed documents are origin country of employee, overtime, experience and expertise and problem solving. These results are coherent with Oliveira *et al.* (2010) and Mention (2011) results, according to whom the most reported items are: training policies and internal communications. Only Unicredit Bank provides information on social dialog, promotional initiative for gender balance, leadership development initiatives.

In general, the most reported items are referred to workers' relationship and training; this means that information concerning aspects as health, safety and training programmes are more highlighted. Unicredit is the company that provides the most information pertaining to human capital, follow Ubi Bank.

Table 7 – Human capital information divided per banks

Sub.	Item	Uni	CrV	Ubi	Car	Uni	CrV	Ubi	Car
		2006				2012			
Employee's profile	staff	1	1	1	0	1	1	1	1
	manager	1	1	2	1	1	1	1	1
	gender distribution	4	1	2	1	3	3	1	1
	country of origin of human resources	0	1	0	0	0	1	1	0
	average age of employee	1	1	2	1	2	2	0	1
	n. full-time employee	1	0	2	1	1	1	1	1
	n. contracts	0	4	1	0	1	1	1	0
	Protected categories	0	2	3	0	1	1	0	0
	overtime	0	0	0	0	0	0	0	0
	education	1	1	1	0	1	1	1	1
Knowledge	Placement subdivision	1	1	2	1	1	1	1	1
	experience	1	3	1	1	1	3	1	1
	expertise	4	1	1	1	1	2	1	1
	seniority	0	1	0	0	2	0	0	0
	awards	0	1	1	0	0	2	0	0
	Teamwork	0	0	0	0	0	0	0	0
	language	0	0	0	0	0	0	0	0
Skills	problem solving	1	0	0	0	0	0	0	0
	Internal communications	9	7	11	6	12	0	6	8
	Social communication	0	0	0	0	13	0	0	0
	creativity	0	0	1	0	0	0	0	0
	conscientiousness	1	0	2	0	3	0	0	0
Attitudes	proactivity	0	0	0	0	0	0	0	0
	Personal initiative	0	0	0	0	0	0	0	0
	Customer centric	1	1	1	0	1	0	0	0
	commitment	1	1	2	1	2	0	0	0
	motivation	0	0	2	1	3	0	0	0

	managerial experience and abilities	0	0	3	0	1	0	0	0
	entrepreneurial behaviour	0	0	0	0	2	0	0	0
	Engagement index	0	0	0	0	1	0	0	0
	% promoted staff/tot. staff	0	1	1	0	2	1	2	0
	Integration process	2	0	0	0	0	0	0	0
	n. injury	0	1	1	0	1	1	2	0
	n. lost days for injury	0	0	1	0	1	1	2	0
	n. disciplinary measure	0	0	0	3	0	0	3	0
	Regular opportunity	0	4	6	1	9	2	1	0
	promotional initiative for gender balance	0	0	0	0	8	0	0	0
	Support protected categories	0	0	0	0	8	0	0	0
	Health and wealth of employee	0	0	4	4	0	4	5	1
	quality life of employee	0	0	0	0	0	0	0	0
	Employee's satisfaction	0	0	0	0	0	0	0	0
	turnover	0	2	0	1	0	0	5	0
Talent	diversity	6	0	2	0	6	0	1	0
manag.	recruitment policy	0	8	2	8	0	9	6	3
	Remuneration and incentive policies	0	2	0	11	4	0	8	2
	Performance Management	0	0	0	0	20	1	6	0
	appreciation of human resource	0	0	0	0	11			0
	Career development	0	5	8	0	3	1	3	0
	Absent rate	0	3	0	4	1	1	1	2
	Leadership development initiative	0	0	0	0	15	0		9
	involvement initiative	0	0	0	0	13	0	2	0
	initiatives to support employees who return after long absence	0	0	0	0	3	0	3	0
	survey among employee	0	0	0	3	4	0	3	1
	training program	2	3	7	7	40	3	8	10
	professional program	4	1	1	0	15	1	3	0
	induction program	6	0	1	0	2	0	0	0
	relationship manager program	0	0	0	0	10	0	0	0
Training	Manager program	10	0	1	0	1	1	2	12
policies	investment in training	0	0	1	0	1	2	1	5
	h of training	1	1	1	1	9	1	1	1
	methods of training	1	1	1	3	6	3	1	2
	typology of topic	1	4	2	0	11	6	1	2

n. participants	1	1	2	2	10	1	1	2
master	1	0	1	0	0		1	0
head training	0	0	1	0	3	1	1	0
Human Capital	62	65	83	63	272	59	88	69

b) Structural Capital

Unicredit is the company that provides in 2006 and 2012 the most information pertaining to structural capital. The items relate to intellectual property are not present in document, it binds to the type of business activities of the undertakings concerned.

Table 8 – Structural Capital information divided per banks

Sub.	Item	Uni	CrV	Ubi	Car	Uni	CrV	Ubi	Car
		2006				2012			
Intellectual property	patents	0	0	0	0	0		0	0
	trademark	0	6	0	0	0	3	0	0
	licenses	0	0	0	0	0	0	0	0
	copyright	0	0	0	0	0	0	0	0
	database	0	1	0	0	0	0	0	0
	systems, network, software	0	4	7	0	2	0	0	0
	remote/online banking system	0	1	0	0	0	0	0	0
information system and infrastruc.	security measurement	0	0	0	0	0	0	0	3
	certifications	0	10	2	0	0	3	0	0
	tecnology	0	2	3	0	2	0	0	0
	Investment for regulatory compliance	0	0	0	0	3	0	0	0
	intranet	0	0	0	0	1	0	1	0
Management process	communities of practies	0	0	0	0	8	0	0	3
	virtual worplace	0	0	0	0	0	0	0	0
	quality process improvement	2	0	1	0	0	0	0	0
	operational risk management processes	0	0	0	0	0	0	0	0
	computerized processes	0	0	0	0	0	0	0	0
Corporate culture/identity	identity	5	0	0	0	20	8	0	0
	vision	9	0	2	0	5	1	1	14
	mission	12	2	2	7	3	1	1	2
	corporate value	29	7	5	8	20	10	1	12
	information and communication in the company	11	2	2	10	20	0	0	0

Innovation capabilities	awareness of employees	2	0	0	0	2	2	0	0
	research	0	0	0	0	2	0	0	0
	development and innovation	0	2	3	0	4	0	0	0
	product or service innovation	0	2	0	0	10	0	0	0
Structural Capital		70	39	27	25	102	28	4	34

c) Relational Capital

The relational capital is the area of intellectual capital which companies both in 2006 and 2012 pay the most attention. Companies seem to acknowledge that their customers and in general stakeholders are a critical source of wealth, and that by building a positive image with stakeholders they can acquire an important intangible element – a good reputation. Reputation is inherent to the financial services and it is highly influenced by human capital and structural.

Table 9 – Relational Capital information divided per banks

Sub.	Item	Uni	CrV	Ubi	Car	Uni	CrV	Ubi	Car
		2006				2012			
Brand	brand awareness	0	2	0	0	0	0	0	0
	trust	1	0	1	0	0	0	1	0
	transparency	1	0	0	0	6	0	1	0
	credibility	1	0	0	0	1	0	0	0
	awards received	1	0	2	0	8	0	11	0
	image	1	10	1	0	3	0	0	0
	caution	2	0	0	0	6	0	0	0
	customer relationship management	0	0	5	2	6	0	2	14
	loyalty	0	1	1	1	0	0	1	0
	satisfaction	5	1	3	5	3	0	1	11
Customers	retention tax	0	1	0	2	0	0	0	0
	ability to acquire new customers	0	0	0	0	1	0	0	0
	customized/personalized services	3	12	3	3	14	12	6	15
	segmentation of customers	0	2	6	3	0	0	0	2
	quality of service	2	2	2	5	11	0	0	3
	response time to credit	0	0	0	0	2	0	0	0
	client claim/complaint service	3	3	4	4	3	0	4	0

	n. claim/complaint	1	2	4	2	0	3	6	6
	customer assistance	0	5	7	4	3	0	0	0
	cross-selling index	0	2	2	0	0	0	6	0
	hearing tools for customers	0	5	0	0	24	0	1	0
	customer satisfaction index	4	0	0	0	4	0	0	0
	Greenwich quality index	0	0	0	0	2	0	0	0
	consumer protection	6	0	0	0	13	0	6	6
	multichannel bank	0	5	32	3	34	7	6	18
Distribution channel	promotional and marketing initiative	13	12	1	3	0	4	3	0
	territorial expansion policy/plan for branches	0	8	6	0	2	0	7	0
	accessibility for person with disability	0	0	0	0	9	0	6	13
	collaboration	10	9	1	0	30	0	20	8
	cooperation	0	0	0	0	0	0	0	0
	outsourcing	0	0	0	3	0	0	0	1
	relation with media	0	4	0	7	0	8	4	0
Business partnerships	relation with universities or research institute	0	3	3	0	14	0	8	3
	relation with suppliers	4	11	15	13	7	10	7	6
	shareholder satisfaction	0	0	0	0	0	0	0	0
	relation with other banks	0	2	2	9	0	0	6	5
	Relation with regulatory body	0	5	0	7	0	6	3	6
	relation with Public Administration	0	1	1	15	0	0	0	6
	dialog with investors	0	0	0	0	18	0	5	0
	community involvement	11	6	6	10	33	4	10	8
	environmental protection measures	47	35	38	10	50	48	41	8
Corporate action	azioni filantropiche	32	4	8	0	32	0	6	0
	corporate sustainability actions and initiatives	7	22	0	0	14	0	8	0
	sponsorship	29	30	18	16	3	13	20	16
	guidance and training activities	0	26	2	0	0	0	5	0
	Relational capital	184	231	174	127	356	115	211	155

6. Conclusion and future research

Considering the peculiarities of the banking sector, its being knowledge-intensive and the changes that have affected the industry, this study analyzes the level of information on intellectual capital of the banks listed on the Milan Stock Exchange. Practices regarding

disclosure of intellectual capital in Italian banks was conducted using content analysis, which allowed us to examine and define the extent and the content of the information provided in the documents of social reporting.

The study shows that the relational capital, as shown in previous works, predominates followed by information on human capital and structural capital then. Either way, the information level is quite high. Analyzing the trend shows a substantial increase in information related to capitale human and relational capital and the structural remains almost constant.

The results have implications for policy and management . At the level of policy Basel II drives to provide more information, particularly on intellectual capital, but to date there are no specific references on how to provide such information and this can make it difficult to implement the prediction of a balance of intellectual capital, especially if it is not mandatory. Therefore it would be desirable to develop a framework for this report may be directed to the preparation of the document and its comparability over time and somehow assure the reader about the goodness of the information contained therein. From the management point of view to an enterprise knowledge-intensive management of intellectual capital is essential. Prepare a report like this can bring benefits in terms of transparency, trust and reputation. So how management uses time and effort to identify its key resources so should communicate outside.

This research expands on previous studies of voluntary intellectual capital disclosure (ICD), as it is the first study that focuses on measuring intellectual capital using the content analysis and an IC index in the banking sector. Moreover, this paper contributes to the existence literature mainly in three ways: first, we analyze the quantity and the quality of IC disclosure in the financial sector; second we choose Italian banks; third, we compare the information disclosed in the annual reports and in the sustainability reports of the firms belonging to the sample.

The study certainly has limitations and the principal is to be attached to the use of content analysis, unaccurate the subjectivity of interpretation even though there is a list of predefined items, secondly, the sample size does not allow to generalize the results even if it is recognized that judgmental or purposive approach offer comparable results to the use of probabilistic methods with small samples (Thietart, 2003), even if our goal is not to generalize the results to the case of an exploratory study. The study is exploratory in nature and its goal is to expand your knowledge with reference to a sector that is still

largely unexplored.

Regarding the future of the research, it could be useful accompany the content analysis of questionnaires to firms in the sample. This is because, as already mentioned, the technique of content analysis suffers from subjectivity. In other words, the content analysis involves the application in the trial of an attribute information to the intellectual capital and at the same time it is difficult to decide whether a paragraph in a document contains specific information on intellectual capital. In addition to reading a document, typically hundreds of pages with lots of information and involves fatigue and tuner can easily result in a view but this information is not. Still content analysis is static and identifies what is happening at a certain time not identify themselves but the long-term strategy.

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Appendix I – Previous studies on ICD

Author(s)	Year(s) of sample selection	Media	Sample	Country	Object and finding	Industry, if specific	Content analysis			
							unit of analysis	Number of items	Framework	Scal e scoring
Haji e Mubaraq (2012)	2006-2009	Annual report	20 listed banks	Nigeria	To examine longitudinally the IC disclosure practice	Banking sector	na	44	Previous literature	0-1
Khan e Ali (2010)	2007-2008	Annual report e questionari	20 listed banks	Bangladesh	To report the findings of a study of IC reporting	Private commercial bank	word	21	Sveiby (1997)	0-1
Mention (2011)	2001-2009	Annual report	The first 5 banks of 5 european countries	Germany, Francia , UK, Italia e	To examine the voluntary reporting practices of IC	Banking sector	Text unit	15 with many indi	from Guthrie & Petty 2000;	0-2

				Spagna				cat ors		
Abdolmohammadi (2005)	1993-1997	Annual report	58	USA	to develop a descriptive framework of the components of intellectual capital in annual and to investigate the effects of disclosure of intellectual capital on market capitalization	Cross-industry, whom 9 banks	Word	58	extends Guthrie et al.'s (2003)	The frequency of information
Bontis (2003)	2002	Annual report	10.000	Canada	To examine the extent of IC disclosure	Cross-industry	term	39	No detail given	0-1
Bukh et al. (2005)	1999-2001	Initial Public Offering (IPO)	68	Danmark	to examine whether information on intellectual capital (non-financial information on knowledge based resources) is disclosed in Danish IPO prospectuses	Cross-industry	Item	78	No given detail	0-1
Garcia-Meca-Mejean e Martinez (2007)	2000-2003	Analyst report	260	Spain	To examine how much analysts use IC information in their report	Cross industry, listed firms with some banks	Item	60	Bukh, Nielsen e Gormes e Mouritsen (2004)	0-1
Goh & Lim (2004)	2001	Annual report	20	Malaysia	To study reporting practices of companies	top profit making company, 5 banks	Attributes	24	Guthrie & Petty (2000); Sveiby (1997)	0-1
Guthrie & Petty (2000)	1998	Annual report	20 big listed companies	Australia	To examine the level of IC disclosure	Diversi settori, 1 bank	attributi	24	Sveiby (1997)	0-3
Guthrie et al (2006)	1998-2002	Annual report	150	Hong Kong e Australia	to investigate and compare the voluntary reporting of intellectual capital	Cross industry, comprese financial services	Phrase and item	24	Guthrie & Petty (2000)	0-3
Oliveras et al (2008)	2000-2002	Annual report	12	Spain	To investigate the level of IC disclosure	Cross industry, banks	Word	NA	Guthrie e Petty (2000)	NA
Ordonez (2003)	2000	questionario	119 firms with more than 100 employee, then 5 case	Spagna	To examine the reporting of IC disclosure	Case studies, 2 banks	Questionary			

			studies							
Vandemael et al. (2005)	1998,2000,2002	Annual report	60 for each year	Netherlands, Sweden, UK	to compare IC disclosure practices and their evolution in the three countries	Cross-industry, with some banks	Sentence	22	Bozzolan et al. (2003)	0-2
Vergauwen e Van Alem (2005)	2000-2001	Annual report	89 companies with 178 corresponding annual reports	Netherlands, France e Germany	To map IC disclosures in corporate annual reports	Cross-Industry, with some banks	term	38	from Bontis (2003)	na
Vergauwen et al. (2007)	2002	Annual report	60	Sveden , Denmark e UK	to study the relationship between intellectual capital disclosures (ICDs) and the relative importance of intangible assets as company value drivers	Cross industry top 20 majour capitalized	Item, word	108	Previous literature	NA
Oliveira, Rodrigues, Craig 2010	2006	Sustainability reports	42	Portogallo	To analyze the voluntary disclosure of IC in sustainability reports	Cross industry, 3 banks		88		0-1
Khan & Khan (2010)	2007-2010	Annual report	32	Bangladesh	To examine the extent of Human capital reporting	Cross industry, 10 banks	Word count	20	Previous literature	0-1

Does voluntary IC disclosure improve market assessment of company value and of its capacity of creating value?

Anna Maria Biscotti *

Department of Economics, University of Foggia
Via R. Caggese, 1/2,
71121, Foggia - Italy

Eugenio D'Amico

Department of Political Science, University of Roma 3
Via G. Chiabrera, 199
00145, Rome – Italy

** Corresponding author*

Structured Abstract

Purpose – The purpose of our study is to investigate whether companies with higher voluntary IC disclosure are more likely to have a MBV gap larger than one, after controlling for the intellectual efficiency of the firms. Additionally, we aim to investigate – for the first time to our best knowledge – on the effectiveness of voluntary IC disclosure in improving the market valuation process, by testing the effects of additional IC information on the gap between market value and intrinsic value of firms characterized by higher incidence of IC components (mostly non-recognized on balance sheet).

Design/methodology/approach - The empirical analysis is based on non-financial companies that are listed on the Milan Stock Exchange throughout the period from 2008 to 2011. To compute the extent of IC disclosure provided by companies, we build three IC indexes which consider specific IC categories: the internal structure, external structure and human capital (Guthrie and Petty, 2000b). In order to measure the corporate IC components, we follow the Pulic's approach (Pulic, 2000a,b), by calculating the VAIC and its three components: capital employed efficiency (VACA), the human capital efficiency (VAHU), and the structural capital efficiency (STVA), respectively. To estimate the intrinsic value of firm, we follow the Ohlson (1995) and Frankel and Lee (1996) approaches, by using the analysts' earnings forecasts as applied by Barth et al. (1998).

Originality/value - This study contributes to the extant literature on the role of IC information for the efficiency of financial markets in two respects: by enhancing the understanding on the important role of information concerning internal structure of IC in the market valuation process; by testing - through a new analysis approach - the supposed greater accuracy of market valuation process in presence of higher information transparency. The investors' assessment is much more accurate as the market value reflects the intrinsic value of the firm. Therefore, this approach checks on the effectiveness of corporate IC voluntary disclosure in improving the accuracy of investors' assessment, by testing whether firms with an intrinsic value more than book value which

are characterized by higher incidence of IC components are more likely to have a MBV larger than one, when they disseminate more information on IC resources.

Practical implications - This study has practical implications for various parties, such as investors and other stakeholders. It gives evidence on the important role played by voluntary IC disclosure in reducing information asymmetries between the internal and external parties' valuation of companies, primarily increasing the information held by agents in the investment community. This, in particular, in an institutional setting like Italy characterized by companies with dominant shareholders, where the information asymmetries exacerbate the agency conflicts between dominant (controlling) shareholder and minority shareholders. Moreover, the findings contribute to shed light on the effectiveness and determinant role of voluntary IC disclosure practices (in annual reports) in improving the market assessment of high tech companies, thus reducing the possibilities of underestimation of their (more hidden) value creation drivers.

Keywords – Market value, VAIC, Voluntary Intellectual Capital Disclosure, Firm Value, Market Assessment accuracy.

Paper type – Academic Research Paper

1. Introduction

The development of new business sectors and, in particular, the rise of the “new knowledge economy” have led to an increased emphasis on intellectual capital (IC) (Stewart, 1997; Thurow, 1999; Guthrie and Petty, 2000a; Petty and Guthrie, 2000; Guthrie *et al.*, 2001; Bontis, 2001). Indeed, intangible and knowledge resources are increasingly emerging as the new competitive drivers for creating value in global business markets (Stewart, 1997; 2001; Sveiby, 1997; Marr and Schiuma, 2001; Skoog, 2003; Marr *et al.*, 2004; Guthrie *et al.*, 2006; Sharma *et al.* 2007; Oliveiras *et al.*, 2008; Yi and Davey, 2010; Schiuma, 2011). As stated by Stewart (1997), “Intellectual capital is intellectual material-knowledge, information, intellectual property, experience, that can be put to use to create wealth”.

In particular, IC can be viewed as a part of the resources (input) invested by companies to gain competitive advantage and, thus, improve financial performance (output), contributing to increased corporate value and firm wealth (outcome) (Cheng *et al.*, 2010; Molodchik *et al.*, 2012; Naidenova and Parshakov, 2013). Consequently, the more a firm is characterised by technological advances and rapidly increasing IC (i.e., a knowledge-based firm), the more its financial performance and its equity attractiveness for shareholders are driven by its IC resources (Naidenova and Parshakov, 2013). However, the treatment of intangibles in current accounting systems fails to recognise the “new” intangibles (Wallman, 1995; Mortensen *et al.*, 1997; Stewart, 1997; Lev and

Zarowin, 1999; Hedlin and Adolphson, 2000; Petty and Guthrie, 2000; Zambon, 2003; Bozzolan, 2003; Garcia-Meca et al., 2005; Oliveira et al., 2006; Bontis, 2003; Guthrie et al., 2006), such as staff skills and abilities (Stewart, 1997; Lee, 2011), organisational procedure, databases, strategies (Nazari, 2010), customer relationships, etc. (Wong and Gardner, 2005). Indeed, these “soft intangibles” (IC) do not meet the accounting definition of an asset, and consequently, they cannot be recognised in financial statements (Wayne, 2001; Bozzolan et al., 2003). Therefore, financial statements do not contain all intangibles assets that contribute to create company value and the market-to-book value (MBV) gap would reflect the inability of financial statements to take into account the value of IC (Lev and Zarowin, 1999; Mouritsen et al., 2001). In this context, the disclosure of IC would so have a strategic importance to shareholders (Marr et al., 2003) because it integrates traditional financial information, providing more comprehensive information, which enables investors to better interpret the financial indicators (Graaf, 2013) and to reduce the perceived risk associated with the entity (van der Meer-Kooistra and Zijlstra, 2001). Consequently, narrative reporting of IC allows companies to provide broader information on which the users can base the valuation of a firm, facilitating a more accurate valuation (Darrough and Stoughton, 1990; Bukh, 2003; Garcia-Meca et al., 2005). Amir and Lev (1996) found that financial information and non-financial information combined together can better explain market value. Since then, further studies have showed the important role of IC information for the efficiency of the financial market (for a literature review, see Abhayawansa and Guthrie, 2010).

The purpose of our study is to empirically explore whether companies with higher voluntary IC disclosure are more likely to have a MBV gap larger than one, after controlling for the intellectual capital efficiency of the firms. Additionally, we aim to investigate – for the first time to our best knowledge – on the effectiveness of voluntary IC disclosure in improving the market valuation process, by testing the effects of additional IC information on the gap between market value and intrinsic value of firms characterized by higher incidence of IC components.

Because the relations examined likely differ across industries, we present separate findings for firms in the high-tech and traditional non-financial firms. The empirical analysis is based on non-financial companies that are listed on the Milan Stock Exchange throughout the period from 2008 to 2011.

To compute the extent of IC disclosure disseminated by companies, we build three IC indexes which consider specific IC categories: the internal structure, external structure and human capital (Petty and Guthrie, 2000).

In order to measure the corporate IC components, we follow the Pulic's approach (Pulic, 2000a,b), by calculating the VAIC (Value Added Intellectual Coefficient) and its three components: the capital employed efficiency (VACA), the human capital efficiency (VAHU), and the structural capital efficiency (STVA), respectively. To estimate the intrinsic value of the firm, we follow the Ohlson (1995) and Frankel and Lee (1996) approaches, by using the analysts' earnings forecasts as applied by Barth et al. (1998).

The results give empirical evidence that high tech companies with higher value creation efficiency of human capital are more likely to have a market-to-book ratio larger than one. On the contrary, for traditional companies, the value creation efficiency of physical and financial capital employed primarily influences, in a positive direction, the probability of a MBV larger than one. The findings from our further analysis showed that in addition to specific IC performance, also the voluntary disclosure on internal structure of intellectual capital (non-financial information) seems to have an important role in the market valuation process, especially for the high tech companies, mostly characterized by a higher incidence of "soft assets". For the high tech companies, the results also suggest that investors prefer to base the assessments of relational capital resources (external structure of IC) directly on the corporate financial performance. Our final analysis reveals that a greater disclosure on IC appears determinant in improving the market assessment of high tech companies characterized by higher IC performance. For traditional companies, the findings show that investors tend however to incorporate the value drivers of these companies, regardless of disclosure on IC resources, maybe basing their valuations mainly on financial information as well as on other types of information channels (like the analysts). This study contributes to the existing literature in a number of ways. First, the paper gives evidence that the different weight of IC components in companies leads to their different relevance in the market valuation process, showing a tendency to a rational behaviour of the financial market. In fact, the investors' assessment results more based on the value creation efficiency of human capital for high tech companies, whereas for traditional firms strictly reveals the value creation efficiency of physical and financial capital. Second, this study contributes to the extant literature on the role of IC information for the efficiency of financial markets in two respects: by enhancing the understanding on

the important role of information concerning internal structure of IC in the market valuation process; by testing the supposed greater accuracy of market valuation process in presence of higher information transparency through a new analysis approach. The investors' assessment is much more accurate as the market value reflects the intrinsic value of the firm. Therefore, this approach checks on the effectiveness of corporate IC voluntary disclosure in improving the accuracy of investors' assessment, by testing whether firms with an intrinsic value more than book value which are characterized by higher incidence of IC components (mostly non-recognized on balance sheet) are more likely to have a MBV larger than one, when they disseminate more information on IC resources. The remainder of the paper is organised as follows: Section 2 provides the specific hypotheses to be tested. Section 3 describes the research design and method. In Section 4, the results are presented and discussed. In Section 5, conclusions are drawn.

2. Research hypotheses

The significance of IC in explaining the gap between the market and book value of companies is debated in the literature, representing one of the most popular theory on IC (Galbraith, 1967; Bontis 1996; Stewart 1997; Sveiby, 1997, 2010; Edvinsson and Malone, 1997; Lev and Zarowin, 1999; Andriessen, 2004; Dumay, 2012).). Figure 1 shows the theoretical framework we developed for the research hypotheses of this study. According to previous studies in the field, IC can be subdivided into three main structural components: internal structure (structural), external structure (relational) and human capital (Stewart, 1991, 1997; Bontis, 1996, 1998, 1999; Edvinsson and Sullivan, 1996; Sveiby, 1997; Edvinsson and Malone, 1997; Roos et al., 1998; Guthrie and Petty, 2000b; Bontis *et al.*, 2000).

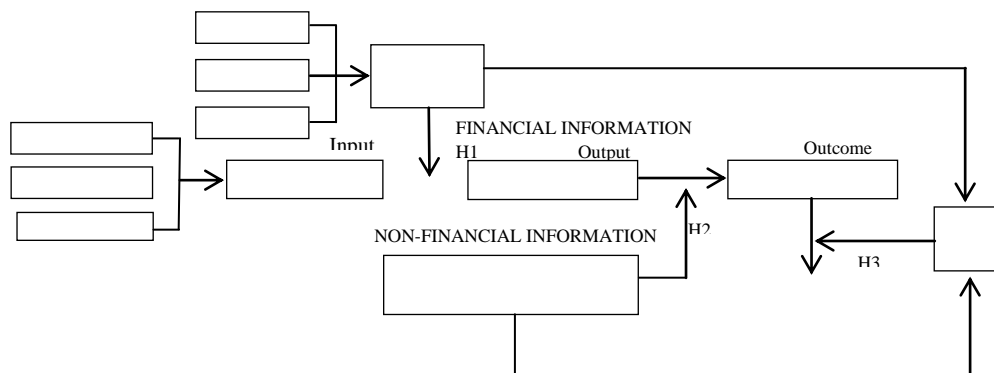


Figure 1. Theoretical framework of research hypotheses

Intellectual capital can be viewed as a part of the resources (input) invested by companies to gain competitive advantage and, thus, improve financial performance (output), contributing to increased corporate value (i.e., intrinsic firm value and market value) and firm wealth (outcome) (Cheng *et al.*, 2010; Molodchik *et al.*, 2012; Naidenova and Parshakov, 2013). The contribute of IC in enhancing the financial performance is valuable through the three Pulic's coefficients of VACA, VAHU and STVA (Firer and Williams, 2003; Chen *et al.*, 2005; Tan *et al.*, 2007; Chan, 2009; Cheng *et al.*, 2010). Indeed, the indices of VACA, VAHU and STVA measure the value creation efficiency of invested capital and intellectual capital components: human and structural (Pulic, 2000a,b). The more the efficiency rises, the more the corporate financial performance increase, *ceteris paribus*. Financial performance allow to give information on the effectiveness of firm strategy, contributing to affect the investors' risk perception of companies over time. It is thus expected that companies with higher IC value creation efficiency are more likely to have a MBV gap larger than one. We thus formulate the following hypotheses:

H1a. Companies with greater physical capital efficiency (VACA) are more likely to have a market-to-book ratio larger than one.

H1b. Companies with greater human capital efficiency (VAHU) are more likely to have a market-to-book ratio larger than one.

H1c. Companies with greater proportion of structural capital in the value creation (STVA) are more likely to have a market-to-book ratio larger than one.

However, in addition to financial performance, the level of market-to-book value depends on further several factors. Among these factors, non-financial information disclosed by the company is recognized as an important means for the effective functioning of capital market (Healey and Palepu, 2001). Some empirical studies support the argument that IC information is incorporated in market values (Abrahams and Sidhu, 1998; Amir and Lev, 1996; Lev and Thiagarajan, 1993; Livnat and Zarowin, 1990; Ritter and Wells, 2006). Moreover, Beattie and Thomson (2005) after examining the reasons for the extreme changes in price-to-book ratios of companies, argue that the significance of knowledge-based assets contribute to these extreme changes (see, for all, Abhayawansa and Guthrie, 2010). Consequently and given that the gathered IC information can be classified in accordance with the three main components of IC (internal structure, external

structure and human capital) (Guthrie and Petty, 2000b; Bozzolan et al., 2003, 2006), we formulate the following hypotheses:

H2a. Companies disclosing more information on the internal structure of intellectual capital in their annual reports are more likely to have a market-to-book ratio larger than one.

H2b. Companies disclosing more information on the external structure of intellectual capital in their annual reports are more likely to have a market-to-book ratio larger than one.

H2c. Companies disclosing more information on the human capital in their annual reports are more likely to have a market-to-book ratio larger than one.

An open communication strategy (non-financial information) adopted by companies is considered as a significant tool in reducing the information asymmetries between the internal and external parties' valuation of companies, thus improving market efficiency (Diamond and Verrecchia, 1991; Elliot and Jacobson, 1994; Coles et al., 1995; Botosan, 1997, 2006; Sengupta, 1998; Healey and Palepu, 2001). In particular for companies characterized by higher incidence of IC components (mostly non-recognized on balance sheet), a meaningful disclosure on IC resources should help with a fairer market assessment, by reducing the likelihood of underestimation of their intrinsic value (Lev, 2001; Van der Meer-Kooistra and Zijlstra, 2001; Marr et al., 2003) The intrinsic value of a firm can be seen (and measured) as the present value of its future earnings (Miller and Modigliani, 1966). Based on these considerations, we investigate – for the first time to our best knowledge – on the effectiveness of voluntary IC disclosure in improving the market valuation process, by testing the effects of additional IC information on the gap between market value and intrinsic value of firms characterized by higher incidence of IC components (measured by VAIC). In particular, if additional non-financial information lead to improve the market efficiency with consequently fairer market estimation; it is thus expected that for companies characterized by higher incidence of IC components (mostly non-recognized on balance sheet), a greater voluntary IC disclosure is determinant in improving the market assessment, by reducing the gap between market value and the intrinsic firm value. Therefore, we propose the following hypothesis:

H3a. Companies with a (intrinsic) firm-to-book value larger than one which are characterized by a higher incidence of IC components (VAIC) are more likely to have a market-to-book ratio larger than one, as voluntary IC disclosure increases.

3. Research design and methodology

3.1 Sample selection and data sources

The sample used to test the preceding hypotheses consists of all Italian non-financial companies listed on the Italian stock market during the period from 1 January 2008 until 31 December 2011. Because the relations examined likely differ between knowledge-intensive firms and traditional organizations, we subdivided the whole sample in two sub-samples: companies belonging to the high tech industry and traditional firms, respectively. To identify the high tech companies, we selected all of the listed companies in knowledge-intensive industries as defined by the Italian Stock Exchange, such as internet providers, biotechnology, entertainment, Internet, IT distribution, high-tech manufacturing, media, retail, software, system integration and telecommunication, and web services (Bozzolan et al., 2006). The total number of the companies with available data included in the sample is 145. We have excluded the companies with a negative value of equity. Consequently, our final sample consisting of 135 companies: 90 traditional and 45 high tech, with a total of 360 and 180 firm-year observations, respectively. We used Osiris for the analysts' earnings forecast and Datastream as a source for the other financial data; while the sources of the data to construct the disclosure indices were the annual reports. We chose annual reports because they represent an important communication tool for external stakeholders (Petty and Guthrie, 2000; Guthrie et al., 2004), especially for agents in the investment community. Indeed, the new Italian regulation concerning the disclosure of non-financial information indicates the annual report as the communication device to use for the disclosure of non-financial information on a voluntary basis. Furthermore, the annual report is regularly produced, thus offering an opportunity for analyses of disclosure policies across reporting periods (Guthrie et al., 2004).

3.2 Measurement of IC disclosure index

Based on prior research, we use a disclosure index as a measure of IC information level disseminated by companies. To build the index, we examined the annual reports of all 135 companies over the four-year analysis period (2008-2011). We conducted a content analysis to examine the IC disclosure (Guthrie et al., 2004) by coding the IC information into specific categories. To identify the IC categories, we used the framework tested by Guthrie and Petty (2000b) and also applied by Bozzolan et al. (2003; 2006). In

particular, the framework consists of three categories of intellectual capital: internal structure, external structure, and human capital. These categories and the items included under each category are illustrated in Table 1.

Table 1. The IC Framework

1. Internal structure (structural)	2. External structure (relational)	3. Human capital
Intellectual property	2.a brands	3.a Know-how
1.a patents	2.b customers	3.b education
1.b copyrights	2.c customer loyalty	3.c employees
1.c trade-marks	2.d distribution channels	3.d work-related knowledge
Infrastructure assets	2.e business collaboration	3.e work-related competence
1.d corporate culture	2.f research collaborations	
1.e management processes	2.g financial contacts	
1.f information systems	2.h licensing agreements	
1.g networking systems	2.i franchising agreements	
1.h research projects		

To construct the index, we coded each item as follows: a score of 1 if the item is reported in qualitative terms, a score of 2 if the item is reported in quantitative terms, and a score of 0 if the item is not referred to. Based on the IC framework in Table 1, we built four different indices for IC disclosure. The first one relates to the overall extent of the IC information (TICD). The next three relate to the content of the disclosed information: the disclosure index of the internal structure information (IsCD), external structure information (EsCD) and human capital information (HcD). The total score of each one, for a company is calculated in accordance with the following algorithm (Singhvi and Desai, 1971; Buzby, 1975; Eng and Mak, 2003; Oliveira et al., 2006):

$$\text{Total score} = \frac{\sum_{i=1}^m di}{m}$$

where the Total score is the disclosure index used as the dependent variable (TICD, IsCD, EsCD, HcD in this study), $di = 0$ or 1 or 2 , as follows: $di = 1$ for disclosure in qualitative terms, $di = 2$ for disclosure in quantitative terms, $di = 0$ if the disclosure item is not referred to, and $m =$ the weighted maximum number of items a company may

disclose. We calculated the four disclosure indices for each annual report. The content analysis and the construction of the index involve the subjective judgment of the researcher. This subjective nature is considered the main limitation of this methodology

(Healy and Palepu, 2001). Therefore, we were concerned about the reliability of the index, and we performed an inter-coder reliability test using the Krippendorff's alpha agreement for coding (Krippendorff, 2004). In particular, two coders (one researcher assistant and one of the two authors) built the scores, by conducting the analysis on the annual reports. A preliminary check was performed on five annual reports after a training provided to the researcher assistant by the authors. The independent scores were all above the minimum limit of acceptance of 80% (Riffe et al., 2005).

3.3 Measurement of the other independent variables

Table 2 describes how the other independent variables are measured.

Table 2. Description and measurement of variables

Variable	Description	Measurement
MBV	Market-to-book value ratio three months after the fiscal year-end	Dummy variable that takes value of 1, when market value is higher than book value; 0 otherwise
Independent variables		
IC Disclosure Indexes		
TICD	Total disclosure index on intellectual capital	Total amount of information disclosed
IsCD	total disclosure index related to internal information	Total disclosure index based on the total amount of information on the internal structure
EsCD	total disclosure index related to external information	Total disclosure index based on the total amount of information on the external structure
HcD	total disclosure index related to human capital	Total disclosure index based on the total amount of information on the human capital
Other Independent Variables		
VACA	Value Added Efficiency of physical and financial capital employed	Value added/Capital employed (Pulic model, 2000)
VAHU	Value Added Efficiency of human capital	Value added/Employee Salaries (Pulic model, 2000)
STVA	Structural capital coefficient	Structural capital/Value Added, where: Structural capital= Value added - Employee salaries (Pulic Model, 2000)
VAIC	Value Added Efficiency Intellectual Coefficient	VACA+VAHU+STVA (Pulic model, 2000)

WBV	Intrinsic-to-book value. The intrinsic value is a non-market-based estimate of firm value. The non-market-based estimate was calculated following the Ohlson (1995) and Frankel and Lee (1996) approach, as applied by Barth et al. (1998). In summary, the equation used is the following: $W_t = FE_{t+2}/(r(1+r)) + (dt*gt)/(1+r)$	Dummy variable that takes value of 1, when intrinsic value is higher than book value; 0 otherwise
	where: W_t is the present value of analysts expected future earnings plus the present value of dividends between time t and the earnings forecast period; FE_{t+2} is the median earnings forecast at the year t for year $t+2$; dt is the year t dividend; gt is the time t dividend growth rate computed over the past three years; r is the cost of equity calculated according to CAPM: $r = \text{risk-free rate} + \text{Beta factor} * (\text{Risk Premium on Market Portfolio})$	
Size	Firm Size	Natural logarithm of total assets
DY09	Dummy variable for the year 2009	
DY10	Dummy variable for the year 2010	
DY11	Dummy variable for the year 2011	

3.4 Data analyses

The data collected for this study over a four-year period (2008-2011) were examined through regression analyses. For our multivariate analysis, we use MBV as a dependent variable, which is a dichotomous variable that assumes the value 1 if market value is higher than book value, and 0 otherwise. As the dependent variable is a dummy, we apply probit regression models. Robust standard error has been used. We control our results for firm size and temporal dummies. In particular, the dummy annual controls for the presence of common trends between companies. We estimated each regression model for the two sub-samples of high tech and traditional companies, respectively. Before carrying out the regression, we verify the possible multicollinearity between explanatory variables by using the VIF (Variance Inflation Factor). The regression models which were performed to test our first two hypotheses are the following:

$$MBV = \alpha + \beta_1 VACA + \beta_2 VAHU + \beta_3 STVA + \beta_4 SIZE + \beta_5 DY09 + \beta_6 DY10 + \beta_7 DY11 + \epsilon \quad (1)$$

$$MBV = \alpha + \beta_1 VACA + \beta_2 VAHU + \beta_3 STVA + \beta_4 IsCD + \beta_5 EsCD + \beta_6 HcD + \beta_7 sSIZE + \beta_8 DY09 + \beta_9 DY10 + \beta_{10} DY11 + \epsilon \quad (2)$$

In order to test our third hypothesis, which supposes the determinant role of voluntary IC disclosure for a fairer market assessment of firms characterized by higher incidence of IC components (VAIC), we first performed the following regression function (without the voluntary IC disclosure variable):

$$MBV = \alpha + \beta_1 VAIC + \beta_2 WBV + \beta_3 VAIC * WBV + \beta_4 SIZE + \beta_5 DY09 + \beta_6 DY10 + \beta_7 DY11 + \epsilon \quad (3.1)$$

Successively, we run a further regression equation, by introducing to the previous function 3.1 the variable on voluntary IC disclosure, as follows:

$$MBV = \alpha + \beta_1 VAIC + \beta_2 TICD + \beta_3 WBV + \beta_4 VAIC * TIND * WBV + \beta_5 SIZE + \beta_6 DY09 + \beta_7 DY10 + \beta_8 DY11 + \epsilon \quad (3.2)$$

The variables are defined as follows:

MBV is the Market-to-book value three months after the fiscal year-end (dependent variable).

VACA is the Value Added Efficiency of physical and financial capital employed;

VAHU is the Value Added Efficiency of human capital;

STVA is the Structural capital coefficient;

IsCD is the total disclosure index related to internal information;

EsCD is the total disclosure index related to external information;

HcD is the total disclosure index related to human capital;

Size is the Natural logarithm of total assets;

DY09, DY10 and DY11 are the temporal dummy variables for the years 2009, 2010 and 2011.

VAIC is the Value Added Efficiency Intellectual Coefficient(VACA+VAHU+STVA);

TICD is the total disclosure index on intellectual capital;

WBV is the intrinsic value of the firm-to-book value (non-market-based estimate of firm value-to-book value).

VAIC*WBV in the interaction term;

VAIC*TICD*WBV in the interaction term.

4. Results and discussion

4.1 Descriptive statistics and univariate analysis

Tables 3A,B and tables 4A,B report the descriptive statistics and the bivariate statistical correlations between all variables with reference to the two samples of high tech and traditional companies, respectively.

Table 3A. Descriptive Statistics – High Tech companies

	MBV	VAIC	VACA	VAHU	STVA	TICD	IsCD	EsCD	HcD	WBV	SIZE
Mean	0.55000	2.89886	0.50584	2.09012	0.30288	0.45474	0.58777	0.41666	0.34592	0.32777	12.5287
Median	0	0	3	9	8	9	8	7	6	8	5
Maximum	1.00000	2.79610	0.40229	1.79318	0.48181	0.45161	0.60000	0.40740	0.30000	0.00000	12.2071
Minimum	0	6	3	1	9	3	0	7	0	0	1
Std. Dev.	1.00000	17.2664	1.96807	9.83715	17.3340	0.79032	1.00000	0.92592	0.73333	1.00000	18.2844
Observations	0	4	8	6	5	3	0	6	3	0	9
	0.00000	15.0314	0.24715	3.30639	15.0967	0.22580	0.25000	0.11111	0.13333	0.00000	9.96885
	0	7	5	1	7	6	0	1	3	0	4
	0.49888	3.07615	0.41863	1.77531	2.05395	0.13349	0.18013	0.15892	0.15306	0.47071	1.56496
	1	6	0	1	8	5	2	3	3	3	0
	180	180	180	180	180	180	180	180	180	180	180

MBV is the Market-to-book value as a dummy variable that takes value of 1, when market value is higher than book value; 0 otherwise; VAIC is the Value Added Efficiency Intellectual Coefficient (VACA+VAHU+STVA); VACA is the Value Added Efficiency of physical and financial capital employed; VAHU is the Value Added Efficiency of human capital; STVA is the Structural capital coefficient; TICD is the total disclosure index on intellectual capital; IsCD is the total disclosure index related to internal information; EsCD is the total disclosure index related to external information; HcD is the total disclosure index related to human capital; WBV is the intrinsic value of the firm-to-book value as a dummy variable that takes value of 1, when intrinsic value is higher than book value, 0 otherwise; Size is the Natural logarithm of total assets.

Table 3B. Descriptive Statistics – Traditional Companies

	MBV	VAIC	VACA	VAHU	STVA	TICD	IsCD	EsCD	HcD	WBV	SIZE
Mean	0.519444	3.644157	0.377691	3.069397	0.197068	0.447088	0.557361	0.420576	0.347778	0.433333	13.54955
Median	1.000000	2.876452	0.305120	2.045527	0.511127	0.451613	0.550000	0.407407	0.333333	0.000000	13.21698
Maximum	1.000000	45.56683	1.970512	44.24780	0.977400	0.774194	0.900000	0.814815	0.733333	1.000000	18.91412
Minimum	0.000000	15.63593	0.001877	0.059862	15.70499	0.112903	0.150000	0.111111	0.000000	0.000000	9.550164
Std. Dev.	0.500317	5.193738	0.298244	4.613206	1.423138	0.133804	0.193689	0.157408	0.160974	0.496225	1.758228
Observations	360	360	360	360	360	360	360	360	360	360	360

..... MBV is the Market-to-book value as a dummy variable that takes value of 1, when market value is higher than book value; 0 otherwise; VAIC is the Value Added Efficiency Intellectual Coefficient (VACA+VAHU+STVA); VACA is the Value Added Efficiency of physical and financial capital employed; VAHU is the Value Added Efficiency of human capital; STVA is the Structural capital coefficient; TICD is the total disclosure index on intellectual capital; IsCD is the total disclosure index related to internal information; EsCD is the total disclosure index related to external information; HcD is the total disclosure index related to human capital; WBV is the intrinsic value of the firm-to-book value as a dummy variable that takes value of 1, when intrinsic value is higher than book value, 0 otherwise; Size is the Natural logarithm of total assets.

Table 4A. Matrix correlation – High Tech companies

Included observations: 180

Correlation Probability	MBV	VAIC	VACA	VAHU	STVA	TICD	IsCD	EsCD	HcD	WBV	SIZE
MBV	1.00000 0 -----										
VAIC	0.19857 5	1.00000 0									
VACA	0.19635 9	0.52350 0	1.00000 0								
VAHU	0.18477 4	0.74061 3	0.58294 9	1.00000 0							
STVA	0.09767 2	0.75083 6	0.07635 1	0.12604 4	1.00000 0						
TICD	0.03078 0	0.08919 3	0.05348 2	0.02921 8	0.09742 7	1.00000 0					
IsCD	0.14049 7	0.03808 3	0.04962 7	0.04423 8	0.10538 7	0.84077 2	1.00000 0				
EsCD	0.09851 8	0.13705 8	0.16639 5	0.16852 1	0.02569 5	0.83752 4	0.48534 6	1.00000 0			
HcD	0.07462 4	0.00562 9	0.04030 8	0.14020 4	0.13783 0	0.72038 1	0.55471 7	0.38872 4	1.00000 0		
WBV	0.29856 4	0.12154 2	0.23949 9	0.19559 3	0.03584 3	0.14271 8	0.15622 6	0.08090 3	0.11814 6	1.00000 0	
SIZE	0.19898 9	0.22050 6	0.20081 1	0.26993 4	0.05600 3	0.60592 4	0.43117 7	0.61067 2	0.36644 4	0.17968 7	1.00000 0

MBV is the Market-to-book value as a dummy variable that takes value of 1, when market value is higher than book value; 0 otherwise; VAIC is the Value Added Efficiency Intellectual Coefficient (VACA+VAHU+STVA); VACA is the Value Added Efficiency of physical and financial capital employed; VAHU is the Value Added Efficiency of human capital; STVA is the Structural capital coefficient; TICD is the total disclosure index on intellectual capital; IsCD is the total disclosure index related to internal information; EsCD is the total disclosure index related to external information; HcD is the total disclosure index related to human capital; WBV is the intrinsic value of the firm-to-book value as a dummy variable that takes value of 1, when intrinsic value is higher than book value, 0 otherwise; Size is the Natural logarithm of total assets.

Table 4B. Matrix correlation – Traditional companies

Included observations: 360

Correlation Probability	MBV	VAIC	VACA	VAHU	STVA	TICD	IsCD	EsCD	HcD	WBV	SIZE
MBV	1.00000 0 -----										
VAIC	0.01417 4	1.00000 0									
VACA	0.32574 1	0.26458 3	1.00000 0								
VAHU	0.04199 6	0.95831 6	0.15319 9	1.00000 0							
STVA	0.01614 0	0.48759 7	0.25942 3	0.22369 3	1.00000 0						
TICD	0.18554 1	0.00808 0	0.17041 9	0.04654 9	0.08569 1	1.00000 0					
IsCD	0.15733 3	0.02879 6	0.10470 0	0.06853 1	0.09511 8	0.78772 3	1.00000 0				
EsCD	0.17882 9	0.02933 4	0.24829 0	0.00892 7	0.08395 6	0.82630 7	0.38984 5	1.00000 0			
HcD	0.07028 7	0.03319 4	0.01948 8	0.03427 2	0.00596 4	0.71752 6	0.41588 2	0.45337 0	1.00000 0		

	0.1833	0.5301	0.7125	0.5169	0.9102	0.0000	0.0000	0.0000	-----		
				-							
WBV	0.38109	0.03485	0.23130	0.01762	0.13586	0.16968	0.15220	0.15127	0.07253	1.00000	
	6	3	6	9	4	2	2	5	3	0	
	0.0000	0.5098	0.0000	0.7389	0.0099	0.0012	0.0038	0.0040	0.1697	-----	
	-		-								
SIZE	0.03327	0.11697	0.13740	0.12442	0.05235	0.31852	0.15727	0.20804	0.47585	0.16618	1.00000
	2	3	1	6	2	6	4	6	0	8	0
	0.5292	0.0265	0.0090	0.0182	0.3219	0.0000	0.0028	0.0001	0.0000	0.0016	-----

MBV is the Market-to-book value as a dummy variable that takes value of 1, when market value is higher than book value; 0 otherwise; VAIC is the Value Added Efficiency Intellectual Coefficient (VACA+VAHU+STVA); VACA is the Value Added Efficiency of physical and financial capital employed; VAHU is the Value Added Efficiency of human capital; STVA is the Structural capital coefficient; TICD is the total disclosure index on intellectual capital; IsCD is the total disclosure index related to internal information; EsCD is the total disclosure index related to external information; HcD is the total disclosure index related to human capital; WBV is the intrinsic value of the firm-to-book value as a dummy variable that takes value of 1, when intrinsic value is higher than book value, 0 otherwise; Size is the Natural logarithm of total assets.

4.2 Multivariate analysis

Tables 5A,B report the findings from the first regression equation (1), which was formulated to test our first hypothesis. The model is run on the two subsamples of high tech (Table 5A) and traditional companies (Table 5B), respectively.

Table 5 A. Binary Probit - High Tech companies

Dependent Variable: MBV

Included observations: 180

QML (Huber/White) standard errors & covariance

Variable	Coefficient	z-Statistic	Prob.
<i>Const</i>	2.573183	3.143957	0.0017***
VACA	0.539965	1.632859	0.1025
VAHU	0.158503	2.170924	0.0299**
STVA	0.053173	0.896310	0.3701
SIZE	-0.266184	-3.957560	0.0001***
DY09	0.725441	2.595355	0.0094***
DY10	0.398537	1.462943	0.1435
DY11	0.122126	0.434707	0.6638
Mcfadden R-squared	0.130905		
Max VIF	1.59		
LR statistic	32.42904		
Prob(LR statistic)	0.000034		

*** indicate the significant at the 0.10, 0.05 and 0.01 levels respectively.

MBV is the Market-to-book value as a dummy variable that takes value of 1, when market value is higher than book value; 0 otherwise; VACA is the Value Added Efficiency of physical and financial capital employed; VAHU is the Value Added Efficiency of human capital; STVA is the Structural capital coefficient; Size is the Natural logarithm of total assets; DY09, DY10 and DY11 are the temporal dummy variables for the years 2009, 2010 and 2011.

Table 5B. Binary Probit - Traditional companies

Dependent Variable: MBV

Included observations: 360

QML (Huber/White) standard errors & covariance

Variable	Coefficient	z-Statistic	Prob.
<i>Const</i>	-1.641761	-2.633242	0.0085***
VACA	2.252460	5.711264	0.0000***
VAHU	-0.033720	-2.056509	0.0397**
STVA	-0.063856	-1.206915	0.2275
SIZE	0.041749	1.014582	0.3103
DY09	0.772171	3.776556	0.0002***
DY10	0.747308	3.649048	0.0003***
DY11	0.243186	1.191296	0.2335
Mcfadden R-squared	0.146811		
Max VIF	1.51		
LR statistic	73.18856		
Prob(LR statistic)	0.000000		

***, **, * indicate the significant at the 0.10, 0.05 and 0.01 levels respectively.

MBV is the Market-to-book value as a dummy variable that takes value of 1, when market value is higher than book value; 0 otherwise; VACA is the Value Added Efficiency of physical and financial capital employed; VAHU is the Value Added Efficiency of human capital; STVA is the Structural capital coefficient; Size is the Natural logarithm of total assets; DY09, DY10 and DY11 are the temporal dummy variables for the years 2009, 2010 and 2011.

With reference to the high tech companies, we can observe that the findings are consistent with *H1b*, while *H1a* and *H1c* are not statistically validated. In particular, VAHU shows a positive and significant coefficient (at the 5% level). We also find a negative significant coefficient (at the 1% level) between the companies' size and the MBV. Among the temporal dummies control variables, the year 2009 is found to have a positive and significant coefficient (at the 1% level). For the companies belonging to the traditional industries, the results support the hypotheses *H1a* and *H1b*, while *H1c* is not validated. Specifically, VACA and VAHU present a positive and significant coefficient

(at the 1% and 5% level, respectively). The firm size variable is not significant, whereas the year dummies 2009 and 2010 show a positive and significant coefficient (both at the 1% level). It is thus interesting to note that high tech companies with higher value creation efficiency of human capital are more likely to have a market-to-book ratio larger than one, whereas a MBV larger than one is less likely among the bigger ones. Consequently, these results give empirical evidence of the primary relevance for the investors of the quality and abilities of the human capital, which represents one of the most important strategic value driver in the knowledge-intensive companies. For traditional companies the value creation efficiency of the human capital appears to reduce the likely to have a market value higher than book value of equity, whereas the value creation efficiency of physical and financial capital employed primarily influences, in a positive direction, the probability of a MBV larger than one. Moreover, the firm size on average has no impact on this probability, thus revealing for the investors the productivity gains of the capital employed. Finally, the results reveal that for high tech company a positive common trend exists only in the year 2009, while for traditional companies also for the year 2010. However, this trend is not maintained in the year 2011 for both categories of companies. One possible explanation for these results could be that the lasting effects of the financial crisis erupted in 2008 led to a stronger perception of risk by investors associated with the specific firm over time, and first of all with regard to high-tech firms characterized by more "soft assets".

Tables 6A,B report the findings from the second regression function (2), which was formulated to test our second hypothesis. Also this model is run on the two subsamples of high tech and traditional companies, respectively.

Table 6A. Binary Probit - High Tech companies
 Dependent Variable: MBV
 Included observations: 180
 QML (Huber/White) standard errors & covariance

Variable	Coefficient	z-Statistic	Prob.
<i>Const</i>	2.911429	3.130323	0.0017***
VACA	0.794708	2.332609	0.0197**
VAHU	0.240834	2.886502	0.0039***
STVA	0.018354	0.345463	0.7297
IsCD	3.071543	3.973057	0.0001***
EsCD	-1.545082	-1.647939	0.0994*
HcD	1.068122	1.254656	0.2096
SIZE	-0.438998	-4.736612	0.0000***

DY09	0.796251	2.647970	0.0081***
DY10	0.418051	1.430094	0.1527
DY11	0.099465	0.343171	0.7315
McFadden R-squared	0.230949		
Max VIF	1.81		
LR statistic	57.21289		
Prob(LR statistic)	0.000000		

*** indicate the significant at the 0.10, 0.05 and 0.01 levels respectively.

MBV is the Market-to-book value as a dummy variable that takes value of 1, when market value is higher than book value; 0 otherwise; VACA is the Value Added Efficiency of physical and financial capital employed; VAHU is the Value Added Efficiency of human capital; STVA is the Structural capital coefficient; IsCD is the total disclosure index related to internal information; EsCD is the total disclosure index related to external information; HcD is the total disclosure index related to human capital; Size is the Natural logarithm of total assets; DY09, DY10 and DY11 are the temporal dummy variables for the years 2009, 2010 and 2011.

Table 6B. Binary Probit – Traditional companies

Dependent Variable: MBV

Included observations: 360

QML (Huber/White) standard errors & covariance

Variable	Coefficient	z-Statistic	Prob.
<i>Const</i>	-1.842451	-2.779852	0.0054***
VACA	2.116935	5.181910	0.0000***
VAHU	-0.030243	-1.587419	0.1124
STVA	-0.072750	-1.334617	0.1820
IsCD	0.854664	2.030625	0.0423**
EsCD	0.396051	0.765113	0.4442
HcD	-0.030342	-0.053877	0.9570
SIZE	0.012710	0.273657	0.7843
DY09	0.768407	3.717637	0.0002***
DY10	0.752791	3.639186	0.0003***
DY11	0.234495	1.147768	0.2511
McFadden R-squared	0.159960		
Max VIF	1.72		
LR statistic	79.74333		
Prob(LR statistic)	0.000000		

*** indicate the significant at the 0.10, 0.05 and 0.01 levels respectively.

MBV is the Market-to-book value as a dummy variable that takes value of 1, when market value is higher than book value; 0 otherwise; VACA is the Value Added

Efficiency of physical and financial capital employed; VAHU is the Value Added Efficiency of human capital; STVA is the Structural capital coefficient; IsCD is the total disclosure index related to internal information; EsCD is the total disclosure index related to external information; HcD is the total disclosure index related to human capital; Size is the Natural logarithm of total assets; DY09, DY10 and DY11 are the temporal dummy variables for the years 2009, 2010 and 2011.

After controlling for the value creation efficiency coefficients VACA, VAHU and STVA, the findings give empirical support to the hypothesis *H2a* for both categories of companies analysed. However, the results show a coefficient of IsCD both higher and more statistical significant for the high tech companies compared to the traditional companies (3.07, $p < 0.01$ vs. 0.85, $p < 0.5$). Moreover, contrary to our expectations in *H2b*, we find a negative and significant coefficient of EsCD (at the 10% level) for high tech companies, while this hypothesis is not statistically validated for the traditional companies. Finally, *H2c* is not statistically supported for both types of firms. In summary, these findings show that in addition to specific IC performance, also the voluntary disclosure on internal structure of intellectual capital (non-financial information) seems to have an important role in the market valuation process, especially for the high tech companies, mostly characterized by a higher incidence of “soft assets”, like internal structural capital. As stated by Amira and Lev (1996), we can observe a “complementary” role of non-financial information in explaining the market value. As concerns the negative coefficient found with reference to the disclosure index on the relational capital (external structure of IC) of high tech firms, a plausible explanation could be that investors prefer to base the assessments of these strategic resources directly on the corporate financial performance, which also reflect the value creation efficiency of human capital as well as of physical and financial capital employed (these latter found with a positive and significant coefficient).

Finally, it is interesting to notice that the introduction of the IC disclosure variables in the model has contributed to improve its explanatory power, particularly with regard to the high tech companies (McFadden R-squared increases from 0.13 to 0.23 for high tech companies, while for traditional companies the increasing is weaker: from 0.15 to 0.16). In particular, we can observe that for high tech companies the positive coefficient of VACA become statistically significant (at the 5% level), and also the significance of the VAHU coefficient increases (from 5% to the 1% level); while for traditional companies

the negative coefficient of VAHU is no more statistically significant. Finally, the results reported in Tables 7A1, A2 and B1, B2 show that our third hypothesis (*H3a*) is empirically supported for high tech companies.

Table 7A1. Binary Probit – High Tech companies

Dependent Variable: MBV

Included observations: 180

QML (Huber/White) standard errors & covariance

Variable	Coefficient	z-Statistic	Prob.
<i>Const</i>	3.217156	3.555328	0.0004***
VAIC	0.088656	1.573889	0.1155
WBV	0.633428	1.688690	0.0913*
VAIC*WBV	0.169505	1.548124	0.1216
SIZE	-0.325109	-4.364953	0.0000***
DY09	0.774877	2.587860	0.0097***
DY10	0.533253	1.824619	0.0681*
DY11	0.332735	1.192918	0.2329
McFadden R-squared	0.210569		
Max VIF	2.78		
LR statistic	52.16432		
Prob(LR statistic)	0.000000		

*, **, *** indicate the significant at the 0.10, 0.05 and 0.01 levels respectively.

VAIC is the Value Added Efficiency Intellectual Coefficient (VACA+VAHU+STVA); WBV is the intrinsic value of the firm-to-book value as a dummy variable that takes value of 1, when intrinsic value is higher than book value, 0 otherwise; VAIC*WBV in the interaction term; Size is the Natural logarithm of total assets; DY09, DY10 and DY11 are the temporal dummy variables for the years 2009, 2010 and 2011.

Table 7A2. Binary Probit – High Tech companies

Dependent Variable: MBV

Included observations: 180

QML (Huber/White) standard errors & covariance

Variable	Coefficient	z-Statistic	Prob.
<i>Const</i>	4.140871	4.367705	0.0000***
VAIC	0.092542	1.586634	0.1126
TICD	2.400689	2.215277	0.0267**
WBV	0.495390	1.335249	0.1818
VAIC*TICD*WBV	0.425481	2.028935	0.0425**
SIZE	-0.490553	-5.334485	0.0000***
DY09	0.829419	2.720302	0.0065***
DY10	0.581907	1.947525	0.0515*

DY11	0.369385	1.345418	0.1785
McFadden R-squared	0.246014		
Max VIF	4.90		
LR statistic	60.94508		
Prob(LR statistic)	0.000000		

*,**,*** indicate the significant at the 0.10, 0.05 and 0.01 levels respectively.

VAIC is the Value Added Efficiency Intellectual Coefficient (VACA+VAHU+STVA); TICD is the total disclosure index on intellectual capital; WBV is the intrinsic value of the firm-to-book value as a dummy variable that takes value of 1, when intrinsic value is higher than book value, 0 otherwise; VAIC*TICD*WBV in the interaction term; Size is the Natural logarithm of total assets; DY09, DY10 and DY11 are the temporal dummy variables for the years 2009, 2010 and 2011.

Table 7B1. Binary Probit – Traditional companies

Dependent Variable: MBV

Included observations: 360

QML (Huber/White) standard errors & covariance

Variable	Coefficient	z-Statistic	Prob.
<i>Const</i>	0.670907	1.180847	0.2377
VAIC	-0.017370	-1.367976	0.1713
WBV	0.577245	2.383077	0.0172**
VAIC*WBV	0.153931	2.744013	0.0061***
SIZE	-0.111808	-2.701074	0.0069***
DY09	0.716789	3.559455	0.0004***
DY10	0.786981	3.704202	0.0002***
DY11	0.377662	1.825208	0.0680*
McFadden R-squared	0.173923		
Max VIF	2.77		
LR statistic	86.70416		
Prob(LR statistic)	0.000000		

*,**,*** indicate the significant at the 0.10, 0.05 and 0.01 levels respectively.

VAIC is the Value Added Efficiency Intellectual Coefficient (VACA+VAHU+STVA); WBV is the intrinsic value of the firm-to-book value as a dummy variable that takes value of 1, when intrinsic value is higher than book value, 0 otherwise; VAIC* WBV in the interaction term; Size is the Natural logarithm of total assets; DY09, DY10 and DY11 are the temporal dummy variables for the years 2009, 2010 and 2011.

Table 7B2. Binary Probit – Traditional companies

Dependent Variable: MBV

Included observations: 360

QML (Huber/White) standard errors & covariance

Variable	Coefficient	z-Statistic	Prob.
<i>Const</i>	0.457032	0.767531	0.4428
VAIC	-0.010633	-0.837561	0.4023
TICD	1.638168	2.773431	0.0055***
WBV	0.836619	3.903129	0.0001***
VAIC*TICD*WBV	0.160740	1.700298	0.0891*
SIZE	-0.151827	-3.411515	0.0006***
DY09	0.723263	3.524441	0.0004***
DY10	0.803899	3.691914	0.0002***
DY11	0.395397	1.886045	0.0593*
McFadden R-squared	0.184872		
Max VIF	2.97		
LR statistic	92.16274		
Prob(LR statistic)	0.000000		

* ** *** indicate the significant at the 0.10, 0.05 and 0.01 levels respectively.

VAIC is the Value Added Efficiency Intellectual Coefficient (VACA+VAHU+STVA); TICD is the total disclosure index on intellectual capital; WBV is the intrinsic value of the firm-to-book value as a dummy variable that takes value of 1, when intrinsic value is higher than book value, 0 otherwise; VAIC*TICD*WBV in the interaction term; Size is the Natural logarithm of total assets; DY09, DY10 and DY11 are the temporal dummy variables for the years 2009, 2010 and 2011.

Specifically, with respect to high tech companies we find a positive and significant coefficient of the interaction term VAIC*TICD*WBV (0.42, $p < 0.05$), while the interaction term VAIC*WBV is not statistical significant. These findings give empirical evidence that a greater disclosure on IC appears determinant in improving the market assessment of high tech companies characterized by higher IC performance. For traditional companies, we find a positive and significant coefficient for both interaction terms: VAIC*TICD*WBV (0.16, $p < 0.10$) and VAIC*WBV (0.15, $p < 0.01$), thus showing that investors tend however to incorporate the value drivers of traditional companies (and with more statistic significance), regardless of disclosure on IC resources, maybe basing their valuations mainly on financial information as well as on other types of information channels (like the analysts).

5. Conclusions

Starting from one of the most important theory that considers the intellectual capital of companies in explaining the market and book value gap larger than one, and considering the important role of intellectual capital as a part of the resources (input) invested by companies to gain competitive advantage and, thus, improve financial performance (output), contributing to increased corporate value (i.e., intrinsic value and market value) and firm wealth (outcome), this paper first empirically tested whether the gap of market-to-book value larger than one is more likely for the Italian non-financial listed companies with higher value creation efficiency of intellectual capital. Additionally, this study investigated whether companies with higher voluntary IC disclosure are more likely to have a MBV gap larger than one, after controlling for the intellectual efficiency of the firms. A conclusive analysis is finally carried out in order to check on the effectiveness of voluntary IC disclosure in improving the market valuation process, by testing the effects of additional IC information on the gap between market value and intrinsic value of firms characterized by higher incidence of IC components (mostly non-recognized on balance sheet).

Because the relations examined likely differ across industries, we performed separated regression equations for firms in the high-tech and traditional non-financial firms, by using data over a time period of four years (2008-2011). The results give empirical evidence that high tech companies with higher value creation efficiency of human capital are more likely to have a market-to-book ratio larger than one, whereas a MBV larger than one is less likely among the bigger ones. Consequently, these findings give empirical evidence of the primary relevance for the investors of the quality and abilities of the human capital, which represents one of the most important strategic value driver in the knowledge-intensive companies. On the contrary, for traditional companies the value creation efficiency of the human capital appear to reduce the likely to have a market value higher than book value of equity, whereas the value creation efficiency of physical and financial capital employed primarily influences, in a positive direction, the market valuation of the firm, affecting the probability of a MBV larger than one. Moreover, the firm size on average has no impact on this probability, thus revealing for the investors the productivity gains of the capital employed. Finally, the results reveal that for high tech company a positive common trend exists only in the year 2009, while for traditional companies also for the year 2010. However, this trend is not maintained in the year 2011

for both categories of companies. One possible explanation to these results could be that the lasting effects of the financial crisis erupted in 2008 led to a stronger perception of risk by investors associated with the specific firm over time, and first of all with regard to high-tech firms characterized by more "soft assets". The findings from our further analysis showed that in addition to specific IC performance, also the voluntary disclosure on internal structure of intellectual capital (non-financial information) seems to have an important role in the market valuation process, especially for the high tech companies, mostly characterized by a higher incidence of "soft assets", like internal structural capital. For the high tech companies, the results also suggest that investors prefer to base the assessments of relational capital resources (external structure of IC) directly on the corporate financial performance, which also reflect the value creation efficiency of human capital as well as of physical and financial capital employed. Our final analysis reveals that a greater disclosure on IC appears determinant in improving the market assessment of high tech companies characterized by higher IC performance. For traditional companies, the findings show that investors tend however to incorporate the value drivers of these companies, regardless of disclosure on IC resources, maybe basing their valuations mainly on financial information as well as on other types of information channels (like the analysts).

This study contributes to the existing literature in a number of ways. First, the paper gives evidence that the different weight of IC in companies leads to their different relevance in the market valuation process, showing a tendency to a rational behaviour of the financial market. In fact, the investors' assessment results more based on the value creation efficiency of human capital for high tech companies, whereas for traditional firms strictly reveals the value creation efficiency of physical and financial capital. Second, this study contributes to the extant literature on the role of IC information for the efficiency of financial markets in two respects: by enhancing the understanding on the important role of information concerning internal structure of IC in the market valuation process; by testing the supposed greater accuracy of market valuation process in presence of higher information transparency through a new analysis approach. The investors' assessment is much more accurate as the market value reflects the intrinsic value of the firm. Therefore, this approach checks on the effectiveness of corporate IC voluntary disclosure in improving the accuracy of investors' assessment, by testing whether firms with an intrinsic value more than book value which are characterized by higher incidence

of IC components (mostly non-recognized on balance sheet) are more likely to have a MBV larger than one, when they disseminate more information on IC resources. This study has practical implications for various parties, such as investors and other stakeholders. It gives evidence on the important role played by voluntary IC disclosure in reducing information asymmetries between the internal and external parties' valuation of companies, primarily increasing the information held by agents in the investment community. This, in particular, in an institutional setting like Italy characterized by companies with dominant shareholders, where the information asymmetries exacerbate the agency conflicts between dominant (controlling) shareholder and minority shareholders. Moreover, the findings contribute to shed light on the effectiveness and determinant role of voluntary IC disclosure practices in improving the market assessment of high tech companies, thus reducing the possibilities of underestimation of their (more hidden) value creation drivers. Our research has a number of limitations that might warrant future research. In this study, it has assumed that higher levels of information are implicitly considered as a higher quality of disclosures., Specific aspects related to the quality of disclosure could be thus investigated to test the hypotheses. Moreover, the analysis could be extended to other countries in a comparative perspective.

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Intellectual Capital Efficiency and Business Performance: Empirical Evidence from the Professional Football Sector in Italy

Federica Ricci*, Ida Samantha Gilvari

Department of Economic and Law
University of Cassino and Southern Lazio.
University Address: 03043 Loc. Folcara Cassino (FR) Italy

Vincenzo Scafarto

Department of Scienze Umane, Sociali e della Salute
University of Cassino and Southern Lazio.
University Address: 03043 Loc. Folcara Cassino (FR) Italy

** Corresponding author*

Structured Abstract

This paper aims to explore the significance of intellectual capital (intangible assets) to firm performance in the context of professional football clubs. Specifically, it investigates whether the efficiency of intangible assets investments affect positively the sporting performance in a sample of Italian top-tier football clubs.

The conceptual and analytical model underlying this study is the VAIC (Value Added Intellectual Coefficient) model pioneered by Pulic (1999; 2000a,b) which is intended to measure the extent to which firms create added value based on intellectual capital efficiency (ICE).

Purpose. Through adaptations to the VAIC model, this paper aims to: 1) provide indicators suitable to measure ICE in the professional football sector; 2) to investigate empirically whether the efficiency of intangible assets investments (as measured by these indicators) is positively associated to sporting performance.

Design/methodology/approach – This paper performs a quantitative analysis based on the statistical technique known as mixed-effects linear regression for longitudinal analysis. The analysis covers a time period of five years and specifically the sporting seasons from 2007 to 2012.

Practical Implications – The results from this study provides tentative evidence that intellectual capital efficiency is positively associated to sporting performance. To football club managers it stands to suggest that importance of ongoing investments in human capital and the need to nurture positive relationship with external stakeholders.

Originality/value. To our knowledge studies of the kind in the professional football sector are in actual short supply.

Keywords – IC valuation, professional football club, Value Added Intellectual Coefficient

Paper Type – Academic Research Paper

1. Introduction

This paper aims to explore the significance of intellectual capital (intangible assets) to business performance in the professional football sector. Specifically it aims to explore the relation between intellectual capital efficiency and sporting performance in a sample of Italian top-tier football clubs.

The conceptual and analytical model underlying this study is the VAIC (Value Added Intellectual Coefficient) model pioneered by Pulic (1999; 2000a,b) which was originally intended to measure the extent to which firms create added value based on intellectual capital efficiency (ICE). By using the VAIC model and its underlying constructs as a starting framework, this paper has developed adaptations to the original formulation of VAIC in an attempt to fit the conceptual and measurement model to the peculiar features of professional football businesses. In doing so, two tentative indicators have been proposed which are intended to measure the efficiency of intangible assets (e.g. investments in playing talent) that are of great significance to professional football businesses. Then, it has been analyzed empirically the relation between the intellectual capital efficiency (as measured by the specially-devised indicators) and the sporting performance of the clubs in the sample (in terms of points achieved in the League standing at the end of each sporting season). The results from the empirical analysis appear – at least to some extent – to support the contention that investments in intellectual capital affect positively the sporting performance of football clubs.

The remainder of the paper proceeds as follows. Section 2 briefly describes the VAIC model as conceived by its originator (Ante Pulic, 1998; 2000a; 2000b), presents an overview of studies that have applied the VAIC model as well as the main criticism to this approach; Section 3 presents the empirical analysis, reports and provides a discussion on its results; Section 4, that concludes the paper, summarizes its main findings, highlights its limitations and outlines possible directions for future research.

2. Background

Ante Pulic (1998, 2000a, 2000b) proposed the VAIC method to provide information about the value creation efficiency of tangible and intangible assets in a company. Starting from Skandia Navigator (Edvinsson and Malone, 1997) and from the value added concept, Pulic constructed the VAIC as follows:

$$\text{VAIC} = \text{CEE} + \text{HCE} + \text{SCE}$$

with :

- CEE (Capital Employed Efficiency) indicator of VA efficiency of capital employed;
- HCE (Human Capital Efficiency) indicator of VA efficiency of human capital;
- SCE (Structural Capital Efficiency) indicator of VA efficiency of structural capital;

where:

- $\text{CEE} = \text{VA} / \text{CE}$ (VA = value added; CE (Capital Employed) = book value of the net assets);

- $\text{HCE} = \text{VA} / \text{HC}$ (VA = value added; HC (Human Capital) = total salaries and wages);

- $\text{SCE} = \text{SC} / \text{VA}$ (SC = VA - HC).

In several studies of his own, Pulic depicts firms' market value as stemming from capital employed and intellectual capital, the latter being defined as the 'sum' of human and structural capital. For instance, he found a significant degree of correlation between the (mean) value of intellectual capital (as measured by VAIC formulae) and firms' market value by using a sample of 30 randomly selected companies from the UK FTSE 250 between the years 1992-1998 (Pulic, 2000a).

Many researchers have used Pulic's VAIC as an efficiency measure of capital employed and intellectual capital, often with the aim to assess its impact on firm performance. Among these, Chen et al. (2005), using data drawn from Taiwanese listed companies, have explored empirically the relation between VAIC and firms' market-to-book value ratios as well as the relation between intellectual capital efficiency and firms' current and future financial performance. Their findings lend support to the hypothesis that firms' intellectual capital has a positive impact on market value and financial

performance, hence the contention that intellectual capital efficiency can be a leading indicator for firms' future financial performance.

Iazzolino, Laise and Migliano (2014) have compared VAIC with one of the most commonly used performance evaluation methods, the Economic Value Added (EVA), based on a correlation analysis on a sample of firms belonging to different industries. They found no linear correlation between these two measures of performance and explain this finding as due to the fact that EVA measures the VA from the shareholders' perspective, whilst VAIC is a measure of VA from the stakeholders point of view. Hence, they conclude, VAIC is a measure that usefully complements existing ones and thus is to be included as an innovative measure of Intellectual Capital Efficiency.

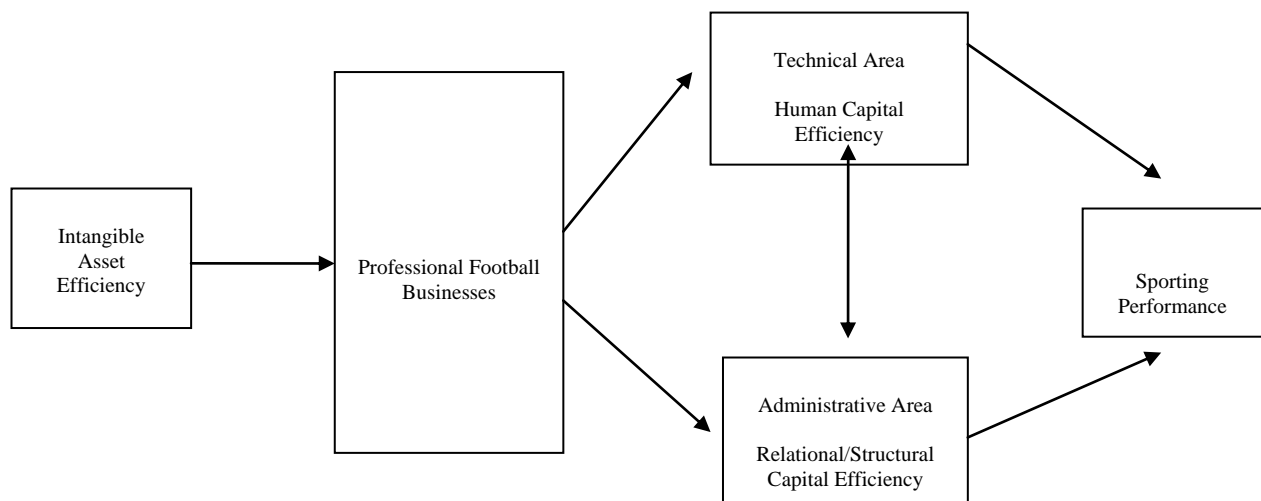
However other researchers studying the relation between intellectual capital efficiency and firm performance have reported contrasting results. For example Firer and Williams (2003) who have investigated the relationship between intellectual capital and traditional measures of corporate performance (e.g. ROA) found no strong positive impact of VAIC on profitability, productivity and market value, so they identify physical capital as the most significant source of corporate performance. By the same token, Chan (2009) has investigated empirically the relation between intellectual capital as measured by VAIC and different measures of firm financial performance, using data of all the constituent companies of the Hong Kong Stock Exchange. The results of this analysis revealed no conclusive evidence to support an association between IC and financial performances in the sample companies.

Expectedly, the VAIC method has attracted criticism. For instance, Shähle et al. (2011) show that VAIC is an invalid measure of intellectual capital. Firstly, they note, VAIC parameters merely indicate the efficiency of the company's labour and capital investments. Second, the calculation method uses overlapping variables and has other serious validity problems. Still, the results do not lend support to Pulic's hypothesis that VAIC is correlated with a company's stock market value. The main reasons behind the lack of consistency in earlier VAIC results lie in the confusion of capitalized and cash flow entities in the calculation of structural capital and in the measure of intellectual capital concepts. In doing so, the VAIC method departs from the usual tools and concepts of intellectual capital analysis, in that it considers pure financial and work efficiency variables. Besides, it is based on balance-sheet items and therefore it does not capture important constituents of intellectual capital.

3. Empirical Analysis

3.1 Research methodology

Using the VAIC model and its underlying constructs as a framework, this paper aims to measure the efficiency of intangible assets investments and its impact on sporting performance for a sample of professional football clubs playing in the top-flight division (Serie A) of Italian football, with particular respect to human and structural capital. The underlying and implicit premise for the choice of this research question lies in the assumption that sporting performance are closely tied to economic performance in the context of professional football businesses. Think, for instance, of the favorable impact that positive sporting performances (wins) can have on match revenues and merchandising sales. Based on this premise, this paper aims to explore the relation between the efficiency of intangible assets investments and sporting performance. Graphically, this can be depicted as in the following figure:



As shown in the above figure, this paper draws a (theoretical) distinction between a ‘technical’ and ‘administrative’ area of management within football clubs. By ‘technical area’ we refer to the sporting side of football club management. In terms of intangible assets, it relies primarily on the players in squad as a major constituent of its human capital. By ‘administrative area’, we refer to all activities supportive of technical activities. In terms of intangible assets, it refers to the value added created through developing positive business relationships with external stakeholders.

For either area of management, we have defined efficiency indicators specially-devised to measure the efficiency of intangible investments. In doing so, we have constructed ratios of outputs to inputs for either area.

The data used to construct these indicators have been drawn from the official balance sheets of the sample clubs from 2007 to 2012. In particular, with regard to the ‘technical area’, we have used as measures of output the revenues accruing from players’ trading (termed ‘plusvalenze’ in the Italian accounting jargon) while the values of players’ registration rights are used as measures of input. The resulting efficiency indicator expressed as HCE is as follows:

$$\text{HCE} = \text{Revenues from players' trading} / \text{Players' registration rights}$$

Instead, the efficiency indicator for intangible investments in the ‘administrative area’ has been constructed by considering the various outputs (revenues) accruing from business relationships with external stakeholders. Specifically, the external sources of revenues have been grouped as follows:

- Revenues from TV Rights;
- Corporate Image Revenues, comprised of merchandising, sponsorship and advertising revenues
- Match Revenues
- Other Revenues.

Underlying each source of revenue are different business relationships with different customer groups (e.g., respectively, television networks, consumers, spectators). Therefore all such sources of revenue taken together are considered as forming the relational capital. It should be noted however that under the rubric “corporate image revenues” one might also include the brand value of football clubs, which should nevertheless be considered as forming the structural capital of football clubs. In this paper, however, the brand value is not considered separately and thus the efficiency of relational and structural capital is measured at an aggregate level.

Specifically, the indicator for the efficiency of relational and structural capital is obtained by dividing the sum of revenues from customer capital (which intrinsically embody the brand value) by the value of total assets net of the value of players’ registration rights (as this latter value has already been included in the first indicator). The

resulting indicator referred by the acronym RSCE (= relational and structural capital efficiency) is as follows:

$$\text{RSCE} = \text{Revenues from TV rights} + \text{Corporate Image Revenues} + \text{Gate Revenues} - \text{Other Revenues} / \text{Total Assets} - \text{Players' registration rights}$$

3.2 Results

The objective of the statistical analysis presented below is to assess whether the two efficiency measures of intellectual capital affect the score achieved by clubs in the course of time. The underlying research hypothesis is as follows:

- *An increase in intellectual capital efficiency affects positively the sporting performance achieved by clubs.*

This hypothesis has been tested on a sample of professional football clubs playing in the top-flight division (Serie A) of Italian football. The data set covers a five-year time period and specifically the sporting seasons from 2007 to 2012.

To provide a balanced data panel, we chose to include in our sample only those clubs which have never been demoted from the top League in the time period being studied.

Data analysis has been made using the statistical technique known as linear mixed-effects regression model for longitudinal data. This model has been run with longitudinal data on the relative scores achieved by clubs in the whole time period. Relative scores are obtained by dividing the final score of each club by the maximum achievable score.

The following table shows the sample of football clubs on which the model has been run.

Popolazione Considerata
Cagliari
Catania
Fiorentina
Genoa
Inter
Juventus
Lazio
Milan
Napoli
Palermo
Roma
Udinese
Totale osservazioni = 60

The mixed-effects linear model attempts to fit a single regression (hyper)plane to the efficiency observations for each clubs. In the related literature, this statistical technique is referred to as multilevel model for longitudinal analysis. It not only describes the trend of the scores achieved by clubs in the five-year period under consideration, but through estimating the so-called “fixed effects” (the regression parameters describing the overall temporal trend) it shows the specific features of the evolving trend of scores by fitting them to each single club. Moreover, a description of the specific features of the temporal trend of club scores, through the so-called random effects, is offered by analyzing the relation between the context variables (as measured by HCE and RSCE) and the special features of the temporal trend of the scores achieved by clubs.

By running the model, it has been first obtained the fixed-effects solution. In particular, from this estimate it has been derived the general regression curve which represents the mean trend of the relative scores for the whole sample, as a function of the two efficiency measures for human and relational/structural capital, in the five sporting seasons being observed. In particular, the general regression curve is as follows:

$$rel_score = 0.527 - 0.00329 * time + 0.05841 * ehc - 0.01841 * ersc - 0.01483 * (time * ehc) + 0.003185 * (time * ersc)$$

Note that the general regression curve has a slope of -0,00329 and an intercept of 0,5270.

3.3 Discussion

The negative sign of the slope would suggest that the scores achieved by clubs tend to balance each other out in the course of time.

Through the model it has been also explored the relation between scores and the context effects (i.e. the efficiency measures for intellectual capital HCE and RSCE through time. In particular, the influence of the two measures on the general regression curve has been observed both with respect to slope and intercept.

Fixed-effects Solution

Effetto	Stima	Errore Standard	DF	Valore t
Intercept	0.5270	0.04907	11	10.74
TIME	- 0.00329	0.01114	11	- 0.30
C_EHC	0.05841	0.08693	32	0.67
C_ERSC	- 0.01841	0.06585	32	- 0.28
TIME*C_EHC	- 0.01483	0.02139	32	- 0.69
TIME*C_ERSC	0.003185	0.01983	32	0.16

Through the statistical processing of data it is possible to observe how, on average, an increase in the human capital efficiency interacts positively (C_HCE) with the intercept of the single regression curves of the clubs in the sample. Instead, an increase in the efficiency of relational and structural capital impact negatively (C_RSCE) the intercept of the single clubs, compared to the general regression curve.

As shown in the table, the mean effect of RSCE on the general intercept is + 0,005841. This is due to the fact that clubs characterized as having an high efficiency of human capital lie above the general regression curve. That is to say, an increase in human capital efficiency would reflect an increase in sporting performance.

Instead, the mean effect of ERSC is negative: - 0,01841. However, this negative effect, being very close to zero, can be regarded as being negligible. From a business-economics perspective, it could be inferred that an increase in investments in human/structural capital has virtually no impact on the sporting results achieved by clubs.

However, the analysis of the interaction effect of human capital and relational/structural capital on the slope of the general regression curve gives different results. In particular, the mean effect of HCE on the slope of the general regression curve is - 0,01483. This means that an increased efficiency of human capital produces a 'flattening' of the regression curve; put differently, the indicator TIME*C_EHC signals that the positive interaction effect of human capital efficiency on club performance tends to diminish over time. This might be explained as due to the fact that, while human capital efficiency, in general, impact positively club performance, this positive impact tends to decrease in significance in the medium term unless an adequate renewal of the squad occurs. This effect is in a sense 'substantiated' by the peculiarities of human resources management practices in professional football clubs, which virtually every year are given the chance to strengthen their squad through a transfer season regulated by the football association (FIGC in Italy). As a matter of fact, in no other business organization the renewal of human resources occurs at such rapid and steady pace.

It is however interesting to note that the mean effect of RSCE on the slope of the general regression curve is 0,003185. This means that an increased efficiency of relational and structural capital produces an increase in the slope of the curve. Put differently, the indicator $TIME * C_ERSC$ signals that over time the interaction effect of relational and structural capital efficiency on club performance (score) would tend to increase. A possible explanation this is that, while in the professional football sector the efficiency of relational and structural capital *in general* does not impact significantly club performance, in the medium term the interaction effect of relational and structural capital on club performance would tend to increase over time. This is arguably due to the fact that investments in relational capital by their very nature usually do not yield immediate economic returns: in fact economic returns only materialize over time to the extent that market relationships become established and grow. In turn, the increases in economic returns (revenues) from customer capital augment the spending power of clubs in playing talent, which might explain our findings that relational capital efficiency impact positively sporting performance in the medium term.

4. Research summary and limitations

In the current phase of economic evolution, a major source of a firm's competitive advantage lies in its intangible assets. It is therefore commonly held that investments in intangible assets affect positively business performance.

This paper has put to empirical test this contention by exploring the impact of intangible assets on performance in the context of professional football business. Specifically, we aimed to assess whether intangible assets such as intellectual capital had an impact on club performance expressed in terms of points in the League standing. In order to do so, we have used the statistical technique known as mixed-effects linear regression model for longitudinal analysis.

The empirical test has been performed on a sample of professional football clubs playing in the top-flight division (Serie A) of Italian football. The data set covers a time period of five years and namely the sporting seasons from 2007 to 2012. In order to provide a balanced data panel, we chose to include in our sample only those clubs which have never been demoted from the top-flight division (Serie A) in the time period being considered.

In order to provide measures of intellectual capital, we have used as a framework the VAIC model proposed by Pulic, which is intended to measure the intellectual capital efficiency (ICE). However the VAIC coefficient as put forth by Pulic appeared not to be very suited to measure the ICE in the peculiar business of professional football; therefore, by making some adaptations to the original model, we have provided two specially-devised efficiency measures referred to above as HEC (Human Capital Efficiency) and SRCE (Structural/Relational Capital Efficiency).

Based on a theoretical distinction between the technical area of club management (and the related investments in human capital) and the administrative area (and the related relational and structural capital), it has been explored the impact of HCE and SRCE indicators on the sporting performance (measured as relative scores) achieved by the clubs in the sample.

In the light of the results from the statistical processing of data, one might conclude that for the clubs in the sample, as regards the time period under consideration, an increase in the human capital efficiency affect positively sporting performance. However, this positive impact interaction has been found to fade over time, as shown by the (mean) effect of the EHC indicator on the slope of the general regression curve. As already noted, this result might be explained as due to the fact that the competitive position of a club is primarily determined by its human capital (meaning the players in squad), which however implies ongoing investments in playing talent if the positive impact on performance is to be sustained over time.

Instead, as regards the interaction of structural/relational capital, it has been found that an increase in the investments in relational/structural capital has virtually no impact on sporting performance at least in the short term; while in the medium term a positive association has emerged between the efficiency of relational capital and sporting performance. This result has been explained as due to the fact that in general the relationships with external stakeholders take time to develop and therefore they yields returns in both economic and sporting terms only in the medium-to-long term.

Taking together all the findings from this study, we are led to conclude that intangible assets investments can impact positively football club performance. Results from statistical analysis appear to lend support to this contention, especially as regards investments in technical area; though, in the medium-to-long term it might hold true for the administrative area too. This stands to suggest that investments in intangible assets are

a significant consideration in both the technical and administrative area of football club management.

It is no doubt that the findings and conclusions from this study suffer from many limitations that could, at least to some extent, be overcome through further research. In particular, it would be valuable:

- To extend the time horizon of the analysis;
- To extend the analysis to tangible assets
- To replicate the study on foreign Leagues.

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Patents and Scientific Publications: an Empirical Analysis of the Italian System of Academic Professor Recruitment¹

Bruno Marsigalia *, Tiziana Buttarò, Emanuela Palumbo

Department of Economics and Law
University of Cassino and Southern Lazio
03043 Loc. Folcara, Cassino (FR) – Italy

** Corresponding author*

Structured Abstract

Purpose – The recent increase in patenting by European and American university researchers has raised concerns by observers asking whether increased patenting is associated with less open publication of their research results. This leads us to examine if the propensity to academic patenting would affect publication of scientific research results and, therefore, cause a lower diffusion of knowledge resources; or, conversely, if it could improve academic performances by increasing quantity and quality of scientific publications.

Design/methodology/approach – We propose a quantitative approach through which we aim to test whether academic researchers who both publish and patent are less productive than their peers who concentrate exclusively on scholarly publication in order to communicate their research results. More specifically, by using the statistical model of comparison between sample means – we analyse if the average number of academic inventors publications is lower than those of non-academic ones. We use a panel dataset comprising Italian academic researchers who have obtained the National Scientific Qualification as full professor in the sector “02/B3–Applied Physics”, in the session 2012.

Originality/value – With regard to the relationship between patenting and publishing by university researchers there is not an unanimous doctrinal orientation. Additionally, there is only limited empirical evidence regarding the correlation between these two variables. Our study contributes to the existing literature by supporting the thesis according to which the open publication of university research results is not inhibited by patenting by university faculty members.

Practical implications – The outcomes of the application suggest that it would appear appropriate to encourage a greater use of patents by university researchers. It would seem, in fact, that – thanks to the financial support to academic research and, in general, to the

¹ *Even though the work is a result of the combined effort of the Authors, paragraphs 1 and 4 have been developed by Emanuela Palumbo, paragraphs 2 and 3.3 by Tiziana Buttarò and paragraphs 3.1 and 3.2 by Bruno Marsigalia.*

incentives arising from contact with industry – the development of industrial applications is likely to produce an additional stream of results, which are relevant also in the eyes of the scientific community. These observations allow us to assert that patents could be recognized as efficient indicators of knowledge production.

Keywords – Intellectual capital, scientific productivity, academic patenting, technology transfer

Paper type – Practical Paper

1. Introduction

The strategic importance of intangible assets for a company's success is widely recognized. This importance has only grown in the recent years due to the increase in international economical competition and to development of what is commonly known as the knowledge economy (Bosworth and Webster, 2006; Edvinsson and Malone, 1997; Foray, 2006; Ghidini, 2009; Lev, 2003; Rifkin, 2001; Rullani, 2004; Stewart, 1999; Sveiby, 1997; Trequattrini, 2008; Zanda, 2009). Particularly, knowing that the competitive advantage amongst different economies is basically related to the efficacy of implementation of the innovative system has lead the economists to pay special attention to the role of science as one of the main *input* to generate growth within an economical system (Romer, 1990).

In that context, it is widely known the crucial role of Public Research Institutions (PRI) and especially of the universities, which play into the technological transfer of knowledge by the appropriate endorsement of the scientific research (Cicchetti et al., 2007; Lazzeroni, 2004; Mansfield, 1991; Mansfield, 1995; Mansfield, 1998; Narin et al., 1997; Piccaluga, 2001).

Thus, in the latest years a gradual process of transformation of universities has happened. Nowadays, they have developed new functions due to a greater open-mindedness towards the external environment and to the growing desire to satisfy research needs and to offer new educational services within their economic and social system (Bonaccorsi, 2000; Godin and Gingras, 2000). There are new activities of technological transfer towards private firms that have been implemented, as well as the more traditional activities made by the universities, such as the delivery of technical and scientific knowledge and the development of competence.

The *Triple Helix Model* (Etzkowitz and Leydesdorff, 2000) is a representation of that “entrepreneurial” function. According to this model, the development of technological innovation is a collective and localized activity (Antonelli, 1999) that requires a synergic co-operation between universities, the industrial world and institutional players. In fact, reading the actual economical scenarios through the items and variables that is possible to represent in that model, universities would assume a third mission (in addition to the traditional researching and educational activities) to participate in the economical national growth and particularly in their home region. Thus, a new educational model has developed the “entrepreneurial university”.

To better understand the numerous structured activities implemented by the universities to deliver technological transfer, it is possible to examine the kind of knowledge and players involved (Baglieri, 2008).

According to the traditional classification made by Polanyi (1958), knowledge can be considered as codified knowledge – very easy to transfer thanks to a formal language used (the code) – or as tacit knowledge, held by the producer and therefore it is more difficult to be transferred and reproduced in different context, gathering to the contextual knowledge.

With special regard to the actors involved, the technological transfer can be started by the university throughout its direct relationships with companies or by the individual professors.

When the result of the research is a tacit knowledge and the actor involved is the university, the process of adding value to it (also a commercial value) happens through the foundation of *spin-off* companies, whose share could also partially belong to the university itself; on the other hand the process of value diffusion happens through personal contacts. Basically, that is the hypothesis when the researchers change the academic institution to whom they belong and go to physically follow the pattern of their own results obtained or when the industrial researchers stay for long periods into the laboratories where the researches undertaken by the firms take place.

Meanwhile, when the technological transfer is promoted by an individual professor those consulting activities bring some benefits to the university. The increase in internship opportunities and employment for the graduate students, as well as the chance to strengthen the scientific production indicators, are only some of the advantages for an academic institution that the university can exploit.

When the results of the research mainly belong to the type of codified knowledge, the process of value adding made by the university can be patented and eventually transferred by an exclusive or non-exclusive contract of licensing.

In contrast, an individual professor can implement the knowledge diffusion mainly through publications and presentations to the conventions.

It is particularly useful then to analytically analyze the individual level of professors' results. The Italian legislation about university patents allocates to the researcher, rather than to the university, the exclusive ownership of the royalties from the invention patented (D.Lgs. February 10, 2005, no. 30, art. 65).

That represents a preferential treatment when compared with existing regulations in other European countries. In fact, France, Germany and Great Britain have chosen to allocate the property of the royalties to universities, to endeavor to reduce the differences between private and public academic institutions and also between the professors themselves. That effort is inspired to the Bayh-Dole Act (USA, 1980) that promoted the possibility for universities to manage the royalties and copyrights and to collect the profits given by the licenses (Henderson et al., 1998; Jaffe, 2000).

The Italian law appears to support that "privilege" to incentivize the researchers in patenting their inventions.

All these matters suggest some main consequences.

First of all, the universities that aim to develop the local economical growth have to implement the technological transfer activities using several instruments and systematic procedures.

In addition, most of the transfer activities require the legal protection of a patent. Also within the range of the non-formal knowledge transfer there is the possibility to apply for some patents. For instance, even the constitution of spin-off companies (technological transfer of tacit knowledge) is based on the transfer of a patent – codified knowledge – to protect the inventor (Cesaroni and Gambardella, 2001).

On the other hand, the results of professor's cooperative researches could lead to patents owned by the partner enterprise and by the professors. In this case, the professors will be listed amongst the patent's inventors. That is the *inventorship* process.

Because of those considerations and the growing demand by the European and American universities to register patents, we are using the university patents as a significant index of knowledge production.

In the following paragraph we will glance at the literature's view on the consequences that patents on academic research have on scientific progress. The purpose is to analyze if either the attempts to patent techniques and tools that are used in the scientific research will emphasize the knowledge production and diffusion; or per contrary whether it would be a limit to scientific progress, due to the rising costs of research.

The third paragraph will demonstrate the reliability of university patents as a proxy for knowledge production activity, throughout a quantitative analysis of the Italian market. It will then illustrate the statistical methodology applied to the sample and its characteristics and resulting data.

Finally, the fourth paragraph presents the conclusions, focusing on both its limitations and the research evolutions that can be done.

2. Literature review

This section aims to investigate the effects produced by academic patenting on scientific research. The purpose is to analyze whether patents enhance the production and transfer of knowledge or represent a limitation to the scientific progress. The second hypothesis considers scientific process as a cumulative kind of process, thus, it has to be based on the free access to the stock of existing knowledge.

Part of the literature supports the theory that scientific progress is a collective and cumulative enterprise (Behrens and Gray, 2001; Blumenthal et al., 1986; Cohen et al., 2002; Dasgupta and David, 1994; Geuna, 2001; Krimsky, 2003; Lee, 1998). That means the research tools – laboratory equipment, experimental procedures, measurement tools – developed by scientists are fully available for others researchers, that can easily refer to the results obtained by their colleagues' work, in order to add innovative results to the former researches. Instead patenting could restrict the access to the research's results, so to affect the effective production of knowledge. The exclusive use of research tools by those scientists that invented them and own the exclusive licenses, could slow down the scientific progress and, therefore, the total amount of discoveries.

Heller and Eisenberg (1998) suggested that since the end of 1980s patenting has moved firstly within biomedical research. They pointed out that the intellectual property of tools is fragmented in many patents held by several owners, causing a multiple overlaps and concatenations between them. This phenomenon is known as a *tragedy of*

the anti-commons: the researcher has to require several licenses to access to the common pool of scientific discoveries necessary to deepen his research. The negative effects would be enhanced by the diffusion of the so-called *reach-through license agreement*, that allows the owner of a patented invention to preserve the rights on downstream discoveries around basic inventions.

Murray and Stern (2007) developed an experiment to test the anti-common hypothesis. Their study is based on the concept of dual knowledge, in which a single discovery may contribute to both scientific research and useful commercial applications. A key implication of dual knowledge is that it may be simultaneously instantiated as a scientific research article and as a patent. Such patent-paper pair is at the heart of their empirical analysis. The authors exploit the fact that patents are granted with a substantial lag, often many years after the knowledge is initially disclosed through paper publication. The knowledge associated with a patent paper pair, therefore, diffuses within two distinct intellectual property environments – one associated with the pre-grant period and another after formal IP rights are granted. Relative to the expected citation pattern for publications with a given quality level, anti-commons theory predicts that the citation rate to a scientific publication should fall after formal IP rights associated with that publication are granted. Employing a differences-in-differences estimator for 169 patent-paper pairs (and including a control group of publications from the same journal for which no patent is granted), they find evidence for a modest anti-commons effect (the citation rate after the patent grant declines by between 9% and 17%). This decline becomes more pronounced with the number of years elapsed since the date of the patent grant, and is particularly salient for articles authored by researchers with public sector affiliations. Some other surveys arrive to the same conclusions (Sampat, 2004).

Another disadvantage associated with the protection of the scientific research results would be the inventors' attitude to replace publishing with patenting. An assumption widely accepted by the scientific community claims that the youngest researchers need to firstly enforce their intellectual capital. Thus, if starting the career protecting their scientific output, they risk to be less productive in the future time; in contrast the older colleagues, thanks to the previously accumulated knowledge, would be able to devote themselves to patent the results of their efforts (Beraldo, 2007). That consequence, together with the slowing down of publications, would lead to a quality depletion.

Henderson et al. (1998) compared the amount of university patents between 1965 and 1988 with a random control sample equals to 1% of patents granted by the *United States Patent and Trademark Office – USPTO*. The authors also measured the *generality* and the *importance* of university patents for the control sample. The generality index measures the number of technological classes in which a given patent is cited, while the importance index takes into account the number of citations received. The results show that university patents are more important and more general than controls along the period analyzed. However comparing generality and importance of university patents with controls decreased after the introduction of the *Bayh-Dole Act*. That reduction has been due to two factors: 1) the BDA would induce patenting even smaller universities, whose research and inventions are not original; there would be also a reduction in the average quality of patents of larger institutions, with a considerable increase of patents that do not get any citations.

Finally, another disadvantage of academic patenting would lie on the shift of resources allocated to basic research towards more “attractive” applied research, sacrificing activities of medium-long term. While some fields do not express a distinction between basic and applied research (biotechnology), some other fields could be affected by relevant consequences, such as the physical shift of resources.

On the other hand, part of the doctrine agrees with the assumption that patents do not constitute a limitation to the production and dissemination of knowledge for several reasons, but rather an effective boost for the scientific research.

Firstly, a possible consequence of applying for a patent is that academic scientists become acquainted with researchers in companies. As these acquaintances develop into relationships, it is expected that industry contacts might become sources of ideas for new research projects (Azoulay et al., 2009). In fact, academic researchers report that problems they work on in academic research often come from ideas and problems encountered during industrial consulting (Mansfield, 1995). Another survey of scientists reported that 65% of researchers reported that interaction with industry has influenced their research. One respondent commented: “There is no doubt that working with industry scientists has made me a better researcher. They help me refine my experiments and sometimes have a different perspective on a problem that sparks my own ideas” (Siegel et al., 2003). This involvement and feedback may produce additional publications, and

potentially additional patents. As Agrawal e Henderson (2002) highlighted «*most patentable research is also publishable*».

University researcher involvement in commercialization activities may also provide additional information to the researcher about the value of various research streams. Research grants and consulting have, and continue to, serve this purpose in many academic settings. Additional exposure to and interaction with commercialization and industry may supplement these other indicators (Feller, 1990).

In addition, there is a natural analogy to the complementarities observed between applied and basic research in industrial firms. Rosenberg (1998), for example, documented that innovations born out of contact with commercial enterprises in the applied field of chemical engineering ushered a new era of basic discoveries in chemistry.

Yet, scientific publications are indicators of explicit knowledge generated in research and development stages of innovation (Cicchetti et al., 2007). Therefore, part of the doctrine believes that if the patents number is positively correlated to the scientific publications, the patent would be considered as a tool to promote the production of new knowledge.

With that regard, Markiewicz and Di Minin (2004) found that between these variables may exist a positive relationship due to two main reasons: 1) publications may serve as a type of advertisement, increasing the awareness and knowledgability of the relevant scientific community with regard to the patented technology. This can raise the value of the patented research because it increases the legitimacy of the technology and creates a set of researchers who know about it and may be interested in utilizing the patented research; 2) patents and publications may be positively correlated without being causally linked. If “good” researchers produce more and better research output, then these researchers will have more patents and publications.

Similarly, if the work of a researcher develops or improves over time, then the researcher may increase both patents and publications. Thus, the fact that higher numbers of patents and publications are both indicators of researcher quality suggests that a positive correlation would hold.

One could also imagine that patenting, and the associated possibility of licensing and industry involvement, would allow a university researcher access to additional funding (either from licensing revenue or industry funding) that he could spend on his research and lab expenses. The respondent quoted above also stated: “Also, my involvement with

firms has allowed me to purchase better equipment for my lab, which means I can conduct more experiments” (Siegel et al., 2003). The additional funding could allow for additional equipment, researchers, and junior faculty members, all of which could contribute positively to the publications and patents produced by the lab. This “pyramid effect” of patents and publications produced under the supervision of a university researcher whose name appears on many of the patents and publications generated complicates the interpretation on a positive correlation between patenting and publishing.

Finally, patents would be a source of information because of the recognition of the citations’ number as an indicator of knowledge *spillovers* phenomena. In fact, a patent generally quotes a certain number of previous patents and scientific publications, to whom the invention is connected. Just the citations’ number received by a patent is, according to some important studies (Harhoff et al., 1999; Jaffe et al., 1993; Jaffe and Trajtenberg, 1996; Jaffe and Trajtenberg, 1999; Jaffe et al., 2002), a significant indicator of its commercial value. In other words, patents can be weighed on the citations’ number received by future patents. Therefore, patents have an important explanatory function as information about them which are published may be used by several people, as well as by the inventor, to be updated on the state of the art (Grupp and Schmoch, 1999).

The idea for which patents would represent a stimulus to the production of cognitive resources leads us to focus attention on some empirical studies, which – although in limited number – have tested the ability of patents to generate knowledge by analysing the existence of a *trade-off* at the individual level between patenting activity and scientific publications.

These empirical analyses have followed so far common methodologies and provided essentially similar results.

Agrawal and Henderson (2002) explore the degree to which patents are representative of the magnitude, direction, and impact of the knowledge spilling out of the university by focusing on *MIT– Massachusetts Institute of Technology*, and in particular on the departments of *Mechanical Engineering (ME)* and *Electrical Engineering and Computer Science (EECS)*. Drawing on both qualitative and quantitative data, they show that patenting is a minority activity: a majority of the faculty in the sample considered never patent, and publication rates far outstrip patenting rates. Most faculty members estimate that patents account for less than 10% of the knowledge that transfers from their labs. Their results also suggest that in two important ways patenting is not representative of the

patterns of knowledge generation and transfer from MIT: patent volume does not predict publication volume, and those firms that cite MIT papers are in general not the same firms as those that cite MIT patents. However, patent volume is positively correlated with paper citations, suggesting that patent counts may be reasonable measures of research impact.

Calderini and Franzoni (2004), draw on bibliometrics, biographical and patent data of a sample of 1.323 Italian public researchers in the field Engineering Chemistry and Nanotechnology for New Material Sciences along 30 years (1971-2001). They measure scientific performances in each year as: a) the number of publications in that year and b) the quality of the publications, given by the average Impact Factor of the journals where the researcher published his/her work. Results of descriptive statistics and panel data analysis showed that patenting is never detrimental to quantity and quality of publications. The study suggests that scientific performances of scientists are likely to increase in the proximity of a patent event: panel data estimates seem to indicate that patenting is likely to generate a temporary increase in the number of publications, with no decrease in expected quality. Additional publications are made in the biennium of patent priority and, above all, in the following one.

Markiewicz and Di Minim (2004) compare a sample of 150 academic inventors and an equivalent sample of non-academic inventors employed in different sectors from 1975 to 1995. The results presented in their study suggest that the open publication of university research results is not inhibited by patenting by university faculty members: the annual number of publications by a faculty member increases following application for a successful patent, controlling for field, year, and time profile of publications by matched non-inventors. A doubling in the number of patents by a researcher is associated with a 5-10% increase in annual publications.

That tendency is confirmed by Breschi et al. (2007), who found that start to patent implies an increase of scientific productivity of about 15%.

Meyer (2005) examines for the field of nanoscience and nanotechnology whether researchers who both publish and patent are more productive and more highly cited than their peers who concentrate on scholarly publication in communicating their research results. His study is based on an analysis of nano-science publications and nanotechnology patents of a small set of European countries (Belgium, Germany, United Kingdom). While only a very small number of nano-scientists appear to hold patents in

nanotechnology, a considerable number of nano-inventors seem to be actively publishing nano-science research. Overall, these co-active individuals appear to outperform their solely publishing, non-inventing peers in terms of publication counts and citation frequency.

Azoulay et al. (2009) examine the influence of faculty patenting activity on the rate, quality, and content of public research outputs in a panel dataset spanning the careers of 3.862 academic life scientists, all of whom have been employed at U.S. universities or public research institutions between 1968 and 1999. They find that academic scientists who patent are more productive than otherwise equivalent scientists that are not listed as inventors on patents, but that publication quality appears relatively similar in the two groups. So they find that patenting has a positive effect on the rate of publication of journal articles, but no effect on the quality of these publications.

An important result of Italian data (Breschi et al., 2005; Breschi et al., 2007) presents two different types of academic inventors, «occasional» and «persistent», that behave differently towards patents and publications. Occasional inventors are scientists who patented only once in the course of their career. They increase the publications normally a couple of years preceding the patent and one following year. Persistent inventors are those that patented at least twice in their career. Their publications have a positive and continuous effect from the patenting activity even three years after the first patent.

In line with the aforementioned empirical studies, this paper aims to analyze the impact produced by scientific patenting on academic publishing activity.

3. The empirical analysis

3.1. Methodology

In this section the effectiveness of university patents as tools used to measure performance related to the production of new knowledge will be tested by verifying the existence of a correlation at individual level between patents and scientific publications, using data referring to the Italian context.

The reasons underlying this analysis are different.

First, an academic scientist could allocate their energies towards more economically profitable activities and, therefore, devote the majority of their time to patenting or to the

development of patents whose applications have already been filed. This could reduce the effort in terms of scientific publications.

Second, patenting of scientific output may cause a delay in the publication to not invalidate the patent, together with the affixing of restrictions on the dissemination of scientific results. This problem is particularly felt in Europe, where the researcher wants to patent his scientific output can not rely on the so-called *grace period*, which in the United States allows to publish research results aimed to patenting up to 12 months prior to the submission of the patent application, without this invalids the novelty requirement of the latter.

Finally, the results of the study are useful to understand if a greater propensity to patenting can change the orientation of academic research, moving it towards more specific and applied aims at the expense of general and theoretical ones. This change could cause a shift from academic basic research to applied research and, therefore, it could prevent patents from being recognized as efficient indicators of knowledge production.

Below the statistical methodology used, the characteristics of the sample under study, and the results observed will be exposed.

The empirical study has been conducted to test the hypothesis for which the productivity of academic inventors, in terms of scientific publications number, is not divergent from the non-academic inventors one.

In other words, we aim to understand if propensity to academic patenting could affect the publication of scientific research results and, therefore, lead to a lower diffusion of cognitive resources; or, conversely, if it represent a tool to improve their academic performances by increasing the quantity and quality of scientific publications.

The analysis has been conducted by comparing two samples: a sample of academic inventors – academics who hold at least one patent or one patent application – and a sample of academics with similar characteristics, but they never patented any results of their scientific research.

In order to test the above hypothesis we have used the statistical model of comparison between sample means, referring to the average number of publications produced by each sample. The number of scientific publications of each academic is computed with reference to a period common to the components of both samples.

The result obtained has been subjected to a test of significance to estimate his reliability.

3.2. Sample characteristics and data

The empirical investigation has been conducted with reference to academic researchers who have obtained the National Scientific Qualification as full professor in the sector “02/B3 – Applied Physics”, in the session 2012.

Participants number to the procedure in this area is equal to 280 academics, from which we have selected only 70 faculty members: those who have obtained the above qualification.

In particular, the sample consists of 31 academic researchers inclined to patent their research results – as holders of at least one patent or one patent application – and 39 academics researchers who do not patent any results of their scientific output. These two groups are the samples object of study.

Although they have not important dimensions, both samples can be considered significant because:

- most of academic inventors holds a number of patents or patent applications exceeding 1;
- in the other sectors it has not been possible to identify a significant sample of academic inventors, also because of the small number of participants who have obtained a favorable judgment to qualification.

In order to compute scientific publications number we have considered the period 1997-2012, as common to all academics of both samples. Consequently, the total number of publications of each faculty member has been purified from those previous the period in question.

The data related to both samples are contained in the following tables (table 1 and table 2):

Table 1 – Number of scientific publications made by academic inventors qualified as full professor in the area “02/B3 - Applied Physics”. Years 1997-2012.

<i>Academic Inventors</i>	<i>No. of Publications</i>	<i>No. of Patents</i>	<i>No. of Patent Applications</i>
A1	182	4	5
A2	88	3	0
A3	59	3	3
A4	60	2	0
A5	211	1	4
A6	120	0	2
A7	93	0	5
A8	107	0	3
A9	133	3	5
A10	101	7	3
A11	125	2	3
A12	328	5	0
A13	60	3	0
A14	200	1	0
A15	70	6	2
A16	72	5	1
A17	80	4	0
A18	142	2	1
A19	86	0	2
A20	20	0	1
A21	69	2	0
A22	100	4	0
A23	162	7	0
A24	146	21	0
A25	189	4	2
A26	90	0	1
A27	135	1	1
A28	166	1	4
A29	64	0	1
A30	176	0	3
A31	169	1	0

Table 2 – Number of scientific publications made by non-academic inventors qualified as full professor in the area “02/B3 - Applied Physics”. Years 1997-2012.

<i>Non-Academic Inventors</i>	<i>No. of Publications</i>
B1	157
B2	80
B3	184
B4	133
B5	138
B6	67
B7	110
B8	52
B9	77
B10	20
B11	52
B12	118
B13	117
B14	69
B15	200
B16	116
B17	72
B18	63
B19	78
B20	110
B21	137
B22	142
B23	108
B24	90
B25	103
B26	233
B27	154
B28	182
B29	65
B30	105
B31	63
B32	98
B33	146

B34	250
B35	90
B36	53
B37	78
B38	72
B39	80

So, we have tested the following research hypothesis:

HP. The average number of academic inventors publications differs from the average number of non-academics inventors ones.

In the following table (table 3) some summary statistics referring to both samples are reported.

Table 3 – Descriptive statistics of academic inventors and non-academic inventors

<i>Samples</i>	Academic Inventors	Non-Academic Inventors
<i>Minimum</i>	20	20
<i>Q1</i>	76	72
<i>Mean</i>	122,677	109,282
<i>Median</i>	107	103
<i>Q3</i>	164	137,5
<i>Maximum</i>	328	250
<i>Standard Deviation</i>	61,947	51,047

The analysis of the descriptive statistics shows that the two sample means do not differ substantially, being the relative difference of only 13publications.

The degree of reliability of the observed difference is confirmed by the test value.

By assuming the two analyzed samples have the same variance (homoscedasticity assumption) and setting a significance level $\alpha= 5\%$,the empirical evidence leads to the rejection of the research hypothesis ($t =0,992$; $p\text{-value} = 0,3247$), as we can deduce by the following table (table 4):

Table 4 – Test on the average values between academic inventors and non-academic inventors

<i>Samples</i>	Academic Inventors	Non-Academic Inventors
<i>Sample size</i>	31	39
<i>No. of average publications</i>	122	109
<i>Standard error</i>	9,020	8,174
<i>t-value</i>		0,992
<i>Degrees of freedom</i>		68
<i>p-value</i>		0,3247

So, it is reasonable to assert that the propensity to patenting does not appear to inhibit the publication of academic research results and, therefore, cause a lower diffusion of scientific knowledge.

3.3. Discussion of results

The quantitative study we have proposed has considerably reinforced the theoretical strand corroborating the assumption that university patenting could positively influence academic research.

The results observed, in fact, do not confirm the lower productivity of faculty member involved in relationships with industry, being the average of their scientific publications higher in number – even if to a limited extent – with respect to that of their non-inventor colleagues. Moreover, the higher number of academic inventors scientific publications clearly emerges also from the other summary statistics values.

The explanations for which academic patenting would increase incentives of researchers to produce and publish rapidly their results research may be different.

First, as Azoulay et al. (2009) pointed out, the market for university inventions is rife with asymmetric information. Academic discoveries often require years of additional development to yield marketable products; there is likely to be a great deal of uncertainty surrounding the commercial and scientific merit of discoveries at this primitive stage; and exhaustive due diligence regarding the value of a discovery is costly. Because of these information problems, is reasonable to believe that scientists' reputations are essential in the market for university technology: an academic researcher's scientific reputation is his/her most important currency in the effort to capitalize on intellectual property in the

market for university-originated technology. By acting as a signal of invention quality, the prominence of a patenting faculty in the community of science diminishes the search and screening costs that potential licensees must incur in the process of identifying promising university technology. Furthermore, university technology transfer officers are aware of the certification role of scientific eminence. Other things equal, because the discoveries of prominent scientists are more marketable in industry, TTOs are more likely to choose to file for patents on the discoveries of high-status scientists. Therefore, the ex post search, screening, and contracting problems in the market for ideas increase faculty's ex ante incentives to maintain their reputation on the scientific labor market, as doing so enhances both the odds of finding an industrial match for their inventions, and the value of their patents conditional on a match.

Second, the presence of the option to patent would not reduce scientists' incentives to invest in the production of public science thanks to the increased financial resources (as a result of increased licensing and royalties) that could be allocated on a discretionary basis perhaps to foster a new area of research or to develop new teaching opportunities – both of which are usually difficult to finance from traditional funding (Geuna and Nesta, 2003). Useful commercial discoveries often lead to industrial sources of funding for the laboratory of the patenting scientist. Even without access to new pools of knowledge, the ability to hire additional post-doctoral scientists or graduate students might result in higher scientific output for a scientist's lab. A related point is that many seminal scientific achievements have been made possible only by technological advances in instrumentation. In the biomedical fields and other areas of science, technological and scientific advances are therefore interdependent: new understandings are often beholden to progress in instrumentation. If patenting scientists are more likely to be in a position to negotiate access to state-of-the-art equipment in corporate laboratories (Owen-Smith and Powell, 2001), or if they are more likely to have developed the technical expertise to understand and modify research equipment, complementarities between the capital stock of their laboratory and that of their industrial partners might also increase publication output.

Finally, the idea for which the propensity to academic patenting does not seem to affect the incentive or ability of scientists to contribute public advances to the scientific literature is supported by the likely achievement of economies of scope that emerge when a scientist is involved in the development of both academic and commercial science. The

possibility of within-scientist economies of scope is also consistent with evolutionary theories of technological and scientific progress in which major advances are understood to represent insightful combinations of disparate pieces of knowledge (Hull, 1988; Weitzman, 1998). Insofar as access to diverse information facilitates the development of new and fruitful lines of scientific inquiry, patenting may facilitate the creation of the professional ties that productively broaden researchers' information networks. It would seem, therefore, that ideas might simultaneously have high scientific value and important commercial potential (Stokes, 1997).

4. Conclusions

Access to university-based research knowledge is critical for innovation in many industries. As patenting by university researchers has grown, observers are asking if that is associated with fewer open publications and research.

The economic theories are not unanimous about the relationship between patenting and publishing by university researchers.

Some of the economists support the theory that universities that strengthen patents would affect negatively the academic institutions themselves. A scientific output protection, would have a negative impact on "free knowledge", because of a higher level of secrecy, a slowdown in publications and more boundaries to access to scientific information about the research activities.

On the other hand, the alternative view suggests that patents are not a tool to prevent the production and diffusion of knowledge, but rather an effective boost to scientific research. Basically, the interaction with industry could enhance research and spark new research ideas. Funding from industry sources and money from licensing revenues may help researchers to implement additional research activities, to hire researchers, and to purchase new lab equipment. It is widely recognized that «*the biggest money comes from industry in return for collaborative research*» (Etzkowitz, 1998). Furthermore, it is possible that the enterprises, even before receiving the industrial funds, will already be selecting the most proactive and dynamic researchers. Thus, the faculty members would be encouraged to publish the results of their scientific researches.

Regarding the relationship between patenting and publishing by university researchers there is a limited amount of empirical evidence: the results of the studies we have

analyzed found that academic inventors are more likely to belong to the group of the most scientifically productive professors.

Our research contributes to the existing literature by providing an empirical investigation of faculty patenting and publishing with a dataset containing academic researchers who have obtained the National Scientific Qualification as full professor in the sector “02/B3 – Applied Physics” (session 2012).

This paper suggests that the open publications of university research is not inhibited by patenting of faculty members. In fact, the analysis found that the average number of academic inventors’ publications is higher than non-academic inventors. Thus, the results do not confirm the hypothesis of lower productivity of faculty members involved in patenting activities.

The results suggest it would be appropriate to encourage a greater use of patents by university researchers. It appears that thanks to the financial support to academic research and to the incentives brought by the industry, the development of industrial applications is likely to produce an additional stream of relevant results for the scientific community. The results of the survey suggest that patents have to be recognized as a significant indicator of knowledge production.

The survey suffers some limitations that could be filled by further insights. Particularly, we state once again that the comparison between sample means has been carried out in a single industry; therefore, future developments of that research could take place starting from different industries to be analysed. Moreover, the analysis is exclusively quantitative and it does not refer to the qualitative academic publications’ outcomes.

Nevertheless, the open-mindedness of universities towards technology transfers deserves further consideration. If that trend were to be overexploited it might bring some negative consequences. In fact, it is worth remembering that universities are mainly meant to produce knowledge available to everyone, throughout publications and mobility of researchers. That happens also thanks to a continuous transfer of information and experiences allocated in a network structure (Beraldo, 2007). If academic researches’ outcome were patented “at the beginning” it would generate a risk to “deform” one of the most important sources of knowledge production.

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How much do Intellectual Capital, Ownership Structure and the Board of Directors affect the Performance of Italian listed companies?

Fabrizio Rossi*

Department of Electrical and Information Engineering
University of Cassino and Southern Lazio (FR), Italy
Via G. Di Biasio 43, 03043, Cassino (FR)

Domenico Celenza, Simone Manfredi

Department of Economics and Law
University of Cassino and Southern Lazio (FR), Italy
Via Sant'Angelo (Loc. Folcara), 03043, Cassino (FR)

** Corresponding author*

Structured Abstract

Purpose – The objective of this paper is to examine the relationship between some aspects of governance (such as ownership structure and characteristics of the board), the efficiency of intellectual capital and the economic and market performance of a sample of Italian listed companies.

Design/methodology/approach – This study investigates a sample of forty Italian listed companies during the period 2002-2012, whose shareholder weight is equal to approximately 50 percent of the total market capitalization. In particular, through regression analysis there will be an examination of the relationship between economic and market performance and the efficiency of intellectual capital, the characteristics of the board and the ownership structure of the companies investigated. In addition, a few control variables (debt ratio, size, industry and firm age) will be used to measure the impact on the regression analysis.

Originality/value – This methodology highlights both the relationship between the efficiency of intellectual capital and the performance of firms and the influence that the governing body can have on the efficiency of intellectual capital. The research on the one hand extends the existing literature on some aspects of corporate governance and intellectual capital; on the other hand it aims to test the importance of the ownership structure and the characteristics of the board of directors as a means of creating value in firms.

Practical implications – The outcome of the application, in addition to enhancing knowledge on the relationship between ownership structures, the characteristics of the board, the efficiency of intellectual capital and business performance, intends to determine if the board of Italian listed companies affects the determination of business results and the management of intellectual capital. Moreover, the results could be useful

both for policy makers in order to regulate the size of the boards and their independence with respect to the ownership, and also for enterprises in determining compensation and benefits.

Keywords – Intellectual Capital, Ownership Structure, Board Structure, Firm Performance, Italian listed companies

Paper type – Academic Research Paper

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1 Introduction

Alongside the more traditional vision based on financial structure (Modigliani and Miller, 1958), ownership structure (Jensen and Meckling, 1976) and the risk-return relationship (Sharpe, 1964) as determining factors in the analysis of the stock performance of companies, there has developed over the last twenty years a vast empirical literature aimed, on the one hand, at measuring the possible relationship between the efficiency of intellectual capital and economic performance, and on the other at verifying if the efficiency of intellectual capital is able to explain the difference between the market value and book value of listed companies. The objective of previous studies was to find additional information variables in the empirical analysis on the efficiency of stock markets (Fama, 1970) and, in particular, to demonstrate that Intellectual Capital Disclosure (ICD) may be useful in extending the flow of information that has an impact on the prices of securities.

In the literature there are two different strands of research regarding the relationship between the efficiency of intellectual capital and business performance.

The first focuses on the relationship between IC and performance, and most of these studies use patents, trademarks and R&D as proxies of IC (Edvinsson and Malone, 1997; Bornemann *et al.*, 1999; Aboody and Lev, 2000). More recently, the relationship has been investigated using the Value Added Intellectual Coefficient (VAICTM), a model proposed by Pulic (2000) as a proxy of the efficiency of intellectual capital.

At the empirical level, however, the results reported in the literature appear discordant. Some authors tested the VAIC and found a positive relationship with business performance (Chen *et al.*, 2005; Muhammad and Ismail, 2009; Clarke *et al.*, 2010;

Janosevic *et al.*, 2013), and yet others, instead, failed to find a significant relationship (Firer and Williams, 2003; Kamath, 2008; Ghosh and Mondal, 2009; Puntillo, 2009; Ferraro and Veltri, 2011; Celenza and Rossi, 2012a). In this context, there have been contributions aimed at verifying whether the VAIC used in conjunction with other variables improves the explanation of the market value of the share capital, and the results appear to be positive (Huang and Wang, 2008; Celenza and Rossi, 2014a).

The second strand of literature is more recent and deals with the relationship between ownership structure, corporate governance in general, and the efficiency of intellectual capital. The aim of this strand is to verify whether the efficiency of intellectual capital is affected by the ownership structure, thus indirectly shifting the focus on agency costs (Firer and Williams, 2005; Saleh *et al.*, 2009; Tsai *et al.*, 2013; Bohdanowicz and Urbanek, 2013; Celenza and Rossi, 2013b).

The objective of this paper is to fit within the second strand of studies and examine the relationship between some aspects of governance (such as ownership structure and characteristics of the board), the efficiency of intellectual capital and the economic and market performance of a sample of Italian listed companies.

2 Literature review

Over the last ten years, numerous empirical studies have investigated on the connection between corporate governance and the firm's performance, also with special regard to Intellectual Capital efficiency.

2.1 Intellectual Capital and firm performance

Several empirical studies demonstrate the impact of intangible assets on both the company's financial performance and stock returns. Aboody and Lev (2000) showed that the impact of generating IC on the current and future operating earnings was very strong. With reference to the chemical industry, for example, they showed that the increase in research and development (R&D) investments doubled the operating profits.

Bornemann *et al.* (1999) found that firms that manage their IC more effectively were able to secure a very strong competitive advantage over other companies and to perform better than them.

There is no single definition of IC. Stewart (1997), for example, defined IC as the "packaging of useful knowledge" (p. 67). Instead, Petty and Guthrie (2000) gave IC a

much more incisive meaning. They considered it instrumental both in determining the value of the company and in improving the economic performance of a nation. In the literature, there is also a widely-accepted idea of the existence of a strong relationship between IC and the market value of firms. For example, Lev and Zarowin (1999), Lev (2001), and Lev and Radhakrishnan (2003) focused on the gap between the market value and the book value of companies, while trying to investigate the invisible values that did not appear in financial statements. More generally, there have been hypotheses about the weight that IC can have on the value of the company and on the need to consider not only the financial variables but also the value of IC.

Edvinsson and Malone (1997), indeed, defined IC as the gap that is observed between a firm's market value and book value.

Marr *et al.* (2004) proposed an organizational approach based on the Knowledge Assets Map and the Knowledge Assets Dashboard. The introduction of the Knowledge Asset Map and Knowledge Asset Dashboard can help firms to identify their key knowledge assets. In particular, the knowledge asset dashboard stresses the important actor/infrastructure relationship and the dynamic nature of these assets.

Pulic (2000 and 2004) offered an additional measure of the value of IC through the VAICTM, which included both physical capital and human and structural capital.

Firer and Williams (2003) tested the VAIC. However, they failed to find a strong relationship with the company's profitability.

On the contrary, Chen *et al.* (2005) found that IC had a very strong impact on the market value and performance of firms. In particular, investments in R&D can provide additional information on structural capital and generate a positive effect on firm value and profitability.

Cabrita and Vaz (2005) investigated a sample of 53 Portuguese banks and found that IC is significantly correlated with the organizational performance of the banks and that the interaction between the components of the IC generates greater value.

Tan *et al.* (2007) investigated 150 companies listed on the Singapore Stock Exchange during the period 2000-2002 and found a positive relationship between the VAIC and financial performance in several sectors, including manufacturing. The results of the manufacturing sector would seem statistically more robust. The authors also divided the sample into three groups according to the values of the VAIC and found that groups of companies with higher VAIC values correspond to results which are positive and

statistically more robust than the values recorded by the companies with the lowest VAIC.

Huang and Wang (2008) investigated 37 companies listed on the Taiwan stock market (17 firms belonging to traditional industrial sectors and 24 to the electronics industry) during the period 2001-2003. The two authors used Ohlson's model by including in the model both the EVA[®] (Economic Value Added) indicator and intellectual capital in order to capture residual information. The two authors found that by including certain variables as proxy of IC the explanatory power of the regression model increases. In other words, the intellectual capital proxy, together with the EVA, provides incremental information for the evaluation of companies.

Kamath (2008), however, did not see any relation between IC and the traditional performance measures, such as profitability and market value. Even Ghosh and Mondal (2009), after investigating 80 companies operating in the pharmaceutical and information sector and testing the relationship between IC and company performance, found that market value and productivity were not significantly related to IC. However, they pointed out that IC was a good predictor of productivity.

Puntillo (2009) examined a sample of banks listed on the Italian stock market, but he failed to find a strong relationship between IC, ROI, and return on asset (ROA).

Muhammad and Ismail (2009) examined 18 Malaysian financial companies in 2007 and found a positive and statistically significant relationship between the VAIC and ROA.

Carlucci and Schiuma (2010) addressed the issue from another perspective and dwelt on the need to identify performance indicators to be placed in the perspective of an analytical network approach, as the selection of these performance indicators is one of the biggest challenges companies will have to face in order to develop an efficient system of performance measurement. The authors emphasized the importance of the interaction of the indicators as a guideline for decision makers.

Clarke *et al.* (2010) investigated a sample of Australian listed companies during the period 2004-2008 and found a direct relationship between IC and the performance (ROA and ROE) of companies.

Ferraro and Veltri (2011) investigated a large sample of companies listed on the Italian stock market through Ohlson's model and found that the variables of the IC did not show a significant relationship with the market value of firms.

Gigante and Previati (2011) investigated the Italian banking sector during the period 2003-2007, using stock returns as the dependent variable. The results obtained indicated a positive but not statistically significant relationship between equity returns, the VAIC and its components.

Maditinos *et al.* (2011) investigated the relationship between IC, market value and financial performance of a sample of 96 Greek listed companies during the period 2006-2008. The results are not in line with most of the hypotheses made, thus emphasizing the failure of the hypothetical relationship between IC and M/BV. However, they identify a statistically significant relationship between the efficiency of human capital and ROE.

Rehman *et al.* (2011) investigated 12 Pakistani companies and found a positive and statistically significant relationship between the components of the VAIC and the ROE.

Venugopal and Subha (2012) examined 41 firms producing software in India during the period 2000-2010 and found that, although the efficiency of capital employed and the efficiency of structural capital were both significantly and positively related to the financial performance, there was no direct relationship between the VAIC (served as an indicator for measuring IC) and the financial performance. Venugopal and Subha (2012) emphasized, however, that “the model which studied the relationship between components of VAIC and financial performance explained the firm’s value better” (p. 130).

Celenza and Rossi (2012a) examined a sample of 11 Italian listed companies during the period 2003-2008 and measured the relationship between VAIC and M/BV and between VAIC and the profitability indicators (ROI and ROE) and didn’t find a significant relationship between the variables.

Celenza and Rossi (2012b) proposed a methodology consisting in the construction of an adjusted multiplier based on a simplified version of the VAICTM. The adjusted multiplier is obtained from the product between the simplified VAIC and the ratio of the ROE of the firm to the ROE of the sector the firm belongs to. The algorithm allows a better illustration of the efficiency of the intellectual capital in a context of sectoral performances.

Javornik *et al.* (2012) investigated 12,000 Slovenian companies during the period 1995-2008 and found a positive and statistically significant relationship between VAIC, ROA and ROE and between the components of the VAIC and financial performance.

Janosevic *et al.* (2013) investigated 100 Serbian companies in 2010 and found a positive and statistically significant relationship between the ROE and the efficiency of capital employed and between the ROE and the efficiency of human capital.

Celenza and Rossi (2014a) investigated 23 Italian listed companies belonging to different sectors, during the period 2003-2008, and found no relationship between financial performance and the VAIC. However, they found a positive and statistically significant relationship between the changes in market value and changes in the VAIC and between changes in performance indicators (ROI, ROE and ROS) and changes in the VAIC, concluding that the VAIC improves the explanation of the regression analysis and assuming its utility as an “additional coefficient” in the analysis of equity performance.

More recently Celenza and Rossi (2014b) investigated the existence of a relationship between the efficiency of intellectual capital and the financial performance of Italian manufacturing firms in the period 2002-2011. The analysis was divided into three methodological stages. In the first stage the relationships between the M/BV and VAIC and between the financial indicators (ROI, ROE, ROS) and the VAIC were examined. The results suggest a positive and statistically significant relationship for both the ROI and the ROE. In the case of the M/BV, however, there is no relationship with the VAIC. The results obtained in the second stage, by rearranging the sample according to the values of the VAIC, point out a positive and more robust relationship between the variables examined, with the exception of the M/BV. In the last stage of the analysis the results suggest that the high VAIC portfolios record a higher average performance compared to low VAIC portfolios and that intellectual capital could be a discriminating variable in returns.

2.2 Ownership structure, board structure and firm performance

The problem of efficiency in the management of business resources has lead many researchers to study the phenomenon related to the agency costs stemming from the separation between ownership and control and therefore arising from the divergence of interests between principal and agent. Agency costs, like other costs, make businesses less competitive; it is therefore necessary to identify the monitoring mechanisms of managers' opportunistic behavior (majority shareholders) that may minimize these costs. Berle and Means (1932) were the first to examine the ownership structures of firms and in particular the problem of the separation of ownership and control, emphasizing the possible

divergence between the interests of owners (founders of the company) and those of the management that manages the resources.

Jensen and Meckling (1976) examined the agency costs caused by the possible opportunistic behavior of managers whose utility function may diverge from the interests of the ownership. They could manage the resources in an inefficient manner in order to maximize their utility function. Fama (1980), starting with the assumption that markets are fully efficient, emphasizes the importance of managerial resources as a monitor of managers' opportunistic behavior. If there exists a managerial market in which skills are traded, it is in the manager's interest not to depreciate his skills in order to avoid reducing his compensation and incentives. Thus a manager who does not maximize the firm's economic value undergoes a depreciation of its capabilities on the market of human resources.

Jensen and Ruback (1983) argued that the market for corporate control represents the largest component of managerial resources and therefore a manager who implements opportunistic behavior, violating the principle of the creation and maximization of value, could be replaced by the takeover.

Fama and Jensen (1983), however, point out that there is not necessarily a monotonically decreasing relationship between agency costs and the share held by managers. With the increase of the stake they own, managers could avoid their dismissal, as it becomes difficult for other managers to take over.

Demsetz (1983) does not believe that there is an appropriate ownership structure for all situations if the value of the firm's assets is to be maximized. As he writes: "The ownership structure likely to maximize the value of the firm's assets depends on the technology of the tasks required of the firm's labor force, on the desired scale of operation and on the managerial ability of potential owners of the firm. No single ownership structure is suitable for all situations if the value of the firm's assets is to be maximized. In particular, from the viewpoint of the owner(s), the optimal distribution of profits is 100 percent to a single owner-manager only in special circumstances" (p. 386).

Demsetz and Lehn (1985), after investigating 511 firms during the period 1976-1980 did not find any relationship between ownership concentration (OC) and the accounting profit rate.

Jensen (1986) believed that by reasoning in terms of free cash flows, the debt may limit any opportunistic behavior, thus ensuring greater efficiency. He argued that excess

cash resources should be distributed to the shareholders and removed from the discretion of managers who tend to reinvest them even in the absence of profitable investment opportunities.

Morck *et al.* (1988) studied the linear relationship between managerial ownership and performance on a sample of 371 U.S. companies in 1980 and found a significant non-monotonic relationship between the variables.

McConnell and Servaes (1990) analyzed the relationship between Tobin's Q, insider and blockholder ownership using two different cross-sectional samples in 1976 and 1986, respectively, and found a positive but decreasing relationship with the increase of OC for insider ownerships and a positive but non-significant relationship for the blockholders.

Cho (1998) examined 326 U.S. companies in 1991 by replicating the work of Morck, Shleifer, and Vishny (1988) and found a similar non-monotonic relationship between Q and the management shareholding. In the next stage, however, he found that Q affects the ownership structure but not vice-versa.

Demsetz and Villalonga (2001) investigated the relationship between Tobin's Q and the managerial ownership of 223 U.S. firms over the period 1976-1980 and found no statistically significant relationship between ownership structure and firm performance.

Faccio and Lang (2002) conducted a study on 5,232 companies in 13 countries in Continental Europe and found that firms are typically widely held for 36.93% and controlled by the family for 44.29%. On average, the relationship between ownership and control is very high and the pyramid control model is widespread in other countries as well.

Anderson and Reeb (2003) examined 403 U.S. firms over the 1992-1999 period and found that family firms represent a widespread pattern and perform better than or as much as non-family firms: the Tobin's Q for family firms is higher than in non-family firms.

Earle *et al.* (2005) analyzed 168 Hungarian companies listed in the period 1996-2001 and found that the size of the largest block increases profitability and efficiency strongly and monotonically. They used two performance measures (ROE and operating efficiency) and found that the second measurement is more significant than the ROE.

Barontini and Caprio (2006) studied the relationship between ownership structures and performance of firms in a sample of 675 listed companies in 11 countries in Continental Europe and found that the most widespread ownership model is the family

model and that this model is positive for the operational performance and the value of the firm.

Perrini *et al.* (2008) investigated a sample of Italian firms during the period 2000-2003 and found that the OC in the five biggest shareholders is beneficial to firm value. They indeed found a positive relationship between the top shareholders and Tobin's Q.

An equally large literature has developed on the relationship between the board and the performance of firms. In many studies there has been an examination of the relationship between the characteristics of the board (size, gender diversity, age, etc.) and performance, and in others the relationship between board compensation and performance. The board should play a monitoring role on the possible opportunistic behavior of the management (Fama and Jensen, 1983). For example, Hermalin and Weisbach (2003) analyzed the economic literature regarding ownership and the board's structure and how their characteristics can affect the firm's performance. They mention the notorious surveys which demonstrate that there is a negative relationship between board size and company profitability; and that both board compensation and size have a significant relationship with the main board decisions, such as the CEO replacement. Finally, they suggest that the board is "an institution that has arisen endogenously in response to the agency problem inherent in governing any organization" (p. 20).

Barontini and Bozzi (2009) investigated the relationship between ownership characteristics and the level of board compensation and firms' performance. The survey was conducted on a copious sample of Italian companies listed on the Milan Stock Exchange (1995-2002). With regard to the data investigated the authors applied a refined version of the total compensation, which is the "other compensation" a value net of the amount accrued in previous years to the directors.

The results are the following: the larger ownership concentration is related to the lower board compensation. On the controlling shareholder side, family firms give higher levels of compensation, thus supporting the rent extraction hypothesis rather than the social network theory. Moreover, the presence of shareholder agreement gathers an average higher compensation. The authors trace the evidence of a negative influence of higher board compensation on the firm's future performance. Finally, they analyze the effects of the separation between cash flow and voting rights.

Bianco *et al.* (2011) analyzed the relationship between ownership structure and the presence of women in the board of directors. They demonstrated that the number of

women on the board arises within public companies with a larger shareholder distribution or international companies, also with a higher percentage of younger directors. Information Technology and high-tech industries are the most characterized by the female presence on the board, together with the companies that have investment banks and funds in the corporate ownership.

The survey focused on the Italian market. It also aimed to trace a link between the presence of women on the board of directors and the company's performance and good governance; however the data didn't support those hypotheses. On the contrary, good governance can decrease when the women directors are relatives of the other members of the board, since the frequency of the meetings decreases.

Barontini and Caprio (2002) extended the empirical research that defined a connection between board turnover and firm performance to a sample of Italian companies listed on the Milan Stock Exchange (1976-1996). The authors followed the same methodology applied in the former survey on board turnover. The data that included takeover effects have been discarded because the work aims to show a normal functioning system.

A main governance characteristic of the Italian Market is a higher ownership concentration (53% of the capital is controlled by the main blockholder). Starting from that peculiarity, the different results with the former study occur. Therefore, Barontini and Caprio demonstrated that the board turnover of Italian companies is higher than abroad; thanks to a greater ownership concentration it is easier to dismiss inefficient directors. Moreover the survey shows that the connection between turnover and standard age doesn't have any empirical evidence, and that the average number of directors on Italian boards is lower than abroad.

Finally, the authors studied the link between board turnover and Italian firms' performance. The data supported that relation, but the variables are not so strongly related as in the results of the American and Japanese surveys. The main reason is once again the high level of OC which doesn't necessarily lead to read the results in terms of inefficient governance, but it could also be explained by the main shareholder's facility in persuading top management to change strategies, however inefficient, rather than having a turnover.

Belcredi and Rigamonti (2008) also based their survey on the Italian context, but they used a peculiar method of comparing the firm's data over time, taking into account only certain years (1978, 1988, 1998 and 2003). Over this period of time they observed the

changes in the board's structure, especially in order to identify the main causal connections between ownership structure and firm performance (calculated using Tobin's Q). They demonstrated that the connection between ownership and board structure is higher in Italy than abroad, since it is a country with a high OC level.

They also demonstrated the following results: the board structure of Italian listed companies has changed very sharply over that period of time; board size is directly related to firm size, while there is an inverse relationship with the cash flow rights of the main blockholder and company size; the separation of control rights has decreased since 1990.

Moreover the authors analyzed the board's composition: the proportion of non-executive directors increases in larger boards and when the role of Chairman and CEO are held by the same person. In addition, regarding the ownership structure in Family Businesses, by analyzing the number of family members in the board, their role and the portion held by independent directors, they illustrated that in family firms there is a higher connection between ownership and board structure; the board is larger if there is a higher proportion of family members in the board; it is more common to have a family Chairman rather than in other kinds of firms; there is a higher presence of independent members (and less non-family executives). Finally, they highlighted that the percentage of family firms has now increased (while foreign-owned and state-owned firms have decreased). With regard to the performance index, Tobin's Q is related both to ownership structure and pyramiding, but not to board structure.

Francis *et al.* (2012) analyzed how corporate governance affects performance from a different point of view, the crisis period. They consider the relationship between those two variables, taking into account financial data starting from the end of 2006. Their results highlight several issues: the number of independent members on the board is not significantly related to firm performance. Nevertheless, when taking into account a re-definition of "independent directors as outside directors who are less connected with current CEOs, a measure called "true independence" (p. 1) there is a positive and significant correlation with company performance indicators. Finally, they demonstrated that the frequency of board meetings, the average age of directors together with their attendance behaviors are all variables that have an impact on firm performance during the crisis period.

Fauzi and Locke (2012) analyzed a sample of 79 companies listed on the New Zealand Stock Exchange, belonging to six different industries, to investigate the effect that ownership and board structure have on the firm's performance. The data came from the annual reports of the companies from 2007 to 2011 and they were analyzed in terms of explanatory variables (number of directors and non-executives on the board, managerial ownership, blockholder ownership, audit, nomination and remuneration committees); dependent variables (Tobin's Q and ROA) and control variables (leverage, firm size and industry level).

The results were the following: the variables that have a significant positive relationship on the firm's performance are: board size, female presence on the board, managerial ownership, leverage and firm size. The same positive results also apply to the companies that follow the NZSC (New Zealand Security Commission, 2004), a set of guidelines on best practice of corporate governance. On the other hand, the survey showed a negative relationship between the presence of non-executive directors, female directors on the board and stockholder ownership with the companies' performance. Finally, the results didn't confirm the endogeneity between corporate governance and firm performance.

2.3 Ownership structure, board structure, Intellectual Capital and firm performance

The relationship between intellectual capital and ownership structure, except for in emerging countries, has been, to the authors' knowledge, little investigated. Among the studies that investigate the relationship between intellectual capital and ownership structures are Firer and Williams (2003), Saleh *et al.* (2009), Tsai *et al.* (2013), Kalyta (2013), and more recently Bohdanowicz and Urbanek (2013).

For example, Firer and Williams (2003) investigated the relationship between ownership structure and intellectual capital disclosure (ICD) on a sample of 390 listed companies in Singapore in the year 2000. Their results show a negative and statistically significant relationship between ICD and ownership concentration, a positive and significant relationship between ICD and size and a positive but non-significant relationship with leverage.

Saleh *et al.* (2009) investigated 264 listed companies in Malaysia during the period 2005-2007 in order to determine whether there is a relationship between the VAIC, the different forms of ownership structures and profitability. They found a negative but non-

statistically significant relationship between the VAIC and leverage and between the components of VAIC and leverage, while the relationship is positive and statistically significant between the VAIC and profitability as measured both by ROA and by the Market to book value. Lastly, they found a negative and almost always statistically significant relationship between the VAIC, its components and family ownership. They concluded that the negative relationship would increase the likelihood of the opportunistic behavior of family members to the detriment of minority shareholders.

Tsai *et al.* (2013) examined a sample of firms listed on the Taiwan stock market during the period 2004-2008 using performance measures such as Tobin's Q and equity returns on a quarterly basis. As a measure of intellectual capital they used the ratio of spending on human resources and sales, and as an ownership index they used the ratio of shares held by board directors and the total equity. However, their study did not show any significant relationship either between the performance and cost of human resources or between the performance and ownership share of the board directors. Instead they found a negative and statistically significant relationship between the debt ratio and Tobin's Q. By dividing instead the ownership structure between family firms and manager controlling, they found a negative and statistically significant relationship between Tobin's Q and spending on human resources in both cases and a positive and significant relationship between equity returns and spending on human resources. They concluded that Tobin's Q is an important performance indicator to measure intellectual capital and the high degree of leverage worsens the performance.

Bohdanowicz and Urbanek (2013) investigated a sample of 354 Polish companies listed during the period 2006-2011 for a total of 1,505 firm-year observations. They used a linear regression model to study the relationship between the VAIC, its components and the various ownership structures. As control variables they used the debt ratio, firm size, growth opportunities and free float. The results show a negative and significant relationship between the VAIC and manager ownership and an almost always positive and statistically significant relationship between size and VAIC and its components (VAHC and STVA). In addition, there is a negative and statistically significant relationship between the VAIC, its components and floating funds; instead they found a positive and statistically significant relationship between the VAIC, its components and the growth opportunities measured by the M/BV. Finally they divided the sample into two sub-samples made up of high-tech and non high-tech, but the results seem to follow the

same trend. The authors concluded that the results are inconsistent with other studies on the relationship between managerial ownership and performance and also in contrast with the assumptions postulated in the agency theory.

Celenza and Rossi (2013) examined both the relationship between the VAIC and ownership concentration and the relationship between the ROA (or Tobin's Q) and ownership concentration. However, they didn't find statistically significant results in the relationship between VAIC and ownership concentration measured by the majority shareholder. On the contrary, they found a positive and statistically significant relationship between the ROA, VAIC, ownership concentration and debt ratio.

Kalyta (2013) instead used a more original approach to examine whether there is a relationship between the board in which there is a higher presence of human capital with greater skills, a higher level of collective knowledge, and the value of the firm. In particular he focused on two alternative measures based on human capital and the level of education in the board, on a sample of 1,000 U.S.-listed companies for the period 2007-2010 in order to determine whether there is a relationship between Tobin's Q and the board's skills. In the regression analysis he considered the following as control variables: size, ROA, leverage, the ratio of R&D and total assets, the ratio of advertising expenses and total assets, and the market share of the 4 largest firms in the reference sector. Except for the size variable which is negative and statistically significant, for all the other variables (ROA, leverage, R&D and market share of the 4 largest firms) he found positive and statistically significant values.

He continued with a second analysis based on the study of the events and measured the market reaction to the announcement of the appointment of the board within 10 days of the announcement date. The results obtained show that the stock market reacts positively to the announcement of the board in the knowledge-intensive sector. The Cumulative Abnormal Return (CAR) ranges from 1.24 % to 1.04% within three days of the announcement date. The author concludes that the contribution made by human capital to the board for the purpose of value creation depends on the board's importance in achieving strategic objectives and therefore the knowledge-intensive firms require a qualified board with additional skills compared to traditional boards.

Most of the research on Intellectual Capital is meant to demonstrate either the correlation between the quantity and quality of information disclosed and firms'

performance or the correlation between Intellectual Capital variables and companies' performance.

Cerbioni and Parbonetti (2007) investigated how corporate governance can affect the quantity and quality of voluntary disclosure on Intellectual Capital. Since it focused on Intellectual Capital, the survey was conducted exclusively on a sample of biotechnological firms listed on the stock market of one of the European countries. After analyzing the data from the beginning of 2002 to the end of 2004, they found that board structure, leadership and size are negatively related to the amount of disclosure on IC; whilst the number of independent directors is positively related to the amount of voluntary information disclosed on IC by the companies.

With regard to the quality of the information disclosed, the empirical research showed that CEO duality has a negative influence on the disclosure of forward-looking information. Moreover, the board structure enhances the annual report's readability. Finally, the quantity of voluntary disclosure is related to a reduction of the agency costs.

Williams (2000) proposed a survey on the connection between the board's composition and Intellectual Capital performance, based on a sample of 84 listed companies in South Africa, one of the main emerging economies. He found that there is a significant positive link between both gender and race diversity across the board of directors and IC performance. The results also demonstrated a significant negative connection between the duality of CEO/Chairman and IC. Some other variables taken into account have not shown a significant correlation with IC, such as the ratio of insiders/outside and the percentage of shares owned by directors. Finally, the author suggests that "stakeholder-agency may offer itself as an applicable theoretical framework to explain the association between intellectual capital performance and corporate governance" (p. 2).

Al-Musalli and Ku Ismail (2012) investigated on how the Board's structure was affecting Intellectual Capital performance. They based their research on a sample of 147 Malaysian companies belonging to a knowledge intensive industry, the banking industry. The sample was analyzed for the period 2008-2010 with special regard on how the board's educational level, nationality diversity and number of independent directors affected IC. The results showed that the number of independent directors didn't have a positive relationship with IC performance; while the other variables considered weren't associated with IC performance.

3 Data and survey methodology

3.1 Sample

The objective of this work is to study the relationship between the performance of a sample of Italian-listed companies during the period 2002-2012 and the characteristics of both ownership structure and the board of directors.

In this regard, 40 companies listed on the stock market were examined whose capitalization was greater than 50 percent of the total capitalization of the stock market.

The analysis was divided into two stages. In the first stage, the relationship between the VAIC, the ownership structure of the three largest shareholders, and the structure of the board of directors was examined. In the second stage, the analysis was aimed at verifying the existence of a significant relationship between company performance, measured by Tobin's Q and by Return on Asset (ROA), and the characteristics of the board and of ownership structure.

The companies belonging to the sample had to meet the following requirements:

- a) the presence of firms with a high intellectual capital content;
- b) the availability of data during the entire observation period, which were acquired through *Bloomberg*, *Datastream*, the *Calepino dell'azionista* (Mediobanca), the reports on Corporate Governance and the financial statements of the individual companies.

The relationships were tested using the following equations:

$$\text{PERF} = \alpha_0 + \alpha_1 \text{BOARDSIZE} + \alpha_2 \text{BOARD_COMP} + \alpha_3 \text{OWNERSHIP} + \alpha_4 \text{BOARD_OWN} + \alpha_5 \text{CONTROL_VARIABLES} \quad (1)$$

$$\text{PERF} = \alpha_0 + \alpha_1 \text{BOARDSTRUTURE} + \alpha_2 \text{BOARD_COMP} + \alpha_3 \text{BOARD_OWN} + \alpha_4 \text{OWNERSHIP} + \alpha_5 \text{CONTROL_VARIABLES} \quad (2)$$

Where:

PERF = performance (VAIC or Tobin's Q or ROA);

Board Size = total number of members of the Board of Directors;

Board Structure = % of executives; % of non-executives; % of independents; % of women;

Board compensation = the total amount of the board's remuneration;

Ownership = the main shareholder's share, the second largest shareholder's share and the third largest shareholder's share.

Control variables = size, debt ratio, firm age, industry.

Instead, the VAIC was added as an independent variable in the models in which the ROA and Tobin's Q are dependent variables.

The following hypotheses were formulated in this study:

H1. There is a positive relationship between the VAIC and ownership structure.

H1a. There is a negative relationship between board size and VAIC.

H1b. There is a positive relationship between VAIC and board compensation.

H1c. There is a positive relationship between independent members of the board and VAIC.

H2. There is a positive relationship between performance (ROA or Tobin's Q), ownership structure, the characteristics of the board and the VAIC.

H2a. There is a negative relationship between board size and performance (ROA or Tobin's Q).

H2b. There is a positive relationship between performance (ROA or Tobin's Q) and board compensation.

H2c. There is a positive relationship between independent members of the board and performance (ROA or Tobin's Q).

H2d. There is a positive relationship between ROA (or Tobin's Q) and the VAIC.

3.2 Variable measurement

Table 1 illustrates the variables used in the study, their measurement and their relevant source of acquisition.

Table 1 - Definition for the Selected Variables

Variables	Definition	Source
Tobin's Q	[(Book Value of Total Assets – Book Value of Shareholder's Equity + Market Value of Shareholder's Equity) / Book Value Total Assets]	Bloomberg and hand collection from <i>Calepino dell'azionista</i>
Return On Assets (ROA)	Operating Profit/Total Assets	Bloomberg and Datastream
VAIC	Value Added Intellectual Coefficient = VAHC + VACA + STVA	Hand collection from firms' statements
VAHC	Value Added Human Capital =	Hand collection from firms'

	Value added/cost of employees	statements
STVA	Value Added Structural Capital = Operative Income/Value Added	Hand collection from firms' statements
VACA	Value Added Capital Assets = Value Added/physical assets + financial assets	Hand collection from firms' statements
Debt Ratio	Total Debt/Total Assets	Bloomberg, Datastream and hand collection from <i>Calepino dell'azionista</i>
Log Size	Log of Total Assets	Bloomberg, Datastream and hand collection from <i>Calepino dell'azionista</i>
Largest_Bh	Largest Blockholder	Hand collection from CONSOB and Corporate Governance Reports
2 nd _Bh	2 nd largest blockholder	Hand collection from CONSOB and Corporate Governance Reports
3 rd _Bh	3 rd largest blockholder	Hand collection from CONSOB and Corporate Governance Reports
Executive	% of Executive members on Board of Directors	Hand collection from CONSOB and Corporate Governance Reports
Non_Exec	% of Non Executive members on Board of Directors	Hand collection from CONSOB and Corporate Governance Reports
Indep	% of Independent members on Board of Directors	Hand collection from CONSOB and Corporate Governance Reports
WoB	% of Women on Board of Directors	Hand collection from CONSOB and Corporate Governance Reports
Board Size	Number of members on Board of Directors	Hand collection from CONSOB and Corporate Governance Reports
Board_Own	% of shares owned by Board of Directors	Hand collection from Corporate Governance Reports
Industry	Two-Digit SIC (Standard Industrial Classification) codes	North Carolina State University website
Firm age	Years by firm establishment	Firms' websites
Board_Comp	Log of total compensation	Hand collection from Corporate Governance Reports

Table 2 illustrates the descriptive statistics of the individual variables used. The dependent variable, according to the models used, is the VAIC, the ROA and Tobin's Q.

For Tobin's Q the mean (1.22) and median (1.14) are very similar. This indicator is widely used in the literature since it is considered capable of measuring intangible assets (Morck et al., 1988).

The mean and median also seem very similar for board compensation, executive members, non-executive members and women on board. It should be noted that this latter indicator is practically almost always absent in the first observation period.

Table 2 - Descriptive Statistics for the Selected Variables

	Obs.	Average	Median	Std. Dev.	Min.	Max.
Tobin's Q	400	1.22	1.14	0.38	0.57	2.48
VAIC	400	3.34	2.60	2.79	-0.01	16.82
Board_Comp	400	2.59	2.81	0.93	0.00	3.96
Largest_Bh	400	42.53	43.87	19.59	0.00	86.09
2nd_Bh	400	5.29	4.55	3.49	0.00	16.06
3rd_Bh	400	2.68	2.03	2.70	0.00	15.94
Board_Own	400	14.40	0.15	22.18	0.00	73.12
Debt Ratio	400	22.92	22.62	11.83	0.86	50.44
Log Size	400	3.08	2.83	1.05	1.63	5.25
Industry	400	48.00	43.50	24.16	13.00	99.00
Board Size	400	8.60	8.25	4.04	0.00	16.75
Executive	400	0.25	0.24	0.14	0.00	0.62
Non_Exec	400	0.54	0.54	0.24	0.00	1.00
Indep	400	0.34	0.28	0.20	0.00	0.77
WoB	400	0.13	0.12	0.06	0.00	0.27
ROA	400	3.13	2.66	3.77	-2.58	13.26

However, in order to examine all variables in a more complete manner, the analysis has been divided into four sub-periods (2002, 2005, 2008 e 2011). Moreover, in order to avoid endogeneity problems among the variables (Demsetz and Lehn, 1985), the statistical technique of dependent variable lagged was used in this study.

4 Results and discussion

Table 3 shows the results of the multiple regression analysis which considers the VAIC as a dependent variable.

Table 3. Relationship between VAIC, Ownership structure and Board structure

VAIC	Model 1					Model 2				
	Years	2002	2005	2008	2011	Overall	2002	2005	2008	2011
Intercept	0.08 (0.95)	3.02 (1.14)	8.19*** (2.88)	9.56*** (3.66)	4.19 (1.50)	3.68* (1.83)	2.98 (0.83)	15.34*** (4.93)	12.36*** (4.12)	4.05 (1.14)
Board_Comp	-0.16 (-0.20)	0.54 (0.60)	-1.51*** (-2.94)	-3.26*** (-3.83)	-1.77 (-1.38)	-1.08 (-0.41)	-0.91 (-0.53)	-0.23 (-0.48)	-1.52 (-1.14)	-2.96 (-1.18)
Largest_Bh	-0.00 (-0.23)	-0.00 (-0.37)	0.01 (0.62)	0.01 (0.69)	-0.01 (-0.21)	-0.00 (-0.02)	-0.02 (-0.60)	0.03* (1.71)	0.02 (0.88)	-0.00 (-0.12)
2nd_Bh	0.28 (1.48)	0.01 (0.09)	-0.02 (-0.38)	0.07 (0.99)	-0.04 (-0.19)	0.06 (0.26)	0.05 (0.22)	0.02 (0.33)	0.08 (1.09)	-0.06 (-0.28)
3 rd _Bh	-0.26 (-1.02)	-0.13 (-0.53)	0.10 (0.79)	-0.05 (-0.36)	0.03 (0.11)	-0.20 (-0.66)	-0.21 (-0.70)	0.13 (1.22)	-0.13 (-0.77)	0.10 (0.28)
Board_Own	-0.01 (-0.54)	-0.01 (-0.48)	-0.03 (-1.44)	-0.01 (-1.13)	-0.01 (-0.18)	-0.02 (-0.68)	-0.00 (-0.02)	-0.00 (-0.24)	0.01 (0.22)	-0.01 (-0.24)
Executive						3.11 (0.39)	5.86 (0.64)	16.08*** (-4.53)	-10.35* (-1.78)	3.56 (0.38)
Non_Exec						6.21 (0.64)	3.70 (0.61)	14.20*** (-5.18)	-7.60* (-1.72)	4.73 (0.53)
Indep						-2.96 (-0.70)	-1.79 (-0.40)	-1.32 (-0.41)	-2.03 (-0.55)	-1.67 (-0.27)
WoB						-5.06 (-0.46)	-9.28 (-0.55)	-0.40 (-0.10)	1.37 (0.29)	-6.31 (-0.48)
Board Size	-0.06 (-0.34)	-0.18 (-0.84)	-0.33** (-2.59)	-0.07 (-0.57)	-0.09 (-0.37)					
Debt Ratio	-0.02 (-0.66)	-0.01 (-0.41)	0.02 (0.98)	0.04 (1.51)	0.02 (0.39)	-0.03 (-0.74)	-0.03 (-0.64)	0.01 (0.50)	0.00 (0.10)	0.02 (0.32)
Log Size	0.54 (0.12)	0.40 (0.50)	0.05 (1.41)	1.12** (2.27)	1.68* (1.85)	0.79 (0.16)	0.46 (0.36)	0.78 (1.21)	1.14* (1.95)	1.86 (1.48)
Firm age	-0.00 (-0.25)	-0.00 (-0.50)	-0.00 (-1.13)	-0.00* (-1.89)	-0.01 (-1.20)	-0.00 (-0.55)	-0.00 (-0.28)	-0.01 (-1.27)	-0.01 (-1.62)	-0.01 (-1.17)
Industry	0.00 (0.27)	0.01 (0.53)	0.00 (0.03)	0.00 (0.20)	-0.00 (-0.18)	0.01 (0.35)	0.02 (0.62)	-0.01 (-0.75)	-0.00 (-0.03)	-0.01 (-0.21)
R ²	17.07%	12.29%	48.09%	57.64%	23.26%	12.14%	12.06%	72.84%	62.51%	24.71%
Adjusted R ²	-11.52%	-17.94%	30.19%	43.04%	-3.20%	-31.79%	-31.92%	59.26%	43.76%	-12.94%
F-value	0.59	0.40	2.68**	3.94***	0.88	0.28	0.27	5.36***	3.33***	0.66
(Significance level)	(0.80)	(0.93)	(0.01)	(0.00)	(0.56)	(0.99)	(0.99)	(0.00)	(0.00)	(0.79)
VIF	1.20	1.14	1.92	2.36	1.29	1.14	1.14	3.68	2.67	1.33

Note: (*), (**) and (***) indicates significance levels of 10%, 5% and 1% respectively. VIF = Variance Inflation Factor. T-value is given in brackets

There is a positive and statistically significant relationship between the VAIC and ownership structure only in the period 2008 (model 2). With regard to board structure, there are no particularly significant relationships. In particular, the relationship between board compensation and the VAIC appears to be negative and statistically significant in the period 2008 and 2011.

In the same period the relationship between the VAIC and the executive and non-executive percentage also seems to be negative and statistically significant.

The relationship between the VAIC and board size also appears to be negative and statistically significant in 2008.

With regard to the relationship between the VAIC and ownership structure, the variable is positive but never statistically significant. Size, instead, appears to be related positively with respect to the VAIC both during the sub-periods and during the entire period examined.

Hypothesis H1 must therefore be rejected, except for the period 2008 (model 2). Sub-hypotheses H1b and H1c must also be rejected. On the contrary, hypothesis H1a can be accepted in particular with reference to the period 2008.

Table 4 illustrates the results of the relationship between Tobin's Q and the independent variables.

The relationship almost never appears statistically significant between Tobin's Q and ownership structure, except for in 2011 in model 2 in which the relationship is positive and statistically significant with the third largest shareholder.

Table 4. Relationship between Tobin's Q, Ownership structure, Board structure and VAIC

Tobin's Q Years	Model 1					Model 2				
	2002	2005	2008	2011	Overall	2002	2005	2008	2011	Overall
Intercept	0.43 (1.23)	3.01*** (6.34)	1.80** (2.04)	1.11 (1.26)	1.54*** (3.83)	0.50 (1.67)	3.35*** (5.39)	0.86 (0.54)	0.44 (0.44)	1.54*** (3.05)
Board_Comp	-0.05 (-0.34)	-0.05 (-0.36)	0.04 (-0.30)	0.42 (1.45)	0.26 (1.39)	0.31 (0.86)	0.19 (0.67)	-0.07 (-0.45)	-0.26 (-0.74)	-0.03 (-0.11)
Largest_Bh	0.00 (1.45)	-0.00 (-1.54)	0.00 (0.79)	-0.00 (-0.43)	0.00 (0.63)	0.00 (0.75)	-0.00 (-1.30)	0.00 (0.37)	-0.00 (-0.50)	0.00 (0.37)
2nd_Bh	-0.03 (-1.06)	0.00 (0.07)	-0.00 (-0.23)	-0.02 (-0.97)	-0.05* (-1.78)	-0.05 (-1.55)	0.01 (0.39)	-0.01 (-0.47)	-0.02 (-1.02)	-0.05 (-1.64)
3 rd _Bh	0.07 (1.52)	-0.04 (-1.00)	0.02 (0.73)	0.04 (0.99)	0.05 (1.13)	0.06 (1.55)	-0.06 (-1.29)	0.02 (0.63)	0.08* (1.93)	0.06 (1.30)

Board_Own	0.00	-0.00	-0.00	-0.00	-0.00	0.00	-0.00	-0.00	-0.00	-0.00
	(0.24)	(-0.80)	(-1.08)	(-0.16)	(-0.71)	(0.72)	(-0.51)	(-1.22)	(-1.10)	(-0.46)
Executive						-0.99	-1.12	1.47	2.70	0.30
						(-0.88)	(-0.70)	(0.85)	(1.69)	(0.23)
Non_Exec						-1.47	-0.15	1.25	2.74**	0.98
						(-1.07)	(-0.14)	(0.87)	(2.27)	(0.79)
Indep						0.29	-0.37	0.15	1.17	-0.50
						(0.49)	(-0.49)	(0.13)	(1.22)	(-0.57)
WoB						5.90***	-0.23	-1.91	-2.57**	0.08
						(3.81)	(-0.07)	(-1.30)	(-2.11)	(0.04)
Board Size	0.02	0.01	-0.02	-0.02	-0.03					
	(0.65)	(0.31)	(-0.68)	(-0.70)	(-0.89)					
VAIC	-0.01	-0.00	-0.01	0.05	0.02	-0.00	-0.01	0.04	0.08	0.01
	(-0.32)	(-0.26)	(-0.20)	(1.03)	(0.58)	(-0.22)	(-0.29)	(0.69)	(1.66)	(0.50)
Debt Ratio	-0.00	-0.01*	-0.00	-0.00	-0.01*	-0.00	-0.01*	-0.00	0.00	-0.00
	(-0.24)	(-1.99)	(-0.98)	(-1.11)	(-1.71)	(-0.98)	(-1.98)	(-0.93)	(0.61)	(-1.25)
Log Size	1.24	-0.21	-0.05	-0.29*	-0.14	1.98***	-0.34	-0.24	-0.47**	-0.10
	(1.54)	(-1.52)	(-0.36)	(-1.93)	(-1.02)	(2.86)	(-1.59)	(-1.02)	(-2.68)	(-0.55)
Firm age	-0.00	0.00	-0.00	0.00	-0.00	-0.00	0.00	0.00	0.00	-0.00
	(-0.90)	(0.27)	(-0.24)	(0.99)	(-0.01)	(-0.89)	(0.42)	(0.29)	(0.62)	(-0.27)
Industry	-0.00	-0.00	0.00	0.00	-0.00	-0.00	-0.00	0.00	-0.00	-0.00
	(-0.17)	(-0.48)	(0.51)	(0.07)	(-0.31)	(-0.70)	(-0.49)	(0.57)	(-0.74)	(-0.70)
R ²	49.09%	38.82%	14.80%	27.16%	24.63%	68.16%	42.40%	21.12%	45.81%	25.97%
Adjusted R ²	29.09%	14.79%	-18.67%	-1.45%	-4.97%	50.33%	10.14%	-23.05%	15.46%	-15.47%
F-value	2.45**	1.61	0.44	0.94	0.83	3.82***	1.31	0.47	1.51	0.62
(Significance level)	(0.02)	(0.14)	(0.92)	(0.51)	(0.61)	(0.00)	(0.26)	(0.92)	(0.18)	(0.81)
VIF	1.96	1.63	1.17	1.37	1.32	3.14	1.73	1.27	1.85	1.33

Note: (*), (**) and (***) indicates significance levels of 10%, 5% and 1% respectively. VIF = Variance Inflation Factor. T-value is given in brackets

The results of the relationship between Tobin's Q and women on board appear to be equally discordant. The relationship is positive and statistically significant in 2002 and negative in 2011. In all the other cases it isn't significant. On the other hand, the relationship regarding the non-executives is interesting, whose data are positive in 3 cases out of 5 and with reference to 2011 they are also statistically significant.

Therefore, all the hypotheses formulated for Tobin's Q must be rejected.

Table 5 reports the results of the relationship between the ROA and the independent variables.

Table 5. Relationship between ROA, Ownership structure, Board structure and VAIC

ROA	Model 1					Model 2				
	Years	2002	2005	2008	2011	Overall	2002	2005	2008	2011
Intercept	6.71**	17.87***	6.10	3.51	5.22	7.38**	14.52***	-12.38	-1.27	4.17
	(2.33)	(4.53)	(0.76)	(0.35)	(1.37)	(2.57)	(3.07)	(-0.88)	(-0.11)	(0.87)
Board_Comp	0.38	-1.21	-0.75	-1.73	0.61	4.70	0.64	-1.40	-7.61*	-2.37
	(0.31)	(-0.90)	(-0.52)	(-0.52)	(0.35)	(1.34)	(0.29)	(-0.92)	(-1.92)	(-0.70)
Largest_Bh	0.02	-0.01	0.06	0.02	0.03	0.02	0.00	0.01	0.04	0.02
	(0.73)	(-0.42)	(1.09)	(0.39)	(0.76)	(0.58)	(0.10)	(0.22)	(0.57)	(0.36)
2nd_Bh	-0.40	-0.41	-0.07	-0.04	-0.18	-0.43	-0.50*	-0.14	-0.04	-0.18
	(-1.39)	(-1.52)	(-0.38)	(-0.19)	(-0.68)	(-1.37)	(-1.88)	(-0.69)	(-0.18)	(-0.61)
3 rd _Bh	0.53	0.87**	0.47	0.92*	0.49	0.49	1.16***	0.38	1.30**	0.62
	(1.37)	(2.32)	(1.37)	(1.86)	(1.27)	(1.18)	(3.01)	(1.06)	(2.67)	(1.40)
Board_Own	-0.02	-0.04	-0.05	0.04	-0.02	-0.02	-0.09**	-0.05	0.00	-0.03
	(-0.84)	(-1.23)	(-0.92)	(0.75)	(-0.65)	(-0.48)	(-2.28)	(-0.81)	(0.05)	(-0.60)
Executive						-13.63	-14.23	22.91	22.26	6.10
						(-1.26)	(-1.18)	(1.49)	(1.24)	(0.50)
Non_Exec						-18.42	-13.75*	21.80*	26.24*	8.50
						(-1.40)	(-1.73)	(1.72)	(1.94)	(0.72)
Indep						5.64	4.33	-2.69	4.77	-3.10
						(0.98)	(0.75)	(-0.25)	(0.44)	(-0.37)
WoB						29.63*	45.45*	-1.33	-32.14**	5.52
						(2.00)	(2.06)	(-0.10)	(-2.35)	(0.32)
Board Size	0.03	-0.04	-0.09	-0.11	-0.21					
	(0.11)	(-0.13)	(-0.26)	(-0.27)	(-0.72)					
VAIC	0.15	0.00	-0.17	0.85	0.14	0.21	0.09	0.67	1.05*	0.14
	(0.57)	(0.02)	(-0.38)	(1.45)	(0.58)	(0.80)	(0.35)	(1.05)	(1.84)	(0.56)
Debt Ratio	-0.03	-0.24***	-0.14*	-0.16*	-0.15**	-0.05	-0.20***	-0.15*	-0.06	-0.13*
	(-0.68)	(-4.28)	(-1.95)	(-1.85)	(-2.57)	(-1.01)	(-3.46)	(-1.97)	(0.51)	(-1.87)
Log Size	-1.30	1.39	0.69	0.59	0.64	0.36	2.75	0.02	-0.34	1.03
	(-0.19)	(1.17)	(0.48)	(0.35)	(0.51)	(0.05)	(1.68)	(0.01)	(-0.17)	(0.59)
Firm age	-0.00	0.00	-0.00	0.00	-0.01	-0.01	-0.01	0.00	-0.01	-0.01
	(-0.76)	(0.14)	(-0.45)	(0.36)	(-0.58)	(-1.02)	(-0.50)	(0.09)	(-0.31)	(-0.56)
Industry	-0.05*	-0.17***	-0.00	0.01	-0.04	-0.07*	-0.19***	0.01	-0.03	-0.04
	(-1.72)	(-4.77)	(-0.10)	(0.29)	(-1.17)	(-2.05)	(-5.21)	(0.25)	(-0.49)	(-1.23)
R ²	21.44%	58.45%	25.89%	42.60%	30.10%	33.02%	67.22%	33.57%	57.34%	30.84%
Adjusted R ²	-9.41%	42.14%	-3.22%	20.06%	2.64%	-4.49%	48.86%	-3.63%	33.46%	-7.88%
F-value	0.69	3.58***	0.88	1.88*	1.10	0.88	3.66***	0.90	2.40**	0.80
(Significance level)	(0.73)	(0.00)	(0.56)	(0.08)	(0.40)	(0.59)	(0.00)	(0.57)	(0.03)	(0.67)
VIF	1.27	2.40	1.35	1.74	1.43	1.49	3.05	1.51	2.34	1.45

Note: (*), (**) and (***) indicates significance levels of 10%, 5% and 1% respectively. VIF = Variance Inflation Factor. T-value is given in brackets

From the Table 5, it can be inferred that the relationship between the ROA and ownership structure is always positive and statistically significant in 2005 and 2011 in both models.

Therefore hypothesis H2 can be accepted.

The relationship between the ROA and the VAIC is always positive but statistically significant only in 2011 (model 2). In this regard, hypothesis H2d cannot be rejected.

The relationship between board size and the ROA is always negative but never statistically significant. In this case also, hypothesis H2a cannot be rejected.

The relationship between board compensation and the ROA is almost always negative and statistically significant in 2011 (model 2). Therefore, H2b must be rejected.

Instead, with regard to the relationship between independents and ROA, the sign of the coefficients alternates and they are never statistically significant.

Sub-hypothesis H2c cannot be accepted.

With regard to the relationship between the ROA and women on board, the coefficients alternate signs and are almost always statistically significant. However, in the case of positive signs they seem to enhance performance compared to the negative sign.

A separate discussion must be reserved for the non-executives since they are statistically significant in 3 cases out of 5, even if they assume alternate signs. The debt ratio is always negative and almost always statistically significant.

The values assumed by the debt ratio appear to be in contrast with the work of Celenza and Rossi (2013b) in which they were positive and statistically significant.

5 Conclusions

The objective of this paper is to examine the relationship between the efficiency of intellectual capital, measured by the VAIC, ownership structure and board structure on the one hand, and on the other hand to verify the existence of a relationship between the ROA and Tobin's Q with regard to ownership structure and the characteristics of the board.

For this purpose, a sample of companies listed on the Italian stock exchange during the period 2002-2012 was examined. Subsequently, the analysis was conducted on 4 sub-periods.

In general, the results obtained do not confirm the hypotheses. In particular, the VAIC doesn't seem to be affected at all by the ownership structure, let alone board structure. The same conclusions are reached by examining Tobin's Q.

With regard to the ROA, instead, the relationship regarding ownership structure can be accepted and the results of this work seem to be consistent with those of Celenza and Rossi (2013b).

With reference to the characteristics of the board, the results obtained are discordant since there seems to be a negative sign relationship between the ROA and board size, as expected.

The presence of a non-monotonic relationship in all the performance models examined should be noted, which is in line with the affirmations of Morck *et al.* (1988). As regards the relationship between performance and board size, the results obtained appear to be in line with those of Yermack (1996) who finds a strong and negative relationship with Tobin's Q. In addition, if confirmed, they are also consistent with the assumptions made by Jensen (1986), who sustains that a board which is too widespread is less efficient in its role of monitoring opportunistic behaviour by management.

Lastly, the results of this study also appear to be in contrast with other works which study the relationship between performance and women on board. In particular, the data are not always positive and statistically significant, as Campbell and Minguez-Vera (2007) and Adams and Ferreira (2009) sustain. The data obtained are similar to those by Fauzi and Locke (2012) both with regard to the coefficient women on board and the size factor.

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Knowledge-based approach to sustainability in smart projects*

Francesco Bifulco, Cristina C. Amitrano,
Marco Tregua*

Department of Economics, Management, Institutions
University of Naples "Federico II"
Complesso Universitario Monte Sant'Angelo - Via Cintia, 26
80126 Napoli

* *Corresponding author*

Structured Abstract

Purpose – We want to analyse how knowledge can favour growth through open and social innovation models (Chesbrough, 2003, Komninos et al., 2011). In particular we focus on smart cities, realized to identify “innovative solutions to city management” (Toppeta, 2010), in order to underline how they can support sustainability (Tanguay et al., 2010). We start examining the smart growth, focusing on the inputs induced by smart cities policies. Then we analyse the firms, searching for the motivations (Ardichvili et al., 2003) of their establishment in smart territories and finally we underline the role of knowledge sharing between firms and local actors.

Methodology – We conduct a case studies analysis (Yin, 2003) aiming to compare different urban contexts and define the issues emerging from literature review in line with our purpose. Case studies approach is suitable when studying knowledge in contexts definable as similar (Davenport, 1997). Moreover we have chosen to investigate three smart projects classified on the basis of their dimension as city (Malta), corridor (Manchester), and district (Barcelona). Furthermore we have selected the empirical evidences taking into account the project leader, as we have a joint venture (Malta), a pool of local agencies (Manchester), and an in-house company public owned (Barcelona).

Originality/value – This research sheds some new light on the role of knowledge in smart cities as knowledge is not commonly considered as an autonomous and relevant feature. This lack of consideration is confirmed when analysing smart cities’ models and platforms (Bifulco et al., 2014), but just as embedded in (and carried by) actors (Lombardi et al., 2011), hence it is often hidden behind other aspects. In our research we underline its relevance in smart projects and we describe as it can be considered as a priority to set up a fertile ground for *smartization* and sustainability through social innovation.

Practical implications – Our results enhance the approach to knowledge when proposing social innovation initiatives: the project leaders involved in smart projects can read

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through different lens the prevailing models to leverage on knowledge (Dhanaraj and Parkhe, 2006) in order to reach sustainability aims. This knowledge-centred approach can favour the mixing and circulation of several sources of knowledge (Anttiroiko et al., 2013). Moreover the creation of new knowledge can favour participation from the different urban actors (Paskaleva-Shapira and Barroca, 2012). Finally the focus on sustainability through knowledge management can be a stimulus to the location of firms in a specific territory (Porter, 2000).

Keywords – knowledge management, sustainability, smart cities, social innovation, open innovation.

Paper type – Academic Research Paper

1 Introduction

The increasing role of urban contexts in the knowledge economy has brought to the diffusion of *smartization* processes, namely different initiatives towards the reaching of a smart, sustainable, and inclusive growth (EC, 2010).

The different actors involved in these projects, especially public administrations and industry players, have a specific role in the collaborative environment of the smart ecosystem, in order to reach sustainability (Tanguay et al., 2010). This aim is related to the development of the so called *drivers*, namely various groups of activities that collect and guide the planning of interventions, that are usually gathered in operative models by technology vendors or consulting companies.

The activities undertaken for the elaboration of smart projects are strictly related to the generation, circulation, and use of knowledge (Yigitcanlar et al., 2008) among the different actors within the ecosystem, namely public institutions, universities, research centres, people (workers and citizens), and firms.

The wide range of players in these urban contexts has induced an extension of the traditional models of analysis, from the triple helix to a quintuple helix model (Leydesdorff and Etzkowitz, 1998; Arnkil et al., 2010; Lombardi et al., 2011; Carayannis et al., 2012), and has conducted us to the analysis of three case studies with a focus on the exchange of knowledge among the different stakeholders of the ecosystem and the new technological, human and organizational capabilities, in order to understand the location of firms in smart contexts.

2 Literature review

2.1 Sustainable development and smart growth

The relevant challenges to be faced in modern times have induced both the policy makers and the economic actors to possible resolutions, based on collaborative strategies and a wide sense of co-responsibility. These features have brought to a focus on the well-known concept of sustainability and its close relationship with the development issue, especially referring to three dimensions of economic, environmental and social sustainability.

A central role has been played by the international and supranational institutions, starting from the setting of the common base by the United Nations, within the World Commission on Environment and Development, to the important activities undertaken by the European Union and its Europe 2020 strategy.

In Europe the environmental issue and its famous “20-20-20” targets (improve energy efficiency, reduce greenhouse gas emission, and energy consumption), preceded the wide objectives of the Europe 2020 strategy, which aims to deliver growth through the development of initiatives related to “three mutually reinforcing priorities” (EC, 2010):

- smart growth, improving the digital society, knowledge, research and innovation
- sustainable growth, promoting green technologies, smart grids, and efficient and sustainable use of resources
- inclusive growth, modernising labour markets and welfare systems, and promoting the employment rate among women, young people and older workers.

Innovation is one of the main flagships developed among these priorities, as an incentive to competitiveness, benefits for all actors and partnerships, and the Programme Horizon 2020 is the related financial instrument, helping the achievement of excellent science, industrial leadership and tackling societal challenges (EC, 2011).

These strategies can be implemented at different territorial levels and the smallest one is the urban context, nowadays facing a growing rate of population and a higher expectation of a better life that makes people moving into cities (Shen et al., 2011) and pressing local government and all stakeholders to get engaged. The different actors involved in these areas are facing the emerging problems through the development of projects, namely smart cities which look at innovation and combine hardware and

software infrastructures (ABB, 2012) in order to develop more “efficient, sustainable, liveable” cities (Toppeta, 2010).

The setting up of smart projects is linked to the concept of sustainable development, which can assume other features in addition to the three main economic, social, and environmental aspects. In detail the sustainability in urban contexts requires the integration of the qualities associated with interactions and the overlapping of these dimensions (Tanguay et al., 2010): development must also be equitable, liveable, and viable.

The achievement of sustainable aims can be stated only with the analysis and evaluation of the undertaken initiatives through the creation and adoption of suitable indicators. The international debate among the different tools for monitoring sustainability has recently converged towards the adoption of the so-called “Dashboard of sustainability”, developed by the Consultative Group on Sustainable Development Indices (CGSDI) and the Joint Research Center (JRC). It supports a synthetic representation of the above mentioned dimensions for the comparison among the performance of sustainability of different countries, but can also be applied in a local urban context (Scipioni et al., 2009).

The sustainability in smart cities projects are related to *drivers*, namely the elements that collect and guide the planning and the development of the activities in a specific context of intervention (energy and environment, transport, services to citizens, ICTs, participation and economic growth). In detail the *smartization* process starts with the choice of one or more *drivers* and within them different indicators can be applied to monitor and measure the sustainability of the activities realized.

This central role of sustainability in the development of smart cities is underlined within the documents elaborate by the industry players and the local public entities involved in the projects. Among the different private-sector partners of cities, many technology vendors have pursued the opportunities to map their products and services to the goals and initiatives of smart cities (Bélissent, 2010), developing operative models with the integration of different *drivers* and looking for a sustainable approach to smart cities management.

Many industry players have developed documents on smart cities with the presentation of their solutions for smart cities, illustrating their operative models and the mix of the different *drivers* (Bifulco et al., 2014). Most of them analysed the concept of

sustainability especially from an environmental, and consequently economic, point of view, looking at the reduction of the cost of services with a more efficient management of energy, water, waste and transport *drivers*.

A wider point of view can be found in Accenture's vision on smart cities (2011), that after the explanation of its own model, analyses the linkages among the sustainability and the different *drivers*, stating the priority of a reduction of the environmental impact with smart initiatives on energy, waste and water management, and transport, and it underlines the importance of citizens education and engagement in sustainability goals.

The relationship between the actors involved in smart projects and the concept of sustainability in smart cities can be also identified in the elaboration of Siemens (2011), aiming for the integration of different stakeholders interests in order to achieve a higher degree of cohesiveness, and Microsoft (2013), looking for people empowerment in government, businesses, and the community through innovation.

The above mentioned perspectives of analysis can be also observed from the public administrations' points of view, which allow a focus on the concept of sustainability both in the development phase and during the monitoring.

2.2 Towards creative and knowledge cities

The increasing number of smart projects is a consequence of the central role of urban areas in the knowledge economy (van Winden and van den Berg, 2004), as the "greater reliance on intellectual capabilities" (Powell and Snellman, 2004) has its main evidences in cities, where knowledge is produced, processed, exchanged and marketed by institutions (universities, research centres, etc.), people (workers and citizens), and ICTs infrastructures.

The requirement for the generation, circulation, and use of knowledge within urban economies (Yigitcanlar et al., 2008) is not the only factor to be analysed in the development of cities, because the aim to a higher quality of life is influenced by a variety of issues that can be identified as smart projects *drivers*.

The *smartization* process in urban areas requires new infrastructures, or the improvement of existing ones, in order to provide multimodal accessibility and facilitate the exchange of goods and people (*driver* transport), but also to enhance the transfer of information through software and hardware components (broadband networks, sensors, wireless connectivity, etc. – *driver* ICTs).

The relationship between knowledge and the development of the other *drivers* (energy and environment, services to citizens, participation, economic growth) in smart projects can be analysed by a comparison with the four axes of the framework of knowledge-based urban development (KBUD) proposed by Yigitcanlar and Lönnqvist (2012):

- Enviro-urban development can be related to the *driver* energy and environment that aims to conserve natural resources, improve urban open spaces and buildings, and enhance the air quality.
- Socio-cultural development refers to one of the services that cities have to assure to their citizens, enhancing residences' skills and knowledge and addressing their needs and desires.
- Institutional development is the focus on the extension of democracy and collaborative participation among the different urban stakeholders, especially citizens.
- Economic development corresponds to the creation of a good business climate and the achievement of prosperity.

All these activities are undertaken by different actors participating in the *smartization* process within cities through a “collaborative leadership” (Foray et al., 2012), as a collective endeavour for efficient innovation systems, based on public-private partnership.

The participative design of smart projects has extended the triple helix model (Leydesdorff and Etzkowitz, 1998), based on the relations among university, industry, and government, with the inclusion of other actors. The additional element has been identified in users within the quadruple helix model (Arnkil et al., 2010), that analyses the urban context from the point of view of new user-oriented innovation strategies and it considers the fourth helix as a wide group bundling citizens, employees, residents, civil society associations, and different kind of users (ordinary, amateur, professional, lead, non-user).

A further evolution of this model has been developed through the so-called advanced triple helix model, focusing on smart cities performance (Lombardi et al., 2011) which adds three themes: the knowledge stock generated by the interplay between universities and industry, the collective learning mechanism taking place when universities help government in the development of public management solutions, and the market institutions which benefit from the innovation processes fostered by industry and government.

The last review of the helices model has conducted to the quintuple helix (Carayannis et al., 2012), composed by five different systems packing actors and resources, namely the education system, economic system, natural system, media-based and culture-based public, and political system.

One of the main challenges for smart cities is the combination of all the above delineated actors through the formation and management of partnership and alliances that may have to create a sustainable ecosystem (Lee et al., 2013). The exchange of knowledge among the different stakeholders of the ecosystem and the new technological, human and organizational capabilities, allow the location of firms in the urban context to offer new services, and maybe to foster emerging industries.

The creation, evaluation, and exchange of knowledge, can be used to produce economic benefits especially in terms of high-technology businesses and services, education, and research and development (Yigitcanlar, 2011). As stated by Laszlo and Laszlo (2002), aiming at the economic development, it is central to codify technical knowledge for the innovation of products and services, market knowledge for understanding changes in consumer choices, financial knowledge to measure the inputs and outputs of production and development processes, and human knowledge in the form of skills and creativity (Lever, 2002).

These different features of knowledge represent the result of the evolution of the first studies on knowledge assets which emphasized the firm's codified knowledge resulting from its internal research and development capacities, while nowadays it is accepted the major role of external sources of knowledge in the firms' capability to innovate (Vaz and Nijkamp, 2009). Then the creation and circulation of knowledge in urban ecosystems allow the creation of innovation among businesses in different ways (James et al., 2011): the existing enterprises can move into new business industries, while new entrepreneurial firms may emerge from both horizontal linkages (between firms) and vertical linkages (alliances between entities that operate at different levels in smart city).

The important role of knowledge in urban contexts is related to the theoretical evolution of smart cities concept, as cities with a high quality of life, thanks to the combination of so-called hardware and software components (ABB, 2012).

The essential idea of quality of life has been developed in connection with the concept of creative city (Florida, 2003), aiming to the improvement of knowledge economy through the so called 3Ts: technology, defined as a function of innovation and high

technology concentrations; talent, related to high educated people; and tolerance, linked to openness, inclusiveness and diversity to all ethnicities.

The consideration of knowledge as a stimulus to urban quality of life, as it emerged from creative cities, is similar to the implications that arise from the concept of knowledge city. It refers to an urban context involved in the attraction of talent and innovation for the creation of high value-added products using research, technology, and brainpower (Yigitcanlar et al., 2008).

The theorization of the buzz concept of being clever, creative or smart has been developed among different literati and summing up all the contributions, there are two main positions: the first one, elaborated by Lee et al. (2013), assimilate the concept of knowledge city to the idea of intelligent city, focused on the achievement of innovation and the nurturing of knowledge, and it considers both as components of a previous step towards the inclusive concept of smart city. However the other position has been taken on by Marsal-Llacuna et al. (2014) which separate the notion of intelligent city from the knowledge city, which is considered as a “bridging initiative” to the intelligent cities, or better known smart cities.

The analysis of the theoretical positions and the examination of different *smartization* processes taking place in many urban contexts have conduct to the awareness of the equivalence between the concepts of knowledge city and intelligent city, as they are both related to the central role of human and social capital in the knowledge economy (Lee et al., 2013). On the other hand, the idea of smart city has been developed in order to include a wide group of activities and actors involved in urban areas, looking at the increasing number of initiatives to be started for each *drivers* (energy and environment, transport, services to citizens, ICTs, participation and economic growth), so that this concept can be considered as a box where all the previous definitions are contained and integrated in a new wider idea.

3 Purpose and methodology

3.1 Purpose

The emergence of issues on smart cities projects and the wide interest they have risen from various big companies, have inducted us to analyse the attractive force exerted between these projects and business. We want to delineate the motivations that push firms

of different sectors in investing and localising their activities in such urban contexts involved in *smartization* processes. In particular, we want to identify the importance of knowledge as a feature in smart projects, even so its propelling role. So our first research question is:

RQ 1: Which is the role of knowledge in the development of smart projects? And how can we define it?

This first step of analysis has showed us a wide perspective that allows us to go deeper in our study, searching for the motivations that conduct firms to locate their activities in such urban contexts through our second research question:

RQ 2: Why are firms attracted to smart cities? And which are their implicit goals for the location of their activities in these urban contexts?

3.2 Methodology and data analysis

The methodological approach we have chosen in order to answer our research questions is qualitative, in particular we have conducted a case study analysis, because of the characteristics of our research (Yin, 2003): we have posed “how” and “why” questions, and the study is focused on a contemporary phenomenon within real-life context, such as smart cities projects.

In detail we have performed a multiple case analysis with the choice of three cases, according to the literary replication criteria (Royer and Zarlowski, 2001) when studying knowledge in contexts definable as similar (Davenport, 1997), in order to identify the knowledge management activities, the sustainability aims and both impacts and consequences for the social context. As it regards this last issue, we investigate people contributions and benefits, firms’ role and activities, and local agencies in different cases.

Our selection of the three cases has also been related to a different spatial dimension among them because “spatial dimension in analysis may yield different, and more meaningful, results, than an analysis which ignores it” (Bailey and Gatrell, 1995). So we analysed three different projects classified on the basis of their dimension as city (Malta), corridor (Manchester), and district (Barcelona). Furthermore this choice has been made by taking into account the features of the project leader involved in these projects, as we have a joint venture (Malta), a pool of local agencies (Manchester), and an in-house company public owned (Barcelona).

The empirical evidences have been investigated through the analysis of reports and official documents available on the project websites, and papers elaborated by the different stakeholders involved in the initiative.

4 Results

4.1 Malta

In 2007 in the industrial area of Ricasoli (360.000 m²), along the eastern coast of Malta's island, an ambitious project started aiming to build a smart city as a bridge among three continents, Europe, North Africa and Middle-East.

The project, called SmartCity Malta, is the result of a joint venture between Smart City (member of TECOM Investment – Dubai Holding) and the Government of Malta, which has given exclusive development rights to the company. SmartCity is a global network of self-sustained townships for knowledge-based industries, based on the model of Dubai Internet City, Dubai Media City and Dubai Knowledge Village.

The purpose of this smart city project is the transformation of “the country's economy to one powered first and foremost by knowledge” (SmartCity Malta, 2010), with the creation of an ICT and media cluster as destination for high-tech industries. This self-sustained industry township aims to offer infrastructures, environment and support systems for knowledge-based companies, and it is involved in the creation of offices, residential and retail spaces, with one-third of the land set aside as open areas.

All the completed or under construction structures are built according to the international sustainability standards, with a focus on the protection of the environment and the provision of a comfortable and healthy place for living and work.

The basic idea of SmartCity Malta is the creation of an attractive urban context, especially for knowledge-based enterprises, providing ICTs and social infrastructures, and media and production services. In details, the technological key amenities include a full digital telecommunications network with high-capacity undersea fibre-optic cables linking Malta to Europe, high-speed internet connections for all homes and businesses, communications infrastructure and consultancy services from global technology leaders (SmartCity Malta, 2011); on the other hand, the focal point on the media industry is linked to the provision of complete technical infrastructures for movies, television, music

production and tied fields, including comprehensive production and post-production facilities and support services.

The promotion of business opportunities is linked to a wide range of consultants, specialists and services that stimulate firms' investment in the area, helping the enterprises in the strategic choices and during their starting activities on the island.

At the end of 2010, the first development phase was concluded with the opening of the first building (SCM 01), made up of 12.000 m² of smart office spaces, specifically planned at achieving best results in terms of efficiency, sustainability and life cycle analysis: these works have included the construction of the service culvert and the installation of below ground services, as the backbone for the supply of power, telecommunication, irrigation water, drinkable water and other services. Among the firms setting up in Malta, two main companies, namely Cisco and Hewlett-Packard, have decided to establish their offices in SCM 01. Meanwhile the second phase of the project started from 2011 and will offer a comprehensive range of additional spaces, with the construction of other four buildings, in particular two blocks will create new space to be used for offices while some other will be reserved as exclusive retail space.

4.2 Manchester

The city of Manchester began its journey towards a wide concept of urban regeneration since the late 1980s, after a long period of industrial activities which left extensive brownfield areas and a high level of unemployment. The solution adopted to overcome these problems was a shift towards a service-oriented economy with a focus on culture, innovation, ICTs, and digital technologies as transversal features to sustain economic growth.

This phase was strictly related to a common phenomenon in UK, namely the urban cultural strategies, and was strengthened by the latest progress in the knowledge-intensive economy which is linked to an increasing attention on the so-called digital economy (Manchester Partnership, 2012). In fact in 2003 the Manchester Digital Development Agency (MDDA) was founded with the aim to develop and implement the city digital strategy, related to the enhancement of digital inclusion, industries and innovation.

The City Council, thanks to the involvement in different partnerships, from the Manchester Partnership to the Manchester City South Partnership, has developed different projects, labelled as smart for their linkages with ICTs, high quality of life and economic

growth (Manchester City South Partnership, 2009; Manchester Partnership, 2012): SHARP project, MediaCity UK, Apprenticeship and Skills Hub, Low Carbon Hub, Airport City Enterprise Zone, Civic Quarter Regeneration Framework, Manchester Living Lab, and the Corridor.

The last mentioned project, the Oxford Road Corridor Manchester, commonly known as Corridor Manchester, was created in March 2008 (Corridor Manchester, 2009), through a partnership among Manchester City Council (MCC), The University of Manchester, Manchester Metropolitan University (MMU) and the Central Manchester University Hospital NHS Foundation Trust. The partnership, situated in a 2,43 km² area along the central Oxford Road, has been created with the purpose of generating further economic growth and investment in the urban knowledge economy.

The Corridor is an area full of knowledge-intensive organizations and businesses, operating in different areas, namely health, education, creative industries, financial services, and ICTs. The vision of the partnership is to create an original, creative, and smart place, “where knowledge goes to work” (Manchester City Council, 2013) and the strategy to realise it is based on five themes: sense of place, transport, environment and infrastructure, research and innovation, and employment, business and skills.

The Corridor initiatives to support innovation are the results of the activities undertaken by different business incubators for start ups, new enterprises, and the development of new product and services, that are the Manchester Science Parks (msp), the MedTech Centre for medical technologies, and two universities entities, the University of Manchester Innovation Group (UMI3 – inspire, invent, innovate) and Innospace (MMU’s business incubator).

In particular the main projects focused on firms are the “Corridor Connections” and “myKnowledgeExchange”. The first brings together companies, researchers and innovators to develop cross-sector collaborations, enhance innovation in priority areas (e.g. low carbon economy, medical devices and future cities), and rise the Corridor profile as an innovation hub and a test bed for new technologies, product and services (Corridor Manchester, 2013). The other project, “myKnowledgeExchange”, or myKE for short, strengthens the facilities for a collaborative environment through a social networking website that provides online access to world-leading expertise, facilities and resources on Corridor Manchester (www.myke.biz).

4.3 Barcelona

The city of Barcelona started its urban regeneration in 2000, after the constitution of the in-house company public owned, namely 22 ARROBA BCN, S.A. (22@Barcelona). The purpose of this company is to develop and execute all types of urban-planning projects in the old industrial and productive areas of Poblenou, concerning the whole South-Eastern quadrant of the city (2,83 km²), with urban designation of 22@ or related to it, in order to substitute the traditional designation “22a” for industrial soil contexts.

The starting activities concerned the construction of new buildings, the deployment of public spaces and green areas, and the equipment of new technologies infrastructures, so that 22@Barcelona could start the path of the knowledge economy, in order to become an important hub of science, technology and culture, where the most innovative companies co-exist with research, training and tech transfer centre, as well as housing, facilities and green spaces.

The urban regeneration phase ended in 2004, when policies were put in place to promote economic activities, with a focus on the development of emerging sectors and the creation of five urban clusters within the district: media, ICTs, medical technology, energy, and design (added in 2008), with the corresponding main centres Barcelona Media Innovation Centre, Barcelona Digital Foundation, MedTech Technology Center, Catalan Energy Research Institute (IREC), and Barcelona Centre of Design (BCD).

These developments have allowed to recognize Barcelona as a smart city pioneer, leading innovation, sustainable and economic growth in order to create a “model knowledge space” (Barcelona City Council, 2010) that promotes collaboration and synergies among university, public administration and firms, and fosters the enhancement of a culture of talent and knowledge.

The presence of facilities and the collaborative environment have attracted different firms, especially the knowledge and technology intensive companies, that have decided to establish their activities in the 22@Barcelona. In fact the pace of economic regeneration, despite the economic panorama, has been positive: between 2000 and 2003, 489 companies moved into the district; from 2004 to 2006 there were 552 new incoming firms, and from 2007 to 2009, 461 new companies moved in (Barcelona City Council, 2010).

These positive results have been reached also thanks to the development of the initiative 22@PLUS business services, started in 2008, that supports the firms in the

studies of their possibility of moving into the district (Barcelona City Council, 2009), with the creation of a catalogue of services and value-added elements offered by the 22@Barcelona, namely technologies and knowledge infrastructures, business cooperation networks, cluster strategies, access to public and private funding, facilities and innovative spaces, access to talent, take-off platforms, and access to market.

Furthermore, in the same year, the innovation district launched the 22@Urban Lab, a project created with the aim to encourage business innovation and facilitate the use of public space as an urban laboratory to test new products and services, especially those that will help to improve people's quality of life and related to the different areas of urban development, mobility, ecology and ICTs (Barcelona City Council, 2013).

5 Discussion

The analysis of all three cases allows us to answer to our RQ1, stating the important role of knowledge in smart projects as a prerequisite for the success of sustainable urban development (Caragliu et al., 2011), and a driver for the increase and enhancement of the participation among urban actors (Paskaleva-Shapira and Barroca, 2012).

We have recognized that knowledge can be considered the engine of both a new economic development, as it happens in SmartCity Malta, and a transformation of an old industrial economy, as it emerged from the Corridor Manchester and 22@Barcellona.

In details the presented smart initiatives can be a context for the application of the dynamic model of knowledge-creating firms (Nonaka and Toyama, 2005) in urban contexts: they have the characteristics of an ecosystem in which the different stakeholders create knowledge through dynamic interactions among them and within the environment.

In this context of innovation, the focus on knowledge is based on relations, interactions and dynamics among the actors (Anggraeni et al., 2007), that can be related to a recent transformation of some cities governments in learning organisations for the formulation and implementation of smart city policies (Anttiroiko et al., 2013): in this way the main actors in urban contexts, such as public administrations, assure the knowledge mobility, namely the sharing, acquisition, and deployment (Dhanaraj and Parkhe, 2006) of knowledge within the ecosystem.

The selected smart projects have conducted us to the identification of their basic characteristics and a deeper analysis of the above mentioned *drivers*: in literature

knowledge is not mentioned among them, but we have recognized it is a prerequisite, referring to it as “local knowledge base” (Caragliu et al., 2011).

The knowledge as a pillar in smart projects is strictly related to the important role of ICTs so that we can be considered both as *cross drivers*, namely fundamental resources for the development of urban sustainable development, without them no initiative could be referred to as smart.

As it concerns our RQ2, the ecosystem of actors in smart projects includes firms and we can affirm that they are attracted in these particular urban contexts above all by the wide circulation and creation of knowledge. In fact this resource is considered as one of the most valuable assets of an enterprise that has to be managed efficiently and effectively in order to gain a competitive advantage in the knowledge economy (Ergazakis et al., 2006).

The location in smart contexts is also related to the importance of physical interactions in a physical space (von Krogh and Geilinger, 2014) which allows the sharing of knowledge in a circular holistic approach, and where the lead users cooperation with firms to create explicit knowledge, thanks to the contribution of their ideas towards the development of new products in a co-creation perspective (Schaffers et al., 2011).

In fact the interactions among the actors in the smart project ecosystem allow firms to create new knowledge by synthesizing their own intellectual capital with the knowledge embedded in the other players (Nonaka and Toyama, 2005), such as customers, suppliers, competitors, universities, or public entities (Leydesdorff and Etzkowitz, 1998; Arnkil et al., 2010; Lombardi et al., 2011; Carayannis et al., 2012).

Within smart projects, these new resources of knowledge become part of the knowledge flow circulation which aims to drive high-tech company start-ups and existing companies’ enhancement and competitiveness, nurture and attract talented people, intensify creativity, develop human capital and research excellence, facilitate the cross-fertilisation of ideas, and encourage the creation of innovative and competitive product and services (Ergazakis et al., 2006).

6 Conclusions

Our analysis of three smart projects has confirmed the necessity of companies to operate in an environment that fosters innovation and favours the acquisition and dissemination of knowledge as well as learning, in order to survive in the contemporary

context of knowledge economy (van Winden and van den Berg, 2004; von Krogh and Geilinger, 2014).

This environment has been delineated by literati as an ecosystem which interrelates various types of actors, namely firms, public agencies, citizens, university, and research institutions (Leydesdorff and Etzkowitz, 1998; Arnkil et al., 2010; Lombardi et al., 2011; Carayannis et al., 2012). These entities can be defined as “loosely coupled” players (Freeman, 1991) because they are linked with exchange relationships (coupled), but the absence of hierarchical controls preserves independence (loosely): so the resulting image is of ecosystem as an environment composed by loosely coupled players.

The smart projects aims to reach a better quality of life and sustainable development (Tanguay et al., 2010; Foray et al., 2012) are strictly related to the integration of different *drivers* in an operative model that allows every actors taking part in urban contexts to satisfy their requests.

The development of these initiatives is frequently based on investments in ICTs and knowledge (Yigitcanlar et al., 2008; Toppeta, 2010; Marsal-Llacuna et al., 2014) as elements that joint together are able to attract companies and talent people, enhance the educational system, create a more liveable urban context, stimulate citizens’ participation, and develop the commitment of public administrations in sustainable activities (economic, social and environmental).

In connection with these goals, we have focused our attention on the relationships among the circulation of knowledge, the development of new business activities, and the attractive role played by these smart projects on companies (Vaz and Nijkamp, 2009). The knowledge-based ecosystem is strictly related to new entrepreneurial initiatives that comes out of social and human capital and has the potential to foster emerging industries (Lee et al., 2013): the existing enterprises may move into new business industries, while new entrepreneurial firms may emerge from both horizontal linkages (between firms) or vertical linkages (alliances between entities that operate at different levels in smart projects).

Our study has been conducted through the case analysis of three empirical evidences, but the results are based on reports and official documents prepared only by the pivotal player and available on the official websites of the smart projects. Further research could be based on a deeper analysis among the different stakeholders involved in the projects, especially firms, in order to compare the motivations that we have underlined with the

actual benefits attained through the location of businesses within the ecosystem. Moreover the data for this advanced study could be collected through some interviews with the main actors, both the managers of companies and the public officials who are responsible of the smart projects.

Finally it could be interesting to widen the context of investigation in order to analyse the achieved results in economic, social and environmental sustainability within the ecosystem, with a comparison of the outcomes of firms located in both smart projects and normal contexts.

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The sustainability report in the the NPOs. An innovative model

Giovanni Bronzetti *, Graziella Sicoli, Maurizio Rija, Franco Ernesto Rubino, Paolo Tenuta, Eugenio Vite

Department of Business Science and Law
University of Calabria
Ponte P. Bucci 87036 Arcavacata Rende CS (Italy)

** Corresponding author*

Structured Abstract

The growing attention toward sustainability report pushed companies, private and public as well, to adopt instruments able to rate sustainability and environmental impact. Many tools can be used to evaluate social communication but the sustainability report is the most complete to explore, measure, understand and communicate the results under this aspect. Through the sustainability report is possible to supply a balanced vision of the sustainability performance of an organization and to understand all the positive and negative effects generated running the activity. To report the activity NPOs as well, has to disclose results and their connection with the surrounding community as social, environmental and economic impact. The voluntary disclosure of Triple Bottom Line information through proper tools, as the sustainability report, The sector vision of the environmental and social report, differently from the sustainability report, does not allow a complete disclosure on social and environmental activity carried on by the companies. Consequently is not fully represented the impact of these activities on the community. Nowadays NPOs use framework, which partially represent the sustainability activities. NPOs as well as for profit organizations have to introduce new reports keen to fill the information necessity of the stakeholders

Purpose – The research tries to build a NPOs' sustainability report able to disclose economic, environmental impact, through a set of relevant indicators

Design/methodology/approach –after a review of the existing literature, the research aims to build a sustainability report for NPOs through a set of economic, environmental and social indicators based on best international practice and in line GBS (Gruppo di studio per il Bilancio Sociale) principles and GRI (Global Reporting Initiative). Then the report will be applied to a voluntary service center (CSV) which contains, for its function and organization, in a wide range, all the environmental variables, social and economic, to be monitored in any NPOs

Originality/value – a new sustainability report for the Italian and European NPOs built on the above set of indicators shows the sustainability level reached by the two NPOs and their social impact on the surrounding community.

Practical implications -The findings appear to suggest an innovative model of sustainability report for NPOs with a significative set of indicators which offer a new disclosure of the activity carried on by the organization. Limit: the work is tested only on a limited number of NPOs which can be extended in the future. Then, as there are many entities similar to CSV around Europe, is necessary also to implement the model in other countries.

Keywords – No profit organizations, sustainability report, economic, social, environmental indicators

Paper type – Academic Research Paper

1 Introduction¹

A sustainable organization, whatever typology it has, is not only financially stable but minimizes its negative environmental impacts and act in accordance with social expectations. Everything in the knowledge to address the future generations with an attitude of greater responsibility for what has been produced in terms of not only economic but also ethical , environmental and social (Jonas , 1978).

The attention to sustainability aspects, led all organizations to determine their own sustainable development through the identification and reporting of what has been done in terms of environmental, social economic impacts.

The document through which organizations represent the impact that their actions have on the economic, social and environmental aspects is named sustainability . The creation of a report on the economic, environmental and social issues is a recurrent habit and is both due to pressure from interest groups and the benefits the company gets in terms of image and credibility. In addition, national and international governmental institutions ask, with force, companies to report their goals and the consequences of their behavior in terms of quality of life, environmental protection, respect for human beings (Paris , 2003).

While the social and environmental reports highlight the impacts of business management respectively on the social and ecosystem side, the sustainability report represents a synthesis of economic, social and environmental side. It allows to represent,

¹ For academic reasons Sections 1, 5.3, are to be attributed to Franco Rubino, Sections 5.1, 5.1.1, 5.3.1 are to be attributed to Giovanni Bronzetti, Sections 4, 5, 6, 9 are to be attributed to Maurizio Rija, Sections 3, 5.2, 5.2.1, 8 are to be attributed to Graziella Sicoli, Sections 2, 7, 10, 12 are to be attributed to Paolo Tenuta, and Sections 11, 11.1 are to be attributed to Eugenio Vite.

in a single document , several aspects by the company : financial, economic , social and environmental . For this reason, it is called triple bottom line reporting type .

The approach obtained, from the budget and from the social environment, does not allow a cross-comparison with the social consequences of environmental policy, which, instead, occurs in the construction of the sustainability report (Vaccari, 2005).

The Sustainability Report is a tool for reporting , planning and control strategy that allows the assessment of an organization according to the logic of economic efficiency , environmental protection and social protection . The usefulness of this type of instrument is linked to :

- the improvement of the government processes that allows the management of the conflict between the three variables: social, economic and environmental;
- • the improvement of the processes of integration of sector policies ;
- • analysis of conflict elements between environmental, social and economic conditions and the description of the equilibrium point reached ;
- • Increased transparency of the accountability and higher involvement of stakeholders and internal staff.
- The policies are perceived only to the extent that it is able to measure them and represent them.
- The majority of large companies reporting sustainability as an accountability tool. This does not happen in the third sector, despite the sustainability represents the main element for NPOs to be reported to its stakeholders . For this reason, this paper aims to fill the gap represented by the absence of a report widely recognized capable of representing the sustainability of NPOs.

2 Literature review

The main feature of sustainable development is its multidisciplinary approach. The Lisbon Strategy, benchmark of the European Union political commitment for economic and social renewal, promotes sustainable development in order to examine decision-making processes , the economic, social and environmental initiatives (triple bottom approach) .

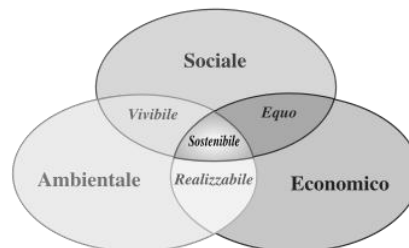
Sustainability and sustainable development are current topics and the subjects of recent scientific researches.

The studies on sustainability and sustainable development have a double purpose: to limit the misuse of the term and seek effective sustainability indicators.

They implied the need to protect and safeguard of human resources, to achieve a better quality of life, the spread of greater prosperity, achieving a level of use and environmental conservation is not harmful to humans and other species and where possible a more equitable access to resources.

We talk about sustainable development when it creates situations of substantial balance between the three spheres social , economic and environmental , or if you prefer, whether it is valid the so-called rule of the balance of the three "E" : ecology , equity, economy.

Table 1: - The three aspects of sustainable development



Fonte: Johann Drèo.

This definition is absolutely antropocentric, as the core question is the ecosystem, and so not only all creatures survival but especially of human beings.

It is evident in this definition the introduction of the ethical principle of equity, it is understood in the sense intergenerational (diachronic approach) that infragenerazionale (synchronic approach) (Valeri , 2004). In other words, if up to a certain point ethics was related only to the relationship between contemporary, from a certain point you start to reflect on behaviors that one generation should have in relation to another one.

A subsequent definition of sustainable development, which instead include a more global view, was provided in 1991 by the World Conservation Union, UN Environment Programme and World Wide Fund for Nature , which identifies it as " *an improvement in the quality of life without exceeding the carrying capacity of supporting ecosystems , from which it depends.*" Loading capacity refers to the ability that a natural ecosystem has to produce, in a stable manner, the resources necessary for the species that live within it, without any risk to their survival.

In the same year the economist Hermann Daly gave a further vision of sustainability. Sustainable is a development that meets three conditions:

1. The consumption of renewable resources does not exceed its rate of regeneration;
2. Consumption of non-renewable resources is offset by the production of an equal amount of renewable resources that, in a long term, is able to replace them ;
3. The introduction of pollutants into the environment does not exceed the absorption capacity of the natural receptors.

The International Council for Local Environmental Initiatives in 1994 identified a further definition of sustainable development: "*development that offers environmental, social and economic services to all members of a community without threatening the viability of the natural systems on which depends on the provision of such services.*" The three of economic , social and environmental dimensions are closely related and each planning intervention must consider the mutual interrelationships. ICLEI ,in fact, defines sustainable development as the development that provides ecological, social and economic opportunities to all residents of a community without creating a threat to the vitality of the natural system , urban and social from which these opportunities depend.

UNESCO has expanded in 2001 the concept of sustainable development stating that "*cultural diversity is as necessary for humankind as biodiversity is for nature (...) cultural diversity is one of the roots of development, understood not only as economic growth , but also as a means to lead a life more satisfactory intellectual , emotional , moral and spiritual "* (Art 1 and 3, Universal Declaration on Cultural Diversity , UNESCO, 2001). In this vision, cultural diversity becomes the fourth pillar of sustainable development , alongside the traditional balance of the three E.

It is clear that the definitions and concepts involved in the study of sustainable development are various, but we can summarize them, basing on the approach provided by Agenda 21 in four dimensions:

1. *Environmental sustainability*, understood as the ability to maintain over time the quality and reproducibility of natural resources, to preserve biological diversity and to ensure the integrity of ecosystems. It involves the minimization of impacts on ecosystems that result in a progressive reduction of the natural heritage and the acceptability of the risks to human health;
2. *Economic sustainability* , understood as the ability to generate a sustainable income and employment and ensure a rational use of available resources. Economic efficiency

can be seen as the prerequisite for environmental sustainability are unsustainable actions involving an economic waste. The assessment of environmental sustainability can not ignore the economic evaluation, indeed, it must logically precede any environmental impact assessment, because, if the action is not economically efficient should be automatically considered environmentally unsustainable.

3. Social sustainability, understood as the ability to ensure equity in access to goods and welfare condition;

4. Institutional sustainability, understood as the ability to ensure conditions of stability, democracy, participation, information, education and justice.

In other words, sustainable development is based on an efficient integration between non-degraded natural ecosystems, advanced technologies and social systems and cultural aware and responsible (Rapisarda, 2005).

It is essential, in this context, being able to represent their sustainable path. For several years there has been widespread awareness of the impossibility of traditional economic reporting systems to represent the full complexity that characterizes all organizations (Lev, 2001; Andriessen & Tiessen, 2001; Pike et al., 2001). The informative limit of economic documents is highlighted by the impossibility to support the opinion of the stakeholders on the set of performance achieved by the company (Elkington, 1997; Kaptein & Wempe, 2002). The Enron and Parmalat cases have accelerated a process in place for several decades in which the information contained in the compulsory accounting documents have lost relevance (Collins, 2001; Francis et al., 2002; Klein & Marquardt, 2006; Lev & Zarowin, 1997); this stimulated the request for additional information (Wasley & Shuang Wu, 2006).

The compulsory accounting documents are inadequate to the information request of the stakeholders. These do not require only information related to the economic sphere. Therefore, the focus of the financial report on economic performance limits the ability to answer the existing need of information. The consequence is that the stakeholder finds an inadequate report and the management a not very good tool for the development of performance in a broad sense, i.e., according with the principles of a sustainable growth. The need to observe simultaneously the effects of any transaction on the company's performance, according with the stakeholder view, pushed manager to extend the scope of observation toward the triple bottom line (Elkington, 1997; Clarkson, 1995; Davenport, 2000). Only monitoring their performance in the extended sense allows to measure and

manage the company's sustainability (Funk , 2003; Kiernan , 2001; Wheeler, Colbert & Freeman, 2003).

The financial statements do not offer a comprehensive view of performance achieved by the company, and is therefore considered insufficient as a tool to guide business decisions (Jensen , 2001; Reynolds, Schultz & Hekman , 2006; Winn, 2001).

The expansion of corporate responsibility and the advent of the stakeholder view, has raised the urgent need to have systems for measuring and evaluating the ability of companies to balance the interests of different stakeholders. This need has led to the need for information by both the management, engaged in the development and pursuit of a social strategy of the company, both of stakeholders interested in understanding the efforts and results of the company regarding compliance of own expectations and , more generally, to the responsibility strategy pursued . This has encouraged the creation of complementary reporting systems to the financial statements, useful to express an opinion on the balance achieved in the triple bottom line (Bennett, Klinkers & James , 1999). They took source documents reporting that, at first , they saw a separation between environmental and social performance in the field , leading to the creation of two separate documents : environmental and social reports . Subsequently there has been a convergence of the two documents into a single report and looking for a single view of economic, environmental and social perspective achieved by the Triple Bottom Line (Higgins , 2002). Soon, arrived sustainability reports, especially adopted in the large for-profit companies in order to report results to stakeholders, aimed to report the joined impacts carried out by the organization (Pedrini, 2007). The Sustainability report although widespread in all sectors, remains poorly used by NPOs even if very important in these dimension of activity.

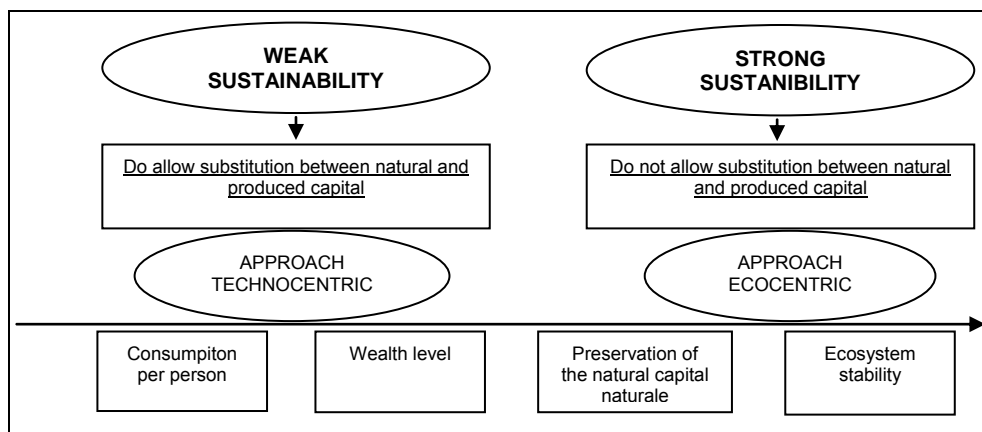
3 Sustainable development measure and assessment

About sustainability is necessary to distinguish between strong economic sustainability from weak economic sustainability. The first one needs to adopt direct measure to avoid environmental irreversible damages; according with this theory there is a strong economic development when to the growth of the capital produced by human (C) is joined a natural capital (N) not lower than the one inherited. Sustainability condition is: $\text{Var}(C) \geq 0 \cap \text{Var}(N) \geq 0$. Weak sustainability, instead, predict that will be future generation to face the environmental deriving from the action of the actual one.

Practically a sustainable growth is got when the wealthness growth so much to balance the diminution of natural wealthness caused by human activity. Weak sustainability is: $\text{Var}(C+N) \geq 0$, with C always positive (>0) instead N may assume also negative values, which consequences may be accepted thanks to C values which generate correctives able to maintain favorable life condition for human (Rapisarda, 2005).

Comparing these two types of sustainability shows that the weak sustainability assumes complementarily between the two types of capital , human and natural, thanks to the use of technology, while the strong sustainability assumes the non-substitutability of capital because it considers the natural capital is not reproducible (so-called critical natural capital) (Tenuta, 2009). In fact, neither the strong nor the weak sustainability may transcend the need for technological innovation and the knowledge of the mechanisms of the ecosphere . Only through innovative technological solutions can replace natural resources and raw materials , such as the use of alternative energy.

However, the question remains as to the degree of risk appetite on the part of both strong and weak sustainability of these types of sustainability : the first one is inclined to the conservation of the natural heritage , and the second to accelerate economic development despite the potential for impacts to global level.



Source: Rapisarda C., Per uno sviluppo durevole e sostenibile, Network Sviluppo Sostenibile, 2005.

Figure 2: - Sustainability classification

The instruments able to measure, monitor and represent sustainability over time and space can be economic, social and environmental (Boggia , 2007). They, in order to

support the various governmental bodies in taking decisions, are used to represent concisely the phenomenon under investigation that is very complex (Tenuta , 2009).

In the present case only a correct integration among economic, social and environmental indexes permits an evaluation of the sustainability.

The use of indicators, in fact, has an informative and evaluative function. In the first case, the indicators allow to monitor a phenomenon in order to be able to study its evolution and, based on this, define the planning choices to approaches management models easily sustainable. In the second case, they may help to simplify the results communication to the stakeholders.

From elaboration of indicators is possible to get the formulation of indices that make up the representation of a phenomenon (Berrini et al, 2000 .) The creation of parametric models is based on econometric estimation procedures. However, despite the importance of indicators is recognized globally, there are still some factors that interfere with their effectiveness. Among them within the guidelines used in their selection, the definition of significant target reference, the relationship between indicators and territorial context, environmental, cultural , in which the activity takes place subject to evaluation and , finally , how to collection and selection of data.

The selection and effectiveness of sustainability indicators is based on several factors established by the International Institute for Sustainable Development (IISD), which can be summarized in the following figure .

Table 3: - Characteristic of sustainability indicators

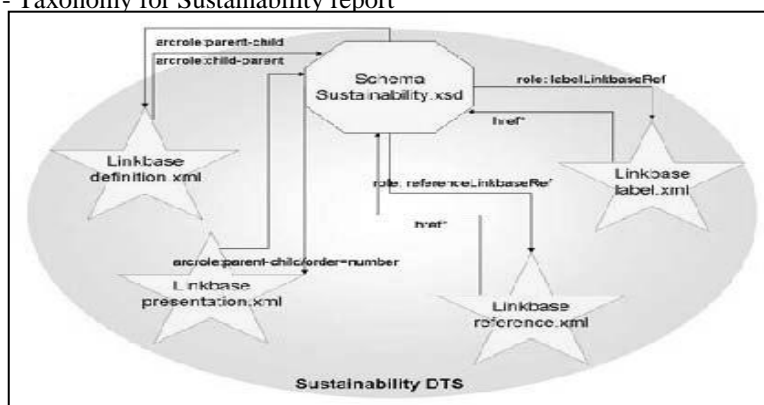
Significance	Indicators should allow to monitor the process of sustainable development and the achievement of target.
Relevance for what examined	Indicators should be relevant in the referred context .
Scientific strongness	Indicators should be based on <i>standard</i> by scientific community and should be comparable with other external information.
Misurability and convenience	Indicatori should be based on information easily reachable and accessible.
Understanding	Indicators should be easy, clear, to be understood also from not skilled people.
Sensitivity	Indicators should be adaptable to the change of the external environment in order to be sensitive at the time change.
Consistency	Should be consistent with the other indicators are part of the specific set.
Sinthesys	Must be able to synthesize in a numerical value a great number of information which refer to a complex phenomenon.
Reliability	Indicators should lead to similar results compared to other measuring instruments in respect of a given phenomenon.

Disaggregability	The indicators must be able to be broken down for the analysis of territory, in order to highlight any differences exist.
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Source: Adapted from *International Institute for Sustainable Development (IISD)*

Despite the contribution made by the Canadian Institute two important issues are still open. The first concerns the complexity existing in the definition of targets, thresholds or reference levels needed for sustainability. The second question refers to the dynamic nature of the territory in which it operates and to the continuous change of the strategies chosen by the governments on sustainability (Stevens, 2008).

Table 4: - Taxonomy for Sustainability report



Fonte: www.e-envi2009.org/presentations/S1/Gomez.pdf

In the part relating to the linkbase *presentation* there are the methods of presentation, or the classifications of the document proposed by the GRI. In what concerns the label linkbase is assigned to each item included in the document one or more descriptive labels, the so-called label in one or more languages; these make available the same document in different languages depending on the needs of potential users of the report. Finally, the part that is the reference linkbase allows you to associate each item defined in the taxonomy scheme, normative references and external documentation which govern concepts.

4 Stakeholders' role in the sustainability representation

The environment where companies operate is organized into group of people, called stakeholders, who interact with the company as they have a legitimate interest in the activities carried on. They fix economic, social and political-institutional relationship with the company (Paris , 2003).

Company and stakeholders influence each other. In fact, stakeholders are social partners involved and may affect the company in determining its objectives; at the same time they are the beneficiary of the acts of the company as affected by economic, financial, technological, social and cultural activities put in place (Cisi , 2003).

The new objectives of environmental protection, quality of products and services offered, safety in workplace, protection of ethical and social values, are the main elements that organizations need to follow to move from a corporate profit vision to turn in a vision in which companies must integrate different stakeholders' groups needs. The documents of economic-financial nature are no longer able to meet the information needed from the actors of the environment in which companies live and work.

The need to represent the stakeholders the economic, social and environmental issues has pushed organizations to adopt control systems of their activities aimed at assessing the sustainability and environmental impact. From Agenda 21 , which placed sustainable development as a prospect to be pursued by all the world and identified actions, actors and instruments to implement the proposals in the Conference , and in particular "*... recognizes that work towards the sustainable development is the main responsibility of governments and requires strategies, policies, plans at the national level ...* ". It is from these assumptions, which later grew topics such as integrated strategic planning, consultation, community participation in decision-making, research and testing of appropriate operational tools, the solution of which are working for decades, with numerous difficulties, national and international communities at different levels. Along with these actions, there are a number of tools legally " binding ", delineated by specific EU and national directives, whose application is of great importance in the planning and design, in particular for large works. This is the Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA), instrument ratified by a special EU Directive and adopted in Italy since years.

To reduce the impact of production processes and encourage market choices in favor of products environmentally friendly, the European Commission has long recognized a

system of certification of products and processes to business: the main ones are EMAS, ISO 9000 and ISO 14001. They are voluntary instruments aimed at improving the environmental performance of products and services. In this context, is proposed the definition of "sustainable" as "the ability of an organization or activity, to maintain and develop their performance in the long run " through a balance between economic-financial and environmental interests.

5 Tools to assess and communicate sustainability

In recently, the complexity of the organizations and a large number of internal and external stakeholders, have made the economic-financial documents insufficient to represent all aspects with which they must deal. Traditional control systems are no longer able to represent the effects of management activities generates in the community and in relation to the reference ecosystem (Terzani, 1984).

In relation to the different realities and managerial needs, is possible to use different reporting tools. In particular, the preparation of documents ranging from ad hoc documents, in order to measure separately the social and environmental dimension (as in the case of environmental reports and social budgets), to the editing of a single document that contains, in an integrated manner, these variables (sustainability report) .

However, regardless of the type of reporting document adopted is possible to identify very relevant common features, namely the voluntary, the free structure, data representation, the monetary and non-monetary data representation (Mio, 2005). In particular, concerning the first characteristic, are documents whose preparation is not mandatory, but discretionary for the company. As regards, the social and environmental certifications, these provide accurate reporting obligations to the outside but also specific duties for their maintenance over time. However, their achievement is a voluntary action, as the information supplied in the documents displayed to stakeholders is discretionary.

Regarding the free structure, the possibility that each organization has to choose the form and the information to be included in the social or environmental document, causes multiple models of environmental and social reporting: it goes, in fact, from very concise documents (environmental report) to very detailed documents (GRI) .

With reference to the third characteristic, in the absence of mandatory requirements, it is possible to make a distinction between descriptive reports and reports containing physico-technical and economic information. It is these types of reports that take a lot of

social and environmental importance, because in them are represented, in monetary terms, environmental and social costs, investments and liabilities. The presence of quantitative-monetary information constitutes the evidence of the level of maturity reached by the management in assessing its impacts on society and on the natural ecosystem (Chirieleison , 2002; Rubino, 2004).

5.1 Environmental performance communication

The use of natural resources, caused by the various processes of industrialization that occurred during the last decades, has ignited a strong debate about environmental issues and the protection of non-renewable resources. Moreover, the effects, sometimes devastating , of human action on the ecosystem (such as rising temperatures caused by the emission of greenhouse gases) have helped to increase public awareness towards environmental risk . The result of this is an increased demand for information supplied from firms, which have had to adopt tools to give an account of the environmental dimension related to the performance of their business. Obviously, these issues require the involvement of all the developed countries, on the understanding that the current ecological crisis requires that companies also assess the pressure exerted on the ecosystem to support the new wealth for the benefit of society (added value) (Courteau , 2008; Mazzola , 2002; Bertini , 1990).

In essence, in pursuing its objectives, every organization has to comply with environmental standards the environment can not be considered only as a container of resources but a real factor of production, an essential element of company's life (Campedelli , 1998).

The need to assess on a global, national and local impacts on the natural ecosystem has led to the development of environmental reporting tools designed to control the positive and negative externalities of production activities. The environmental dimension of the company, its measurement, assessment and control do not emerge from traditional systems of analysis. Hence the need to integrate traditional reporting tools, with others in order to verify the environment variable.

Within organizations, there has been, over time, an increasing expansion of the tools available to consider the environmental variable, so is possible to say that we are witnessing the transition from a purely reactive approach, in which the organizations are

involved in environmental issues as a result of the law imposition, to an attitude of anticipation and proactive.

The results achieved by the organization and the ways in which we come to them must be adequately communicated so that stakeholders can assess the behavior adopted by the company in relation to the objectives achieved. In order to allow clear communication of objectives in different areas (social, environmental, ethical) were born a number of certifications on the management of the company; in the environmental reporting and communication tool used is the environmental report which is drawn through a set of methodologies (environmental accounting) with the aim of identifying, organizing and communicating data on the impact of the activities on the environment.

5.1.1 Enviornmental report

Negative influences on the territory, climate, human health, landscape, have always been considered secondary and marginal elements in corporate decisions. The representation of the environmental dimension is only possible through the integration of traditional instruments with an informational tool designed to assess the environmental variable in the final report. From this point of view, the environmental budget is set up as an accounting tool capable of representing the relationships between the organization and the environment. The environmental report derives its name from the equality of purpose that it has against the traditional budget in financial terms. Both instruments refer, infact, to the results obtained by the organization, over a period of time, obviously on different areas of management (Cisi , 2003).

The Environmental Report is a tool of "control" volunteer available to any organization, for profit or not, with main aim to develop a deeper understanding of environmental issues related to their management activities.

It is in the social matrix that finds its environmental balance, another important sign of the "will " to arrive at the establishment of a truly integrated information system that, as such, enables an overall evaluation "global" organization. Already in financial statements must be adequate environmental information collection, since it is here that all the content found immediate expression of the organization and, therefore, also environmental ones.

Environmental accounting was born from the need to further measure the impact of corporate decisions on the environment compared to the information supplied from the

traditional accounting tools. The existence of environmental accounting allows to assess the environmental impact of economic policies, economic development and costs paid in terms of pollution, expenses for the restoration and compensation .

The ultimate goal of environmental accounting is the construction of the environmental report as an instrument of juncture between the external environment and the organization.

From the environmental report is possible to infer the data of physical and monetary type; it describes the main relations between the organization and the environment in which are contained following indicators:

- Environmental management, which are used to assess the control activities carried out by the organization on environmental issues;
- Environmental absolute, they measure the impact factors created by the organization;
- Environmental performance, which measure the environmental efficiency;
- Potential effect, they assess effects that the activity of the company may have on the environment;
- Effect of environment, which assess the effects of the business activities on the environment generates .

Through the environmental balance will provide all stakeholders with the information necessary to understand the actions taken, the resources used and the results obtained from the organization in carrying out its activities. Those most interested in such information are:

- Customers and consumers, who verify the characteristics of eco-friendly products ;
- Workers, interested to know risks associated with its activities ;
- Environmental groups, who pay attention to the environmental consequences of each choice of the organization;
- Financial institutions and shareholders, interested in monitoring the possible causes of environmental risks;
- Local communities, who watch over the possible negative consequences of external diseconomies caused by the processes of production ;
- Government control, who are concerned with the characteristics and effects of environmental management systems adopted by organizations ;

- Suppliers, business partners , etc. . who pay attention to the possible causes of limitation in the reliability of the organization;

- Associations that oversee environmental protection on a sector basis .

The formation of the environmental report is divided into three phases:

- The first stage involves the collection of data that are subsequently the subject of observation. At the same time it provides for the classification of the data according to the objectives pursued;

- In the second phase, the collected data must be processed in order to transfer them to the environmental balance;

- In the third phase shall exchange data and information processed.

Through the environmental balance are provided to stakeholders a range of information in the environmental field in terms of: actions for environmental protection; resources deployed; expected results (Cisi , 2003).

In modern business management, the role acquired from the environment, is necessarily linked to the realization that the indiscriminate exploitation of natural resources can bring the system to the crisis of unsustainability. The company that does not take into account in its processes of the environment transfer, according to a " process of outsourcing ," its cost to the community. It is important to emphasize that, despite being a tool of "voluntary" nature, the benefits arising from the preparation of the environmental report are very important both on the management plan and image in relations with stakeholders. However, as all the documents of a voluntary nature there is not a unique schema or generally accepted methodology that make budgets homogeneous and comparable, but there is an ample discretion.

5.2 Social performance report

In a global economic environment, highly competitive and uncertain, many organizations choose to disclose to the community the impact generated by their work on the society and environment. All this is linked to the awareness that taking an ethically responsible mind is an essential source of competitive advantage. In fact, to be attentive to the social means to improve the impact caused by the conduct of the business, having regard to cure the economic, security and transparency. In doing so, the orientation put in place by the company becomes an added value that must be adequately disclosed to third parties.

The most widely used tool for reporting the contribution on the amount and quality of relations between the organization and its stakeholders is the social report. To understand the meaning of social report is useful to clarify the term. The noun report is sometimes misleading because it draws more budget, the traditional one, which shows in the classic balance sheet and income statement, assets and liabilities, income and expenses, which come from a system of a book- fixed. The social report, instead, derive from operations outside the traditional accounting schemes; is an account of the social and ethical behavior of a specific activity, with the aim of declaring the results intended and achieved, corroborated by the testimonies of the major stakeholders (Corrocher, 2005; Zamagni, 2003).

The adjective social highlights the company's focus on those who gravitate around it and as a result are influenced by the positive or negative effects of the activity performed.

In view of the foregoing, the social balance is defined as a statement of the behaviors activated and the results achieved; it represents an integration of social and ethical representation of the financial and economic financial statements (Vermiglio, 2000).

5.2.1 Social report

The social report is a tool through which an organization communicates, in a comprehensible and verifiable manner, the ways in which it operates as well as the usefulness of the activity carried out on behalf of the community. In other words, the social report is intended to provide transparent reporting of what the company has done to responsibly fulfill its commitments (Matacena, 1984).

The interest in a social accounting arisen in the various Member unevenly and to meet different needs, but all related to the need to regain the confidence of the public, customers, citizenship and savers. All this is possible thanks to accurate and transparent with regard to these subjects, more or less strangers to business management, involved in the work done by the company.

In medium/long term, in fact, have to pay attention to all those who, by their actions or reactions, can affect the economic balance of the company. For example savers who want to continue to invest in the same company, to customers who make their own choices guided by various considerations, to personnel working more or less depending on the enthusiasm and motivation that it depends on the business climate, the more

general community of reference that can take hostile attitudes in the face of behavior inattentive to the needs of all.

It is the awareness that these issues cannot be overlooked that begins to manifest itself in different situations the need to have a tool to raise awareness among various stakeholders, the impact of the activity performed. In the United States during 60s, in the wake of the movements of consumers and environmentalists, there are examples of statements which serve to highlight the behavior of socially valuable companies in order to stem, in public opinion, the impact caused by these movements themselves (Sacconi , 2005). This attitude has subsequently spread to England, France and other countries with more developed economies.

You have to wait until 90s to have a general interest on the subject that pushes the doctrine to question the form and characteristics that the social budget must have. In Italy, the first attempts at preparing the social report concerns, for example, the State Railways , the Italian Post Office , Unicredit , Telecom Group; these understood the importance of this tool (Corrocher , 2005) .

The social report is a voluntary document that can measure the results and decisions of the organization in terms of social impact on people and on environment in general.

The social reclassified, designed in 1990 by the European Institute of Social Report (IBS), is divided into three basic sections (Bianchi et al, 2001):

- Corporate identity, which identifies the values guide to direct the strategic plan and therefore the policies and choices of action;
- The cash flow statement (production and distribution of value), which indicates the economic resources produced and their distribution in the territorial context;
- The relationship of social exchange, to represent direct interactions with key stakeholders (human resources, customers and suppliers, shareholders and lenders, and state institutions, community and the environment) .

The multiplicity of approaches and the fact that it is a voluntary document have not allowed, to date, to arrive at a generally accepted model of social report. However, in the national context the reference model is the one developed from the committee for Social Reporting (GBS). This represents, at a national level, the main reference for the preparation of the report for all social organizations that voluntarily decided to give an account of their work assuming social responsibility as a point of reference in the definition of business strategy.

Apply this instrument means to assess the environmental and socio-economic performance of an organization, not only from a qualitative, but also quantitative point of view (Beda et al , 2004).

Furthermore, since the preparation of the budget comes from social voluntary action by companies, it follows that the choice of contents and structure of the arguments are quite free; this consequently cause, the final form of the product and its substance. However, there are some limits to the spread of social report, especially in the complexity of the instrument, the lack of standardization and uncertainty of results. Many organizations have produced papers aimed to normalize the phenomenon as summarized in the following table. This led to the production of different documents and, accordingly, in order to facilitate the preparation and the comparison of the results in terms of space and time, arisen the problem of standardization of this phenomenon.

Table 5: - Entities and issued documents

ORGANISM	DOCUMENT
ISEA	AA1000
GRI	Sustainability reporting guidelines
CEPAA	SA8000
CSR Europe	Voluntary guidelines for action
GBS	Social report accounting standards
SEAN/KPMG	ABI/IBS
Group Q-RES	Project Q-RES
Ministero del lavoro e delle politiche sociali/Università Bocconi	Document CSR-RC

Source: Rusconi G., Dorigatti M., Teoria generale del bilancio sociale e applicazioni pratiche, FrancoAngeli, 2004.

In particular, the Institute of Social and Ethical Accountability (ISEA) is an international professional association founded in 1996, committed to develop a culture of social responsibility and ethical behavior in business and nonprofit organizations. In November 1999, he conceived the AA1000 process standard. The Global Reporting Initiative (GRI) was born in 1997 to a meeting organized by CERES (Coalition for Environmentally Responsible Economies) in partnership with UNEP (United Nations Environmental Programme), has promoted the Sustainability Reporting Guidelines on Economic, Environmental and Social Performance. The Council for Economic Priorities Accreditation Agency (CEPAA) is a company accreditation for ethical certification

which is an emanation of the Council of Economic Priorities (CEP), the U.S. institution founded in 1969 to provide investors and consumers with information tools able to analyze the social performance of companies. In 1997 it adopted the SA8000 standard which covers seven reporting areas: child labor, health and safety, freedom of association and union representation, discrimination (racial or sexual) , disciplinary practices, (corporal and psychological punishment , insults), working time (overtime forced, working holiday) and minimum wages. So it is a standard international certification which covers, in particular, respect for human rights and workers' protection against the exploitation of children and guarantees of safety and health in the workplace. Excludes, therefore , the environmental and economic aspects of management.

The SEAN / KPMG has focused, instead, the formulation of an industry standard for banks.

The Res - Q group is a working group formed at the initiative of CELE (Centre for Ethics Law & Economics) with the aim to propose a model of management of the company by establishing a standard of ethical and social responsibility of companies.

The Ministry of Labour and Social Affairs, in collaboration with Bocconi University, has established a working group for the preparation of a standard of social performance indicators contained in the document CSR-SC .

Not all of these documents concern the social report; in fact, is necessary to distinguish between content and process standards where the first aim to normalize the management cycle in order to make it economically and socially responsible (AA1000 documents and RES - Q) while the latter directly detect and normalize the actual contents of social document (GRI documents , GBS and Guidelines of CSR Europe) (Rusconi et al 2004) .

The document SA8000 is, instead, one international certification standards of content whose reference scope is limited only to human resources and not to the company as a whole.

In Italy, several models have been proposed capital budget that can be traced to two approaches; as mentioned above, one is oriented to stakeholders (typical of cooperatives) while the other is prepared according to the reclassification procedure.

5.3 Sustainability measurement and representation

A socially responsible organization is sustainable that means to pursue a development jointly social, economic and environmental.

The growing attention to sustainability and the need to account it to the stakeholders has led to the development of models to measure and report it, through the use of a set of economic, environmental and social measures that assess the impacts produced by the company in an integrated way. The sustainability report is a document that illustrates the impacts that the activity generates on the economic, social and environmental side.

While the budget measure the social and environmental effects of the social and environmental policies carried out by the company, the sustainability report is a tool for reporting, strategic planning and control in order to assess an organization according to the logic of economic efficiency, social and environmental protection.

Sustainability reporting is not only a tool for reporting but it is also a tool for strategic planning and control that enables you to evaluate an organization according to the logic of economic efficiency, environmental protection and social (Tenuta , 2009). It allows improving the processes of governance of the company as it enables the management of the conflict between the variables of social, environmental and economic issues and, at the same time ensures greater transparency in reporting, which translates into greater stakeholder satisfaction.

5.3.1 A standard sustainability communication: Global Reporting Initiative (GRI)

The need to achieve a common standard of sustainability reporting has led to the use of the Sustainability Reporting Guidelines on Economic, Environmental and Social Performance, developed by the Global Reporting Initiative.

The sustainability report, which is based on the GRI Framework, aims to highlight the results and effects with respect to commitments, strategies and methods of management of the organization. It can be used to make benchmark comparisons, than provided by law or voluntary initiatives, both to demonstrate how the company influences and is influenced by expectations about sustainable development, and to compare its performance across the time or respect with different companies.

The GRI Framework is the model of reference for reporting on economic, environmental, and social organization, regardless of size, sector of activity or country of

origin. In order to facilitate the application of this model have been developed guidelines that represent the main international reference for the preparation of sustainability reports.

The Sustainability Reporting Guidelines are applied in any company, public or private, profit or non-profit, large or small. However, there is the awareness that it is not possible to adopt the same model for all. We have tried, as well, to meet the needs of customization through the provision of a number of the documents that integrate the relevance of the guidelines. These documents are (Campedelli, 2005; Mulazzani, 2000):

- The sector supplements, or additions to the guidelines referring to organizations operating in particular sectors (automotive, financial services, tour operations , telecommunications , minimum and metals , public agency) ;
- The technical protocols that relate to specific indicators proposed by the GRI and have the function of supporting procedures and formulas relating to the latter (child labor, energy , water , boundaries and health & safety) ;
- The issue guidance documents, which relates to issues and insights about the diversity, productivity, and so on.

The GRI sets forth the principles that organizations must follow in the process of preparation of the sustainability report. In order to improve and facilitate the understanding of the framework, we proceed to an articulation of the principles in two groups namely the principles of definition of the content and principles of the quality of the report.

The definition of the report's content states that the social information must comply with the principle of materiality, completeness, transparency, inclusiveness of the stakeholders and the context of sustainability.

On the basis of the first principle, the information contained in the report must refer to the topics and indicators that reflect the significant impacts (from the point of view of social, environmental and economic), or that may influence the assessments and decisions of stakeholders in a major way. Therefore, the report should be entered only the information reasonably important in reflecting the social, environmental and economic aspects of the company that may influence the decisions of stakeholders. Materiality is the threshold beyond which a topic or indicator becomes sufficiently important to be included in the report; to determine whether information is relevant must combine external and internal factors, as company's mission or the influence of the same entity on the upstream (supply chain) and downstream (customers). The impacts, however, are

considered significant if they are of concern to the community of experts or those identified using established tools . The second principle implies the open explanation of the procedures adopted in the process of reporting, while the third is based on the systematic consultation of stakeholders in the process of reporting and accountability of economic, social and environmental. In essence, the company must identify its stakeholders and highlight, in the report, the modes by which it met their expectations. The involvement of these parties increases the responsibility for them and mutual trust, strengthening, thus , the credibility of the report. The context of the principle of sustainability is based on the belief that corporate performance has a significant impact on the distribution of value (economic, environmental and social) at all levels (local, regional and global). Since here the necessity to place its performance in a social and environmental context. Finally, the principle of completeness in the quality of the information contained in the report of sustainability requires the inclusion of detailed and consistent with the company's operational boundaries and temporal areas of the report. In practice, the contents of the report should be sufficient to reflect significant economic, environmental and social impacts in such a way as to allow stakeholders to express an opinion on the performance of the organization of the reporting period. Specifically, the completeness relates to the objective (which refers to the topics covered in the sustainability report), the perimeter (with whom he defines the set of entities whose performance is represented in the report) and the timing (the need for information taken as a reference are complete in relation to the period of time specified in the report itself).

The principles to guarantee the quality of the report are aimed at strengthening the security and the reasonableness of the evaluation of business performance by stakeholders. The quality of the report is only guaranteed by the principle of balance, comparability, accuracy, timeliness, clarity and reliability. Compliance with the first principle is to avoid preferences in the selection and presentation of information, and through a consideration of the results favorable and unfavorable, aims to provide a balanced picture of corporate performance. The second encourages the comparison of economic performance, social and environmental enterprise over time. In order to make a correct comparison is necessary for the company to maintain unchanged the criteria used for comparison (operating limits, amplitude and temporal). Any change must be communicated to them by implementing, in conjunction, the changes necessary to ensure compliance with this principle. If there are problems that do not allow the company to

operate in this sense should inform and explain the reasons. The principle of the accuracy guarantees the acquisition of a higher level of accuracy of qualitative and quantitative information contained in the financial sustainability through a detailed indication on approaches , methods and techniques used in the construction of the report. The content of the latter must be detailed so as to enable the addressees of the document to form an idea about the performance of the company. The characteristics that determine the accuracy of the information varies depending on the nature of the information itself, so it is necessary to indicate in the report , approaches , methods and techniques used to collect and process data (Carnevale , 2005). The fourth principle refers to the frequency with which the sustainability report is to be published. Given the close connection of the reporting tool with the financial statements, it is appropriate, for companies, it is compiled and published by the same periodically scheduled for the economic-financial balance, ie annually. The periodic disclosure of the information contained herein will provide valuable support to the decision-making process of various stakeholders. Any updates will be released later with interim basis bearing in mind, in the latter case , the level of importance of the information and the opportunity cost of disclosure / non-disclosure of the same . The fifth principle promotes understandability, accessibility and intelligibility of information in order to ensure their access to the greatest number of users without , however, compromising the highest level of specificity of the data. Finally, the principle of reliability is the foundation of the whole process of the sustainability report ; it pertains to the detection systems , management, communication and control of information and is supported also by the possibility provided in the GRI , to submit the report of sustainability certification using the processes of internal audit and the external audit of its own .

The first part of the line also includes a guide to the definition of the content of the report and the definition of the perimeter. The contents of the report should be decided considering the purpose and company's experience and expectations of the various stakeholders. To this end, through the use of the principles mentioned above, we must identify the arguments and the relevant indicators worthy of being included in the report. The perimeter, instead, refers to the various entities whose performance is discussed in the sustainability report which will, therefore, contain not only all entities that generate a significant impact on the company as well as those over which it exercises control or ' significant influence on financial and operating policies (Carnevale, et al 2008).

The GRI shall also define the minimum content of the sustainability report. The structure consists of four sections related to strategy and analysis, the profile of the organization, report parameters, Governance, commitments and engagement of stakeholders.

In the first section, defined strategy and profile, there is a description of the strategic relationship between organization, sustainability and social commitment.

The second section (profile of the organization) address the demographic information (name, operational structure, company size , ownership and legal form , main brands, the nature of markets served) as well as those inherent in sustainability management systems implemented by the organization (significant changes occurred in the reporting period, honors / awards received in the reporting period) .

The third section (profile of the organization) includes information related to the profile of the financial statements (the reporting period, the date of publication of sustainability reports, frequency of reporting), objective and scope of the report (information pertaining to joint venture activities outsourcing that can significantly affect comparability between periods and organizations, significant changes in the scope, boundary or measurement method) , the policies of external assurance of the sustainability report .

The fourth section, finally, contain a description of the strategic and operational decision-making processes implemented by the organization to ensure maximum involvement of the various stakeholders in the circuit of sustainability. Among these include the description of the corporate governance (indication of the role played by the President, the number of independent directors and / or non-executive directors, etc.). , Commitments and external initiatives (adherence to international standards of social and environmental management or certifications obtained, participation in national trade associations and / or international) , the involvement of stakeholders and so on (Molteni , 2004; Rappaport , 1989).

In this section find space, too, the performance indicators used to provide an immediate and concise information regarding the economic, social and environmental issues related to the activities of reference and in general on the performance according to the triple bottom line approach. In particular, there is a distinction between core indicators and additional indicators; the first (performance indicators) are essential and are used in different types of organization and for most of the social partners, while the latter are used

by a limited number of companies and provide specific information targeted at the stakeholders particularly important. The indicators thus defined are divided into indicators of economic performance, environmental and social (Beedle et al , 2004). The first measure impacts in terms of economic organization towards its stakeholder, in terms of both monetary and non-monetary flows. The second estimate quantitatively the impact produced by the enterprise on the environment in terms of use of inputs (resources and alternative sources) and the management of waste output (waste, emissions, waste). Finally, the third measure the impact of the organization in the social context in which it operates.

In addition, the model provides a self-assessment of the GRI reporting level achieved, which arises from a voluntary statement about the content of the report and the guidelines followed in accordance with the GRI application levels. The levels of application of the Global Reporting Initiative are three (A, B, C), to which you can add a (+) self-assessment of their level of reporting (Tenuta, 2009).

6 NPOs in Italy

The increasing importance of the third sector has taken the Italian legislature to turn its attention to the vast and varied universe of nonprofit organizations. So to the general civil law, which is contained in the few articles of Book I of the Civil Code of 1942, the legislature has added over the past few decades, a special discipline. From the legal point of view, and according to the International classification of Non Profit Organizations include 12 different groups:

- Culture and recreation
- Education and research
- Health
- Social services
- Environment
- Development and housing
- Law, advocacy, politics
- Philanthropic intermediaries and voluntarism promotion
- International
- Religion
- Business and professional associations and unions

- Organization not elsewhere classified.

This classification represent a large range of activities in the non profit fields, highlights the diversity in the sector and suggests that there are many different issues to face across the *NPOs* sector.

From a tax point of view non-profit organizations can be "non-commercial entities " or " non-profit " governed by Legislative Decree December 4, 1997, n . 460. The measure has defined some of the characters and backgrounds typical of companies operating non-profit organization, such as:

- The prohibition of distribution of any profit;
- The obligation to transfer of the assets of the entity in the event of its dissolution to another association with similar purposes or for public purposes;
- Uniformity and effectiveness of the associative relationship;
- The obligation to draw up and approve an annual economic and financial report;
- Free eligibility of the administrative bodies, the principle of the single vote, the sovereignty of the shareholders and associates;
- In transmissibility of membership dues;
- Carrying out activities in the fields of social welfare and social care, health care, charity, education, training, amateur sport , protection , promotion and enhancement of the things of artistic and historical interest , the protection and enhancement nature and the environment , with the exception of recycling of municipal waste , the promotion of art and culture , the protection of civil rights , scientific research of particular social interest ;

The third sector includes a variety of different organizations and associations, is active in many areas of economy ranging from healthcare, social services, employment and culture to environment (OECD, 2003). Compared with private companies the characteristics of *NPOs* include the following:

- Are value-driven, instead of profit-driven;
- Stress the local dimension in their activities;
- Provide and develop services based on needs which are often not recognized by public authorities;
- Offer not only services for clients but also often do community work and/or advocacy work;
- Train and engage volunteers as part of the service staff;

- May have a special approach in their work, e.g. social goal, value goals,
- Empowerment or religious approach. (Borzaga and Santuari, 2003).

NPOs are increasingly involved in welfare, health care, education reform, and public-private partnerships and rural and urban planners use nonprofit and community organizations for local development and regeneration.

All these developments suggest that *NPOs* are part of the transformation of societies from industrial to post-industrial, and from a world of nation-states to one of transnational, even global, economies and societies, where the local level nonetheless achieves greater relevance and independence. The full recognition of the immensely elevated position and role of *NPOs* at the beginning of the twenty-first century is the main difference to the latter part of the previous century, when nonprofits were “(re)discovered” as providers of human services in a welfare state context. *NPOs* are now seen as a part of the wider civil society and welfare systems of modern societies.

The phenomenon of non-profit has grown not only because of the crisis of the *Welfare State*, but also because of a variety of factors, among which we can include:

- Economic development as well as rising incomes, has led to an increase in activity as a result of voluntary and charitable;
- The emergence of new needs and the different and specific services;
- Increasing employment and economic in this sector.

This situation has been favored by the spontaneity and good will of many citizens, who have joined together in groups (associations, cooperatives etc.) in order to provide answers to serious social problems. (Chaminade & Catusus, 2007).

According to the latest census ISTAT (ISTAT, 2011;) the *NPOs* are active in Italy 301 191 and their spatial distribution is quite uneven. 55.2% of *NPOs* is present in northern Italy, 21.5% in the Centre and 16.6% are located in the South.

If the number of active *NPOs* is placed in relation to the resident population in the same year, we note that in Italy there are *NPOs* 38.4 per 10 thousand inhabitants.

This ratio tends to be higher in the northern and central regions (respectively equal to 44.0 and 42.3 per 10 thousand inhabitants institutions), while in the South it presents significantly lower (29.4 per 10 thousand inhabitants institutions).

Today, *NPOs* regularly find themselves sharing the same territory with for-profit organizations, sometimes as collaborators, but probably more often as competitors (Ryan, 1999). *NPOs* are now expected to adopt for-profit competitive strategy approaches

(Weerawardena and Sullivan-Mort, 2001). An *NPOs* gains competitive advantage when it consistently outperforms its competitors, although this performance is not measured in the same manner as it is in for-profit organizations.

Today, as physical assets and financial capital are no longer the primary resources that facilitate competitive advantage but the intangible and the IC resource represent the only one to ensure a competitive advantage (Kaplan and Norton, 2001; Wall et al., 2004)

Nowadays, the role and contribution of *NPOs* are more important and strategic. Various circumstances place *NPOs* activities in competitive environment and require a complex management. This makes the demand of *NPOs* management should be conducted in a more professional, modern, and use the concepts of strategic management. In fact, the performance measurement models that have been developed are tend to profit-oriented organizations, while performance measurement model according to the characteristics of *NPOs* is still relatively limited. The lack of this limitation, is inadequacy the stage of identify and determine the aspects of *NPOs* interaction with internal and external parties that demands of higher levels of capabilities (the need for the level of the knowledge based organization). While the difficulties to develop a mechanism of quantify intangible assets elements, is the intangibility of the leading indicators that expected to perform quantitative value of organizational performance achievement. This constructive research is to develop a performance measurement model according to the characteristics of *NPOs* based on the intellectual capital.

Table 6: - *NPOs Geographic breakdown*

	2011			
	V.A	%	Per 10 inhabitants	Var. % 2011/2001
Piemonte	25.962	8.6	59.5	25.7
Valle d'Aosta	1.319	0.4	104.1	17.8
Lombardia	46.141	15.3	47.6	37.8
Liguria	9.461	3.1	60.3	29.2
Nord-ovest	82.883	27.5	52.6	32.4
Bolzano	4.927	1.6	97.6	-7.5
Trento	5.371	1.8	102.3	17.5
Trentino-Alto Adige	10.298	3.4	100.0	4.1
Veneto	28.898	9.6	59.5	37.6
Friuli Ven. Giulia	10.002	3.3	82.1	29.1
Emilia - Romagna	25.116	8.3	57.8	27.2
Nord-Est	74.314	27.7	64.9	27.3
Toscana	23.899	7.9	65.1	30.3

Umbria	6.249	2.1	70.7	32.3
Marche	10.676	3.5	69.3	37.1
Lazio	23.853	7.9	43.4	33.5
Centro	64.677	21.5	55.8	32.8
Abruzzo	7.261	2.4	55.6	32.5
Molise	1.816	0.6	57.9	35.7
Campania	14.472	4.8	25.1	11.2
Puglia	15.105	5.0	37.3	24.5
Basilicata	3.238	1.1	56.0	41.5
Calabria	7.963	2.6	40.7	22.9
Sud	49.855	16.6	35.7	22.4
Sicilia	19.846	6.6	39.7	19.3
Sardegna	9.616	3.2	58.7	17.7
Isole	29.462	9.8	44.4	18.8
Italia	301.191	100.0	50.7	28.0

Source: Istat 2011

The fundamental difference between the *NPOs* with Profit Organization is situated on the main reason of the establishment of the organization. In simple terms it can be said that the main purpose of Profit Organization is to create financial gain for its owners through profits from the goods/services traded. On the other side the main purpose of the *NPOs* is to meet the social needs of a community or of its members. In return, the *NPOs* not only provide services that are owned but also need to consider all the consequences arising from the services they have. Therefore there is a difference between the groups perspective Profit Organization *NPOs*. Here are the general differences between Profit Organization and Non-Profit Organization.

Table 7: - Differentiation between Profit Organization n Non-Profit Organization

Profit Organization	Non-Profit Organization
Focus on marketing operation line (bottom line)	Focus on social requirement
Aims to create value for shareholders	Aims to create value for the needy
Employee hiring to run the company	The volunteers who run the organization
Source of revenue comes from sales of products and services	Source of revenue comes from contributions from donors and government funding

Source: our elaboration

7 Sustainability report and third sectors

If the financial information in any case constitute an important benchmark for performance evaluation carried out by profit-oriented enterprises, their information capacity is , however, limited in the context of non-profit organizations , with reference to which it is necessary to consider also the contribution they make in terms of improving the social welfare of specific categories of individuals and / or communities and their impact on the environment.

If the financial statements have limitations, the role it plays, however, is different depending on whether it refers to a company or a NPOs. The success of NPOs does not relate to measures of economic-financial order, so the final amount may not be able to express a sufficient measure of the performance levels achieved. A report of management is able to attest to the nonprofit organization's ability to achieve the given conditions of equilibrium during a reporting period, but nothing expresses with regard to the achievement of the goals that inspire action.

If in case the sustainability of the company 's financial statements may be given as a supplement to reporting financial position and, in the case of NPOs sustainable attribute appears more properly refers to the entire action , including the management of the budget, and the possibility that it becomes really object of analysis, commentary and collective evaluation . Reporting sustainable is not a key additional or residual action of NPOs but the original one.

From this point of view, the introduction of the sustainability in NPOs can be considered as a possible response to :

- Lack of transparency regarding the activities and achievements of organizations, which does not allow stakeholders to really evaluate the performance with respect to the pursuit of the mission ;
- Lack of clarification of the objectives and strategies of NPOs , which should be the starting point for the definition of the objectives , but they are often not the result of a systematic and thorough process of strategy formulation and identification of priorities;
- Lack of performance measurement, much more oriented to the correct recognition of accounting phenomena than to the systematic measurement of performance in terms of service quality and effectiveness of interventions;
- Lack of communication, which makes it easily accessible on the outside , if available, and does not allow stakeholders to appreciate (in the sense of giving value) efforts and results actually achieved by NPOs (Di Filippo et al, 2008)

8 Scope of the research

The current reporting documents used by NPOs relates only to the social budget. The non-profit sector is in late in the consciousness of the strategic importance of the representation of their sustainability in order to create and manage knowledge and to enhance the value of the organization.

The present work aims to identify a new framework for the sustainability report, which can be used, by all NPOs and it is expressive of the operating characteristics of each. The new report should be the main mechanism that NPOs can use both inside the structure, to support the strategic management of knowledge, and outside, to communicate to stakeholders the impact of integrated triple bottom line (economic, social and environmental).

9 Hypotheses Testing Conclusions

NPOs do not prepare their financial sustainability report and this is a limit. We believe that the use of an integrated approach to economic, social and environmental is a benefit for the third sector as it helps to represent in a more clear and complete way the development of a sustainable organization.

The hypotheses of the research are:

1. Implementation of a sustainability report encourages the representation of economic, social and environmental organization products, especially in a sustainable NPO in which the reporting is a key element. It is an essential element in the governance of the organization because it promotes an overview of the activities carried out;

2. Using sustainability report favors the process of interaction between stakeholders and the NPOs. It is an essential element for the stakeholders because it promotes overview of the activities carried out.

10 Methodology. Research Framework

The present research is divided in two parts: first is theoretical and is focused on sustainability concept, sustainable development and NPOs characteristics.

Is analyzed the Triple Bottom Line integrated approach as well as tools required to represent the economic, social and environmental organizations in general and in particular NPOs.

In this first descriptive approach , after having shown that it is necessary to represent its stakeholders in an integrated manner the results of its activities in terms of economic, social and environmental issues, is highlighted the absence of a generally accepted framework for the representation of the sustainable impact of the expansion of the third sector organizations.

In the second part of an empirical nature, based on best international practices and in line with the provisions of the GBS and the GRI, is constructed a new framework for NPOs' sustainability reporting of. Subsequently ensure compliance with this sustainability report to a case study.

The empirical analysis consists of two steps. First, a quantitative analysis was performed on the reporting tools available on-line and refer to non-profit organizations with particular reference to those involved in volunteering. The consultations available online it is found, with reference to our country, that the third sector use, where this is done, only models of representation of the social impact of its activities as an integrated approach to triple bottom line (economic, social and environmental). On the basis of the GRI Sustainability Reporting and based on the information and reports prepared by the GBS, has been implemented a first draft of ad hoc reports for the representation of the sustainability of all third sector organizations. Subsequently, it is also looked at the sustainability reports of for-profit enterprises to understand what indicators could be extrapolated and implemented to represent and improve the communication skills of both NPOs with the territory, but also with other geographical areas.

Based on all the information gathered, together with the literature on the subject has been prepared for a new framework for the sustainability of NPOs consists of 26 macro-economic indicators, environmental and social, with indication of where possible correspondence with the GRI indicators.

The choice of the case study for the application of sustainability reports is on a Centre for Voluntary Service (CSV) because for functions and structure includes, in a wide view, all variables environmental, economic and social monitoring of any NPOs.

The choice to analyze the case study of the Province of Cosenza CSV is to be found in the growing concern of the generality of NPOs, to have objective evidence about the quality of services provided and the economic, social and environmental impacts of the activities carried out in the context. The CSV is a valuable point of reference for all NPOs in the area; the implementation of a new framework for the sustainability report of the CSV of the Province of Cosenza could lead to a further extension of the instrument to other NPOs that are addressed to it.

Table 8: - Framework

	FRAMEWORK	CSV INFORMATION
IDENTITY	Provide quantitative data to be used to analyze organization's profile and services supplied	describe the composition of the corporate center and the services provided to the various non-profit organizations users of the services.
ECONOMIC DIMENSION	The economic dimension analyzes the economic impacts on the stakeholders and on local economic systems	Integrated analysis of income and expenses by more specific indicators (such as fundraising, development and impact of investments for public benefit, pension plans for employees).
SOCIAL DIMENSION	The social dimension reflects the impact of the organization on the social systems in which it operates	The social dimension is the one that analyzes the impacts on society and the treatment of employees, as well as analyzing the working conditions and discriminatory practices.
ENVIRONMENTAL DIMENSION	The size affects the environmental impact of the organization on living and non-living natural systems.	The environmental dimension, in a limited way as many indicators are not currently measured by NPOs, provides relevant information on best practices implemented on the consumption of paper, etc.

Source: our elaboration

11 CSV Introduction

The CSV - Centre for Voluntary Service - is a organism provided by the Law on Volunteering (L.266/91) run by Volontà Solidale which is an Association of Associations, a non-profit organization , which has been tasked to support, promote and qualify the activities of the Volunteer in the provinces of Italy where it is present. In 2010, members of the service centers were 9,409, an average of 121 members for CSV. In Calabria, the number of members is equal to 481, with an average number of members per center of 96.

11.1 Historical reasons for the CSV

The CSV Cosenza, funded by the Special Fund for Voluntary Service, operating since 2003 in accordance with the principles of " subsidiarity " and " empowerment " to promote the role of active citizenship in building a more cohesive society and to ensure the protection of the Common Good . Enhance the human resources of the voluntary and enables active citizens of the province of Cosenza of being and doing volunteer work. At the end of March 2014, the CSV of Cosenza operates with 16 employees including 13 part- time employees and 3 employees to the project as permanent collaborators of the Centre. In 2013, subscribed to the CSV of the Province of Cosenza 608 NPOs. A special

note is the strategic body of directors that sets goals and strategies to pursue. It is composed of 21 members with a frequency of 7 meeting per year.

The following entities may apply to CSV and receive services free of charge, within the limits and under the conditions stated in the guidelines,:

Voluntary organizations operating in the province registered or not registered in the register of volunteer work, and individual volunteers who work in them;

Coordination and volunteer networks thematic and territorial;

Groups of people who want to set up an organization to volunteer ;

Would-be volunteers ;

Citizens who want to be involved in the promotion of a culture of solidarity;

Subjects of the third sector and of public bodies that can provide information and guidance on issues relating to volunteerism.

It is clear, therefore, that the CSV supports the practical world of Volunteering through the provision of a number of different services; from basic services, promotion, advice and professional assistance, services, training, documentation, communication and social planning. (table 3)

Figura 9: – Main services of the CSV

Hearing/Orienteering:	Consulenza di base:	Logistic
Association centre	Social meeting organization	Promotional printed
Citizens centre	Preparation of meetings and minutes	Rent of tools
Hearing	Advice for application in various NPOs register	

Fonte: nostra elaborazione

The CSV Cosenza organizes meetings, seminars and training days on topics of interest for the Voluntary and supports the implementation of training programs of the Associations. The service of Education wants to qualify the skills of volunteers or would-be volunteers, foster the exchange of experiences and improve the capabilities of the Associations. As of 31/12/2012, the CSV has surveyed about 1,700 between associations and other organizations of the Third Sector operating in the province of Cosenza; of these:

584 were found to have the requirements of the Law 266/91 (Voluntary Organizations);

432 are volunteer organizations that have turned to the center (74% of voluntary organizations surveyed);

311 are recorded at the Regional Registry of Volunteers;
250 between volunteer organizations recognized at RRV have turned to the center (equal to 80% of the members).

12 Results of hypotheses testing and limits of the research

The advent of the stakeholder view has led to the need to have systems for measuring and evaluating the ability of companies to balance the interests of stakeholders. This need has led to the emergence of new needs for information by both the management, engaged in the development and pursuit of a social strategy of the company, both of stakeholders, interested parties fully understand the commitment and achievements of the company regarding compliance of her own expectations and, more generally, to the responsibility strategy pursued. This has encouraged the creation of reporting systems and complementary to the financial statements useful to express an opinion on the balance achieved in the integrated triple bottom line.

The sustainability report compiled by the CSV of the Province of Cosenza is a tool that can bridge the information gap and anchor the strategic objectives of the objectives of the single CSV NPOs. Through the new sustainability report CSV has been able to:

Identify and map all the activities carried out;

Improving the perception of those who govern the service center on what has been done and what can be done in particular on compliance with certain environmental objectives;

Improving the perception of employees on activities in order to increase the motivation to work;

Improving the perception of all stakeholders (citizens, associations, institutions, etc. .) on activities.

The hypotheses of the research are definitely confirmed. The new sustainability report is intended by the CSV of the Province of Cosenza as a management tool that allows you to monitor the evolution of relations between the CSV and the community; increases the diffusion of knowledge within and outside if properly used and allows a transparent communication with all stakeholders of the performance and organizational skills.

The sustainability report allows the CSV to improve their performance by providing useful information to those interested in the organization. The sharing of knowledge management tools and knowledge allows the improvement of the effectiveness and

efficiency of the services provided and improved organizational stability of the CSV. The sustainability report requires little interpretation, when used and disseminated within and outside the CSV encourages the sharing of resources rather than competing for resources. This is because due to a change in behavior and values of the people of what is good and what is bad for the organization of what is right and what is wrong to do.

This work helps to build a nascent body of literature that suggests that the sustainability report can be used as a conceptual framework for the management and strategic competent representation in all NPOs .

The results of the empirical study are limited by the implementation of sustainability reporting in a single case study. Therefore, even if the job reaches concrete results, the presence of a single organization analyzed reduces and limits the results obtained. In addition, notes the presence of other similar bodies to CSV in several European countries, the report need to be better deployed in other European contexts .

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ATTACHED

CSV OF THE PROVINCIA DI COSENZA SUSTAINABILITY REPORT

Identity: insert in the framework quantitative data useful to analyze the profile of the organization, and services supplied

INFORMAZIONI GENERALI		2013	2012	Differenza
OdV in the Province		608	584	24
Filed in the register		354	270	84
Shareholders of the volunteer service centre		223	219	4
I level	OdV filed in the register	137	125	12
	OdV not filed in the register	49	59	-10
II level	Non volunteer organizations filed in the register	36	34	2
	not filed in the register	1	1	0
Non volunteer organizations				

SISTEMA OF GOVERNANCE		2013	2012	Differenza
SHREOLDERS' MEETING				
	N° OF CALL	2	3	-1
Board				
	N° of members	21	21	0
	N° of calls	7	6	1
Board of auditors:				
	N° of members	3	3	0
	N° of calls	4	4	0

SERVICES PROVIDED		2013	2012	Differenza
N° branches		4	4	0
Hours of operation (in the figure is considered to be the total number of hours of workers)		17160	17160	0
Communication Tools:				
Website	Hours navigation (in minutes) ACCESS	33252	21383	11869
	Average visit time (in minutes) download			
Database	N° consultations from the site	1070	--	
Journal	N° distributed copies	--	--	
Newsletter	No. enrolled	3381	3270	111
Promotion:				
OdV supplied		123	64	
	Member			
	non member			
	Shareholder			
	Non shareholder			
Volunteers supplied(/users)		130	100	
Time dedicated in hours				
Internal resources				
External resources				
Number of conference		5	24	
Number events				

Numero show				
Promotional campaigns		2	3	
More				
Advice:				
OdV supplied		350	315	
	Member	217	180	
	non member			
	Shareholder	132		
	Non shareholder			
Time dedicated in hours				
Internal resources				
External resources				
Advice supplied				
Tax		744	80	
Legal		186	280	
Organization		25	19	
Projecting		270	138	
More.....		190	376	
Training				
OdV supplied		188	74	
	Member			
	non member			
	Shareholder			
	Non shareholder			
Time dedicated in hours				
Internal resources				
External resources				
Informazioni e comunicazione:		2440		
OdV supplied		389		
	Member	240		
	non member			
	Shareholder	159		
	Non shareholder			
Time dedicated in hours				
Internal resources				
External resources				
Service supplied				
graphic processing		273		
Press Releases		35		
Publishing news on the website and NL		448		
Print materials		659		
More		825		
Logistic suppor:				
OdV supplied		212	304	
	Member	122	184	
	non member			
	Shareholder	93		
	Non shareholder			
Time dedicated in hours				
Internal resources				
External resources				
N° of veichles		1	1	
	Owned	1	1	
	rented			
N° of structure available		5	5	
	Owned			
	rented	1	1	
	Free use	4	4	

**ECONOMIC DIMENSION: The economic dimension analyzes
the economic impacts on its stakeholders and on local
economic systems**

DIRECT ECONOMIC VALUE GENERATED AND DISTRIBUTED, INCLUDING REVENUES, OPERATING COSTS, EMPLOYEE COMPENSATION, GIFTS AND OTHER INVESTMENT IN THE COMMUNITY, THE LENDERS AND PAYMENTS TO THE PUBLIC ADMINISTRATION			EC1
	2013	2012	Differenza
DIRECT ECONOMIC VALUE GENERATED			
Management result	3.219	2.020	
Revenues/Income			
Liquid assets	380.931	315.723	
Cash	305	945	
Bank	380.626	314.778	
Income law 266/91	788.427	925.347	
Income extra law 266/91	7.910	3.921	
Public funding	4.438	562	
Shareholders' funding	3.375	3.270	
Non Shareholders' funding	0	0	
Fundraising	0	0	
Contribution on projects	0	0	
Income from extraactivity	0	0	
Income from financial activity	97	89	
% Income used for CSV management	99,00	99,6	
Fixed assets			
Owned structure	0	0	
Veichles	1	1	
CREDITS			
Towards client	0	0	
Others	34.514	193.557	
Equity			
Net equity	350.123	328.243	
Not available equity	347.783	323.882	
Operating costs			
Costs for services supplied			
Di cui			
Costs budgeted	547.591	757.841	
Effective costs	442.640	585.866	
Residual	104.951	171.975	
Rental and running Costs			
Costs budgeted	104.650	104.710	
Effective costs	85.436	103.829	
Residual	19.214	881	
Real estate investments			
Costs budgeted	0	0	
Effective costs	0	0	
Residual	0	0	
Veichles investments			
Costs budgeted	0	0	
Effective costs	0	0	
Residual	0	0	
External advice costs	30.633	143.703	
Web site costs			
DEBTS			
Debts towards volunteers entities	0	0	
Debts towards banks	0	0	

Debts towards Suppliers	18.365	125.487	
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SALARIES			
Wages	332.374	321.611	
Men	83.093	81.000	
Women	249.281	240.611	
Average wage			
University Graduated	13	21.376	
High school degree	3	18.573	
Volunteers reimbursement			
Costs for workers	0	0	

DEVELOPMENT AND IMPACT OF INVESTMENT IN INFRASTRUCTURE AND SERVICES MAINLY FOR "PUBLIC UTILITY"			EC7
	2013	2012	Differenza

COPERTURA DEGLI OBBLIGHI ASSUNTI IN SEDE DI DEFINIZIONE DEL PIANO PENSIONISTICO			EC3
	2013	2012	Differenza

LOCAL INFLUENCE ON THE ECONOMY			EC9
	2013	2012	Differenza

RESOURCE ALLOCATION			NG07
	2013	2012	Differences

FUNDRAISING (FOR ETHICAL PURPOSE), IT INCLUDE FIVE TOP FINANCER, AND FINANCING PER CATEGORIES			NG08
	2013	2012	Differences

2) SOCIAL DIMENSION: THE SOCIAL DIMENSION REFLECTS THE IMPACT OF THE ORGANIZATION ON THE SOCIAL SYSTEMS IN WHICH IT OPERATES

TOTAL NUMBER OF EMPLOYEES, DIVIDED BY TYPE, TYPE OF CONTRACT AND GEOGRAPHICAL DISTRIBUTION		EX LA1		
		2013	2012	Differenza
WORKERS				
Total workers		13	13	
	Full time			
	Part time	13	13	

TIPO DI CONTRATTO				
Expire date contract				
	Full time			
	Part time	13	13	
No Expire date contract				
	Full time			
	Part time			
Collaborators				
	On project based	3	3	
	Consultants			
Other Collaborators				
Tenure CSV				
From..... TO				
From..... TO				
From..... TO				
From..... TO				
Volunteers (identify volunteer's different typology for function and frequency)				
Boards member				

TOTAL NUMBER OF PERSONNEL TURNOVER RATE AND DIVIDED BY AGE, SEX AND GEOGRAPHICAL AREA			LA1		
			2013	2012	Difference
PERSONNEL AGE					
Age Class: from 25 to 34					
	Employees		3	3	
	Project based		2	2	
	External consultant		1	1	
From 35 to 44					
	Employees		9	9	
	Project based		7	7	
	External consultant		2	2	
From 45 to 54					
	Employees		4	4	
	Project based		4	4	
	External consultant				
From 55 to 64					
	Employees				
	Project based				
	External consultant				
From 65 and others					
	Employees				
	Project based				
	External consultant				

GENDER				
MAN				
	Full time		4	4
	Part time			
	Project based		3	3
	External consultant		1	1
FEMALE				
	Full time		12	12

	Full time			
	Part time	10	10	
	Project based	2	2	

TITOLO DI STUDIO				
	Master	1	1	
	Full time			
	Part time	1	1	
	Collaborators			
	Graduated	12	12	
	Full time			
	Part time	9	9	
	Project based	3	3	
	High school			
	Full time			
	Part time	3	3	
	Project based			

RATE OF ACCIDENTS AT WORK OF SICKNESS OF DAYS WORK absenteeism, AND TOTAL NUMBER OF DEATHS, DIVIDED BY GEOGRAPHICAL AREA (INCLUDING VOLUNTEERS IN THE CALCULATION)			LA6
	2013	2012	Differences
Worked hours	17160	17160	
Absenteeism	0	0	
% Absenteeism			
N° of accidents	0	0	
Index of accidents			

AVERAGE HOURS PER EMPLOYEE TRAINING YEAR, DIVIDED BY CATEGORY OF WORKERS (INCLUDING VOLUNTEERS IN THE CALCULATION)			LA10
	2013	2012	Differences
Total hours of training	16	16	
Average days of training per employee			
Average cost of training per employee	0	0	

TOTAL NUMBER OF EPISODES ASSOCIATED WITH DISCRIMINATION AND ACTIONS TAKEN			HR3
	2013	2012	Differences
No one	0	0	

TOTAL HOURS OF TRAINING ON EMPLOYEE POLICIES AND PROCEDURES RELATING TO ALL ASPECTS OF HUMAN RIGHTS RELEVANT TO THE WORK OF THE ORGANIZATION AND PERCENTAGE OF WORKERS PREPARED			HR2
	2013	2012	Differences
	0	0	

PERCENTAGE OF EMPLOYEES WHO RECEIVED TRAINING POLICIES AND PROCEDURES ANTI-CORRUPTION OF THE ORGANIZATION			SO3
	2013	2012	Differences
	0	0	

PROGRAMS OF COMPLIANCE WITH LAWS, CODES AND STANDARDS VOLUNTEERS RELATED TO MARKETING AND FUNDRAISING INCLUDING ADVERTISING, PROMOTION AND SPONSORSHIP .			PR6
	2013	2012	Differences
	0	0	

REPORT OF THE BASIC SALARY AND TOTAL REMUNERATION OF WOMEN WITH RESPECT TO THOSE OF MEN WITH THE SAME CATEGORY AND SPECIFIED BY HEADQUARTERS MOST SIGNIFICANT .			LA13
	2013	2012	Differences

PRACTICES RELATING TO CUSTOMER SATISFACTION, INCLUDING THE RESULTS OF THE INVESTIGATION TO HIS TIMES MEASUREMENT .			PR5
	2013	2012	Differences
Satisfaction surveys relating to the services provided			
Cards liking training course			

3) ENVIRONMENTAL: THE ENVIRONMENTAL DIMENSION AFFECTS THE ORGANIZATION'S IMPACT ON THE LIVING AND NON-LIVING NATURAL SYSTEMS.

RAW MATERIALS USED FOR WEIGHT AND VOLUME			EN1
	2013	2012	Differences
Consumption of paper	161.250	159.700	
Paper A3	45.000	45.400	
Paper A4	116.250	114.300	

PERCENTAGE OF MATERIALS THAT COMES FROM RECYCLED MATERIAL			EN2
	2013	2012	Differences
Consumption of paper	0	0	
Paper A3			
Paper A4			

DIRECT CONSUMPTION OF ENERGY			EN3
	2013	2012	Differences
Fuel transportation	fuel paper		
gas	Bills		
water	Bills		
electric energy	Bills		

INDIRECT ENERGY CONSUMPTION			EN4
	2013	2012	Differences

INTENSITY 'ENERGY			EN5
	2013	2012	Differences

ENERGY SAVING DUE TO CONSERVATION AND EFFICIENCY IMPROVEMENTS			EN6
	2013	2012	Differences
	no	no	

INITIATIVES TO REDUCE OF INDIRECT ENERGY CONSUMPTION			EX EN7
	2013	2012	Differences
ATTENTION TO SET OFF STAND BY SIGNAL	si	si	
STRATEGIES, CURRENT ACTIONS, AND FUTURE PLANS FOR MANAGING IMPACTS ON BIODIVERSITY			EX EN14
	2013	2012	Differences
	no	no	
TOTAL WEIGHT OF WASTE BY TYPE AND METHODS OF DISPOSAL			EN23
	2013	2012	Differences
Production of waste			
Recovery of waste			
Separate collection	si	si	
Printer toner recycling	si	si	
EXPENDITURE AND INVESTMENT FOR THE PROTECTION OF THE ENVIRONMENT, DIVIDED BY TYPE			EN31
	2013	2012	Differences
	no	no	

Strategic prospective methodology for to explore sustainable futures

Guillermo Gándara

Departamento de Relaciones Internacionales y Ciencia Política
Tecnológico de Monterrey
Av. Eugenio Garza Sada No. 2501
64849, Monterrey, N.L. México

Structured Abstract

Purpose – Show the prospective methodology as a tool to generate strategic knowledge for the design of sustainable futures.

Design/methodology/approach – Prospective Strategic is a Social Science discipline dedicate to explore the future. Based on qualitative methods whit participative stakeholders' permits design different future options and planning the transformation from actual scenario to desired future. We propose a four stages methodology process for the design sustainable futures: first understanding the context, followed by a strategic visualization, to continue the stage design the alternative sceneries and define the desired future, and finally concludes planning its construction.

Originality/value – This methodology puts in evidence the possibility of seeking alternative scenarios for a sustainable future in different ambits. Particularly we resume three prospective applications: biodiversity conservations and treatments water.

Practical implications – The outcomes of the application have been allowed to propose strategies and policies for environmental goods management such as environmental services and reuse water, with a long time vision based on a collective desiderated future.

Keywords – future studies, scenario methodology, strategic prospective, future sceneries, future.

Paper type – Academic Research Paper

1 Introduction

The field of futures studies is relatively young. Although man has always tried to anticipate the future, serious, systematic and rigorous reflection on it dates only to the half last century. Prospective attempts to explore where reasonably could lead trends and alternatives of action or inaction that we have in the present and in the future. (Alonso, 2014)

A world where poverty persists, the wealth is concentrated; corruption, organized crime, debt and economic insecurity increase; where pollution and mismanagement of natural resources problems are compounded; where environmental viability for our life support is diminishing and climate change continues; can't be satisfied with his present. According to the report on the future *State of the Future 2012* of the Millennium Project without a serious focus on green growth, falling under water systems, rising food prices, water and energy, population growth, resource depletion, climate change, terrorism and the changing patterns of disease, are likely catastrophic results worldwide and will force in the coming decades, migration, whereby large the world will become increasingly unstable (Glenn *et. all*, 2012).

Since the industrial revolution, the conventional development model had an approach in which the modernization development simply considered as following the standards set by an industrialized society, regardless of the consent and efficient use of resources, assuming the deterioration thereof as an inevitable consequence of development. Facing these challenges, a new development model has emerged to replace the old paradigm of industrial development. As noted by Baker (2006) this model of development "has sought to integrate and reconcile economic activity, social progress and environmental protection within a holistic model that enables the development and promotion of human welfare without having to rely on the destruction of resources."

In this new model of development has integrated the concept of sustainability, which has evolved since its first application, documented in the renewal of the mandate of the International Union for the Conservation of Nature and Natural Resources in 1969, reaching one of the definitions most accepted of sustainable development. Embodied in the report *Our Common Future* by the World Commission on Environment and Development, it establishes that sustainable development implies "meeting present needs without compromising the ability of future generations to meet their own needs" (WCDE, 1987).

From sustainable development and strategic prospective perspectives are presented below two future studies cases. The first presents scenarios for the conservation of a bat species (*Tadarida brasiliensis*) living in northeastern Mexico with the problem of declining bat colony. The second case presents scenarios for the use of treated water in the city of Monterrey, Mexico face the challenge of water stress in a semi-desert area.

2 The Future studies

There are two major future studies visions: first, the deterministic current that premium to the past as the main determinant of the future and considers the phenomena that show verifiable behavior historically. As mentioned Mojica (1999), future is the son of the past. The other stream, the voluntarism, consider building the future as a result of human action, which makes possible that this future will be designed and modified by proactive (Miklos & Tello, 2006). In this sense, Mojica (1999) speaks of the "voluntarism oxygen" to highlight this creative force of man, related to the notion of freedom, to work in one way or another. While the current deterministic served most from tools aimed at knowledge and explanation of the factors of inertia and trend situations, the tools of current voluntarism mostly considered a dynamic approach that is necessary to provide instruments to identify first instance the current system status and then those elements conditions for construction and achieving the desired future. The future is represented in form of scenarios.

For Godet & Durance (2007) "A scenario is a set consisting of a description of a future situation events and a path for moving from the original situation to another future." A scenario is a story with a plausible cause and effect links that connect a future condition with the present, illustrating decisions, key events and consequences throughout the narrative. Scenarios can be exploratory or normative. The first takes into account the present situation and trends to predict the most likely future. Normative scenarios seek collective construction of the future to achieve the most desirable situation. (Glenn, 2009) Among a long list of events that could happen, some are recognized more likely to occur than others. "The likely scenario tells us where we are going. But where we are going is not necessarily where we want to go. The alternative scenarios tell us that there are other paths and roads, the analysis enables us to choose the best." (Mojica, 2005)

Whether the disciplines that frame different methodologies or by the type or origin of information available for the study, methods of approach to the future can be classified on a continuum from the quantitative to the qualitative. Thus, the left side is represented by the forecast, while on the right opposite, we have the prospective. We have for example, quantitative methods such as time series analysis, where futures are mostly conditioned by past patterns showing the series of numerical data. Moreover, the qualitative extreme future will be mainly the result of analysis and interpretation to make it specialists or experts. In the middle we have methodologies that incorporate information from both

quantitative and qualitative nature, where the future is determined by the causal - effect or input- output between the variables that determine the object of study. (Gándara, 2014)

2.1 The prospective process

A future study may be conceived and developed through a comprehensive four-step methodological process. The first stage concerns the global understanding of the context; the second, a strategic view; the third stage is the design of future; and the fourth step to building the future. (Gándara, 2014)

Understanding of the context in the first approach gives the object of study. Refers to the general understanding of the problem or the object of study for the future will be displayed. It means understanding the dimensions of the system. In terms of qualitative methods, if the study requires consultation of experts are here to learn how to communicate with them. In terms of quantitative methods, refers to the identification of variables, observation and understanding of their past behavior and establishing causal relationships between variables. Understanding the context, in other words, means having a macro-level understanding from an observation point at surface level.

After the general understanding, it is possible to sharpen the focus of observation to determine the relative importance of the constituent elements under study may determine its future evolution, this is a strategic visualization. In terms of qualitative methods, refers to both the analysis and categorization of variables and relationships between players, such as the determination of strategic internal and external factors of future factors. In terms of quantitative methods concerns the validation and quantification of the causal relationships between variables, and to identify patterns and analyze their internal composition and its impacts in the future. Strategic display, in other words, it means having an understanding at the micro level tuning the degree of observation from an internal level.

After completing the first two stages of the prospective process, are sufficient to get into futures elements under study. The third stage Drawing the Futures start design allows different scenarios for the future. Whether through the exploratory approach or regulatory approach, it is time to make use of strategic information resulting in the first and second stages to display the possible future states and draw either alternative scenarios or, plausible scenarios. This is the period of greatest creativity because here the stories he tells each scenario are described and given a meaningful name.

The fourth stage Building the Future begins with the participatory definition or selection of the desired scenario or chosen scenario. This is where the path to be drawn to achieve the commitment stage, the relevant action plans. Is the time where the Prospective and Strategy intertwine to form an indivisible pair, as Godet (2000) explains. No doubt, this is the most complex stage, where they reconciled the interests of stakeholders, resolved their disputes, environmental challenges faced, resolved internal challenges. In other words, they must be internalized change factors for the desired scenario. From a systemic point of view is to establish the process towards the development of the system of the present situation to the desired situation in the future.

2.2 Tools for prospective process.

Different disciplines provide methods and tools to complete each stage of the prospective process. For Understanding the context stage will have different qualitative methodologies based on expert consultation, as the panel of experts, focus groups and Delphi method, among others. There are also some tools to graphically represent the object of study as a cause-effect or a tree problem diagrams. Here are also the analysis of megatrends, the systems view, the Marc's Giget Tree and analysis of time series, which, in addition to providing general information about the object of study, also allow you to have a strategic analysis of information for the future.

At the Strategic visualization stage, there are tools specific to classify or weigh the relative weight of the components, factors, actors and/or forces that influence the object of study behavior. As the structural analysis (MICMAC), stakeholder's analysis (MACTOR) and internal and external forces analysis (SWOT).

To develop the third stage Drawing the Futures, are available both methodologies prospective as the forecast. As an example for the design of scenarios, such as Peter Schwartz axes, System Cross-Impact Matrices (SMIC), the Morphological Analysis and Prospective Method of Scenarios and Strategy Network (MEYEP). Within the quantitative methodologies, are the Time Series Analysis, Causal Models and System Dynamics Modeling, which allow the design of scenarios using an exploratory approach.

At the stage of Future constructions, are essential tools and methodologies such as Planning, Strategic Intelligence, Interactive Management, Game Theory and Negotiation and Conflict Resolution, where he established and managed processes for the transformation of this in the desired state in the future.

2.3 Generating knowledge to move from anticipation to action

Anticipation, stakeholder's ownership and action are equally important concepts for building futures. Godet & Durance (2007) define three inseparable areas that give meaning to Strategic Prospective. On the one hand, anticipation, through a forward thinking, which will feature support and content to a vision that established under a collective orientation, achieved the ownership by stakeholders, thus defining the scope of it as a task of the same through the action.

Godet (1993) confirms that "the aim of prospective is precisely determined, what might be the values of the environment parameters taking into account the forces present, projects and actors. What they are, regardless of any formalities, possible, achievable and desirable scenarios. Thus, foresight provides the necessary tools to analyze the problem or study object, recognizing its major elements and providing a specific methodology that suits the objectives. To build sustainable future participation of all stakeholders is necessary. Eleonora Barbieri Masini argues that "participation as a feature of prospective, is related to one based on the values of democracy and citizen participation in decision-making and building their own future vision." (Barbieri, 1993)

. As mentioned throughout the writing, prospective provides tools and methodologies for the scenarios and variables and key stakeholders. It provides an orderly way to wander into the future and imagine what could happen, facilitating the development of specific strategies.

We must take a proactive mentality and the strength and energy to devote to building the most desirable scenario. Instead of being concerned about the aches and pains that could bring the future, it is preferable to allocate attention to the forging of a collective consciousness to change it. This attitude must be supported by concrete actions and strategies to change the course of things; here comes the prospective, not only as a way of thinking, but using an effective methodology.

3 Bats preservation at La Boca Cave

This case study aims the bat specie *Tadarida brasiliensis* (known as free-tailed bat) inhabiting the Boca (mouth) Cave. The cave houses some bat species permanently and others that are migratory. This cave is located in the town of Santiago Nuevo León, within the Protected Natural Area "Sierra Cerro de la Silla" to 36 kilometers from the city of Monterrey. In 2004 the cave was home to a colony of between 600 and 700 thousand

individuals of this specie, having lost in the 90s to 95% of its population (Vela, 2004). Protective actions were limited to the site and therefore the risk of loss of the colony was latent.

The principal objective research is the generation of possible, probable and desirable scenarios to help solve the problems of the Boca Cave, promote the protection and preservation of their bats, as well as the sustainable development of the area. Seeking better and deeper understanding problems of the cave, and make recommendations grounded in strategic prospective aimed at the preservation of the species to a horizon of 10 years.

3.1 Sources of the problem

In general, is detected a lack of environmental education, public disinterest and null respect to biodiversity, specifically related to this bat population, which is subject to constant vandalism inside the cave. The human being has become a major threat to bats and biodiversity in the Boca Cave. In 1991, an investigation of Bat Conservation International documented alarming bats losses in 8 of 10 caves in Mexico that have the largest populations, including the Boca Cave (Walker, 1995). It is estimated that in this place there was a colony with more than 5 million bats easily consumed over 50 tons of insects per night (Moreno, 1996).

Over the years and to date, the cave has been visited by a recurring and varied class of tourists, from those drawn by curiosity to know the bats; maybe other vandalism done by ignorance (as fire, graffiti, firecrackers, garbage), to those who are attracted by the scenic beauty of the place. Whatever be the reason, people have been causing a high impact (some unknowingly and others knowingly) to this fragile ecosystem. Moreover, in front of the cave there is an opencast mine, and there near a treatment plant wastewater is located.

3.2 Methodological process

Prospective is an attitude from a comprehensive and systematic vision to construction of a multiple and uncertain future, with evolutionary structures and dynamic relationships, through actions taken in present (Godet, 2000). For Context understanding stage, the literature review, expert interviews and site visits were made. Global trends in environmental matters, such as sustainable development, biodiversity and ecotourism are

documented. Also, the characteristics of *tadarida brasiliensis*, their ecological and economic benefits, as well as existing legislation at international, national and local levels on the protection of species are investigated.

In Strategic visualization a SWOT analysis that allows to locate the internal and external situation of the problem is made; MICMAC analyzing strategic variables for the preservation species; and MACTOR that identifies the set of stakeholders related to the problem, its main convergences and divergences. In step Drawing the Futures takes a SMIC where probable, possible and desirable scenarios for the Boca Cave are generated. Finally, for the Future construction recommendations arising from the research results are presented.

3.3 The proposed future

The MICMAC results show as key variables: Protecting cave, Ecotourism, Municipal and Institutional projects, Sustainable development, Environmental education, Public disinterest, Stakeholders synergy, Harmful activities, Ecological Municipality, Public budgeting and Financing. The key variables are characterized by highly influential and dependent, ideal for on / off dynamics of the system, or in this case essential to help and preserve the population of bats in the Boca cave.

In MACTOR 12 strategic objectives were raised that were evaluated by 12 actors in the public areas, private, NGOs and scientific community. The objectives were: 1 Define the legal structure of protection and conservation of the cave and its area. 2 Provide the area of equipment, tools and infrastructure needed to protect the area and the cave. 3 Actively participate in the implementation of programs, actions and activities to protect and conserve the area include erosion control, reforestation of green areas, species monitoring, and habitat assessment. 4 periodically develop research and studies on environmental services associated with the bats species. 5 Plan and implement comprehensive environmental education and ecological culture. 6 Having the technology in conservation and preservation of natural areas. 7 Establish a Council of NGOs, Municipality of Santiago, Regional government, private sector and universities, with the purpose of the administration, management and marketing in the area. 8 Establish control measures and effective care of the cave and surrounding area. 9 Disseminate to the public the activities and programs of conservation, research, environmental education, for the benefit of the community. 10 Establish mechanisms for cooperation, cooperation and

active participation among stakeholders. 11 Provide financial resources to carry out programs, projects, actions and activities related to the sustainable development of the area. 12 Develop ecotourism activities in the area of low impact, achieving sustainable economic growth in the region, and the financial sustainability of the project in the future.

For the realization of the possible and desirable scenarios with respect to the issue of the Boca Cave, six hypotheses of future were defined, that together help determine the success or failure of the preservation of the Boca cave. According to SMIC and taking into account the probability of occurrence of each future hypotheses, the 4 most likely scenarios were obtained: Scenario 1 "Bat Survives", Scenario 2 "The fateful", Scenario 3 "and now, who can help us?", and Scenario 4 "I have everything except money", with 41.5%, 22.6%, 14.1% and 4.3% probability of occurrence, respectively.

Scenario 1, "Bat survives", is the most likely and most desirable, where 6 future hypotheses occur. There is a compromise between the stakeholders (H1), extensive environmental education programs are established (H2), an ecotourism project is located in the Boca Cave (H3); a board / trust for the management of the area is established (H4); institutional programs and projects are created in favor of the protection of bats in addition to available financing and public interest (H5), legal land issues are solved, and no harmful activities are recorded in the Boca Cave (H6). Under this scenario, partnerships between stakeholders were successful in that they led to the implementation of programs, strategies and activities for the conservation and bats preservation. The challenge is met and Nuevo Leon is among the first states with comprehensive programs of environmental education and ecological culture. Tourists, farmers and livestock, main divergent stakeholders in the system, they become more aware of the benefits it brings this bats to human health.

4 Future scenarios for wastewater reuse

Water is a finite resource and vital for the preservation of life and the development of the societies; therefore, its conservation is an imminent necessity. Population growth, pollution, climate changes and an inadequate management, among other factors, have contributed to the water scarcity condition. Some countries and regions that actually face serious water stress problems have matured on practice the wastewater reuse. Israel, and Canary and Balearic Island in Spain are examples of that.

Mexico is currently dealing with severe water scarcity; its main industrial and urban centres are located in regions where the natural water availability is limited due to its geographical conditions. Central and northern territories are arid and semiarid regions that concentrate two thirds of the national population and only 30% of the natural water availability. To deal with this situation, it has been necessary the construction of major infrastructure for water supply. As an example, the dam “El Cuchillo” that supplies drinking water to the Metropolitan Area of Monterrey, region in which this work is focused.

4.1 Background case

The Metropolitan Area of Monterrey (MAM) is located in the northeast of Mexico characterized by a semiarid climate, rain scarcity and an important population growth. Even though the metropolis treats 100% of the wastewater generated, only 10% is reused, mainly at industries and golf fields; leaving aside other important potential uses such as landscaping irrigation, agriculture, reuse in homes, businesses, municipalities, and even indirect production of drinking water through the injection of treated wastewater to the aquifers, among others options. If these uses were regarded as feasible options, 100% of the treated wastewater could be reused, diminishing the pressure on water resources and allowing water availability at the MAM for future generations. Another important point to consider are the energy costs required to pump water from other basins and bring them to the cities, so water reuse implies a reduction of volumes pumped and therefore less CO₂ emissions.

Considering the above, the case aims to propose future scenarios for the reuse of treated wastewater in the metropolitan area of Monterrey, identifying the elected scenario in order to release a larger amount of water.

4.2 Methodological process

For Context understanding stage, the literature review, expert interviews and site visits were made. Global trends in Wastewater Treatment, such as the major trends in the treatment of waste water and international cases where measures have been taken to increase this activity are presented. Also, the characteristics MAM wastewater treatment, their technical and policy aspects, current situation of water availability and reuse are investigated. In Strategic visualization by applying a structural analysis of the most

relevant variables are identified. In step Drawing the Futures with the implementation of the SMIC method was developed and describe future scenarios for water reuse in the metropolitan area of Monterrey. Finally, for the Future construction recommendations to achieve the chosen scenario are presented.

4.3 The proposed future

This research helped to figured out a scenario for the wastewater reuse at the MAM Monterrey. With an analysis of the world, national and the local conditions, 24 variables, involved in the studied system, were identified and classified within a subsystem. These variables used with the prospective tool Structural Analysis giving a result of 17 strategic variables: water availability, environmental education, infrastructure, treatment model, water value, technology, reuse, scale treatment, water culture, cost of treatment, treated water competitiveness, consumers, efficiency of collection and reuse system, human capital, industrial wastewater treatment, treated wastewater coverage and financing.

Those variables were used to prepare six hypothetic events. Application of the SMIC method to the events for identification of the four most probable scenarios for wastewater reuse at the MAM: Scenario 1 "Achievement of Water Balance", Scenario 2 "Arrogance has blinded us", Scenario 3 "We are left with good intentions", and Scenario 4 "Voluntarily to try", with 29.1%, 21.7%, 17.6% and 14.7% probability of occurrence, respectively.

Scenario 1, "Achievement of Water Balance", is the most likely and most desirable, where all events happen: Water culture in terms of reuse, environmental programs, acceptance of the use of treated water by the water company (H1). Adopting a decentralized model of treatment of small and medium scale sewage collection system and water distribution and treated with an efficient infrastructure (H2). Adequate treatment of wastewater before discharging to the drain by the industry (H3). Incentives to encourage citizens to recycle water, investment in technology and improvements in effluent quality (H4). Price and quality of treated wastewater compared with drinking water (H5). MAM focused on increasing the reuse of treated water, where the ideas and strategies are routed through concrete actions covering different angles to ensure the availability of water (H6).

Finally, revaluation of water through water rates, severe penalties when permissible limits of pollutants are exceed, re-identification of industries for the type of pollutants

emitted; implementation of dual water supply system for new buildings, including gray water reuse network, decentralized treatment plants built for each housing complex or building under construction; in terms of culture and environmental education, promotion campaign for water reuse and agreement between public and private educational institutions; injection aquifers; and creating agreement with municipalities for the use of treated water, were recommended.

5 Conclusions

This paper highlights the importance of having the knowledge to design sustainable futures by analyzing two case studies. The prospective process applied to the Boca Cave and Water Reuse problems at Monterrey contributed to the reality understanding from a number of important variables, generating knowledge about the influence relationship between them. Moreover, in the case of the Boca Cave analysis of key stakeholders to preserve bats, allowed know the alliances and conflicts among them, taking into account the assessment owed to the strategic objectives, direct and indirect influence on another and each had power to move to action to others.

Also, the solution to both problems with a focus on sustainability was visualized in the future, from design of six future hypotheses for each case study. The assessment of the occurrence probability of these hypotheses by experts yielded possible, probable and desirable scenarios, through a system of cross-impact matrices (SMIC), identifying and describing those four who accumulated 80% probability.

The study aims to be part of the limited references to the on Boca Cave and water reuse in Monterrey currently serving as the basis for future analyzes. It is expected that the results generated in these two cases would aid to know possible future solutions that allow us as human a better coexistence with other species that cohabit the planet and make efficient use of natural resources which we base our development.

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Does knowledge matters in sustainable supply chain?

Graziano Altieri *, Angeloantonio Russo

Department of Business Management
University of LUM, Casamassima (BA), Italy
S.S. 100 Km 18, 70010 Casamassima (BA)

** Corresponding author*

Structured Abstract

Purpose – The purpose of this paper is to investigate the context of knowledge management as an important pillar for many business companies to reach sustainable outcomes. Particularly, we explore the field of knowledge management and supply chain management linked to the achievement of sustainable performance. As a sustainable variable, knowledge may positively affect the relationship between supply chain structure and performance.

Design/methodology/approach – Knowledge Management has become increasingly important among researchers because of its importance as a variable of strategic performance. Its implementation within a strategic perspective may drive firms to successful goals. On the other hand, Supply Chain Management has reached a peak as a research topic and researchers have focused their studies on linking it to the concept of sustainability. Knowledge Management may be seen as a factor to ensure sustainability in supply chain because it is considered a fundamental key point for the achievement of social, environmental and financial goals. Starting from a broad literature review, we build a conceptual framework that links the concept of Knowledge Management, Supply Chain Management and Sustainability, and underlines the implementation of knowledge resources within a supply chain structure (i.e. a supply chain strategy oriented to efficient or responsive goals) as a driver to improve performance in sustainable terms. We propose an empirical approach based on a set of 220 worldwide firms operating as retailers and consumer packaged goods companies. By a regression linear model, we explain this positive relationship between knowledge management and social, environmental and economic performance.

Originality/value – This methodology puts in evidence that knowledge resources oriented to the concept of sustainability may address business companies to improve their supply chain operations and performance. Therefore, supply chain companies may structure their strategic orientation to better achieve social, environmental and economic outcomes.

Practical implications – The outcomes of the application explain knowledge management as a supply chain key factor to create a competitive sustainable advantage. In so doing, we aim at guiding supply chains towards social, environmental and economic performance through the integration of Knowledge Management within their strategic decisions.

Keywords – Sustainability, Supply Chain, Knowledge Management, Performance

Paper type – Academic Research Paper

1 Introduction

Supply Chain Management has been a considerable topic among researchers and practitioners for the last few decades. Actually, this new approach, both in academia and practice, comes from an evolutionary business perspective, where companies try to extend their activities through collaboration with other firms, in order to successfully compete in the global market economy (Lambert, 2008; Seuring et al., 2008). A deep market change has brought companies to review their strategies and operations. Janvier-James (2011) claims global competitiveness in physical exchange is now crucial for economic growth and development. Therefore, globalization of international trade, aggressive competition and technological change represent the main reasons that affect business entities (Sharifi et al., 2013). Consequently, these factors are also driving the development of supply chains where different business units work together (Seuring, 2008). As important phenomena, they have brought firms to compete in a world market, no longer individually (Christopher, 2006). In fact, Hwang et al. (2010) underline how competition has changed recently from being between individual companies to increasingly being between supply chains. All stages within a supply chain have become internationally interdependent. Globalization has forced companies to look for more effective ways to coordinate the flow of materials into and out of the company. Therefore, organizations now understand how SCM can be successfully applied (Halldorsson et al., 2008), in order to reach as many customers as possible all over the world.

Nevertheless, globalization, market competition and technology are not the only understandable reasons. In 2009, Stock & Boyer focused on the effects of managing supply chain and they verified companies operating within it as a whole entity could achieve better economic performance. They confirm the goal of SCM is to reach greater profitability by adding value and creating efficiency, thereby increasing customer satisfaction. This latter aspect has been analysed by Mentzer et al., (2001) which claim the importance of coordination driven by customer needs. Because of customers are demanding goods delivered on time and in a good shape, all stages necessitate closer coordination with suppliers and distributors.

This research firstly shows a broad literature review of three main topics: Supply Chain Management, Sustainability and Knowledge Management. All these topics are linked to one another. Then, a theoretical framework is mentioned in order to explain the purpose of this study. A case study based on worldwide consumer service and goods

companies is provided. Based on it, a regression model using a pooled OLS for panel data is then provided.

2 Literature Review

2.1 Supply Chain

A Supply Chain is generally viewed as a set of collaborative firms. According to this common idea, Lambert et al (2005) define a Supply Chain as a network of companies, or independent business units, from original suppliers to end-customers. It is a network because it has to be composed of three different entities at least. Otherwise it would be a partnership. In fact, a supply chain does not only include suppliers and customers, but also manufacturers, transporters, distributors, retailers (Chopra, S. & Meindl, P., 2007). These figures play important roles. Mentzer, J., Witt, W. D., Keebler, J., Min, S., Nix, N., Smith, D. & Zacharia, Z.(2001) classify a supply chain following three degrees of complexity: a “direct supply chain”, comprising a company, a supplier, and a customer, an “extended supply chain”, including suppliers of the immediate supplier and customers of the immediate customer and an “ultimate supply chain”, referring to all the organizations from the ultimate supplier to the ultimate customer. Through different functions such as new product development, marketing, operations, distribution, finance, and customer service, they collaborate to fulfil the customer needs (Chopra, S. & Meindl, P., 2007). Pienaar W. (2009) defines Supply Chain as a process integration involving organizations to transform raw materials into finished goods and to fulfil the end-user through an efficient transportation system. Supply Chains start with resources (raw materials), combine a number of value adding activities across different business stages and terminate with the transfer of goods or services to consumers (Janvier-James, A.M., 2011). Across these business functions, all single members within a supply chain manage an upstream and/or downstream flow of various nature and content. This exchanging flow consists of goods, services, data and information sharing, knowledge, capabilities and finance. In fact, Mentzer, J., Witt, W. D., Keebler, J., Min, S., Nix, N., Smith, D. & Zacharia, Z., (2001) define Supply Chain as a set of three or more entities (e.g. organizations or individuals) directly involved in the supply and distribution flows of goods, services, finances, and information from a source to a destination (customer). As well as Chopra and Meindl (2007) describe a supply chain as a dynamic entity that

involves the constant flow of information, product, and funds between different stages (supplier, manufacturer, wholesaler/distributor, retailer, customer).

A supply chain must be managed to meet customer needs (Fawcett et al., 2007). The customer assumes an important value. It is not only considered as an end user whereby weaving trade relations. He is an active member of the network where he behaves as a connector.

Management of supply chain is a broad and challenging task (Lambert et al., 2005). SCM is not a concept without problems (Burgess et al., 2006; Stock et al. 2009). These problems include the lack of a universally accepted definition of SCM, the existence of several different and competing frameworks for SCM, issues with terminology and the relative lack of empirical evidence supporting the benefits attributed to SCM (Naslund, D. & Williamson, S., 2010). Mentzer, J., Witt, W. D., Keebler, J., Min, S., Nix, N., Smith, D. & Zacharia, Z. (2001) confirm there is confusion to as SCM's meanings, both in academia and practice. A. M. Janvier-James (2011) claims the field of SCM is a comparatively new one, it is lacking on the definition of the terms and, besides, researchers have different perception of the discipline. Stock and Boyer (2009, p.691) declared "it is impossible to develop sound SCM theory until valid constructs and generally accepted definitions of terms are developed". Researchers, practitioners and organizations have been working to find an accepted definition in the last twenty years. Previously, SCM was used as a synonym for inbound and outbound transportation, operations management or purchasing or a combination of them. The field has been developed including the consumer fulfilment. The most significant definitions are mentioned below:

- Harland (1996) terms SCM as the management of a network of business involved in the ultimate provision of product and service packages required by end customers.
- The supply chain encompasses all activities associated with the flow and transformation of goods from raw materials (extraction), through the end user, as well as associated information flows. Material and information flow both up and down the supply chain. (Handfield and Nichols, 1999)
- Kitsolutions (2003) defines Supply Chain management (SCM) as providing the right goods or services, to the right location, in the right quantity, at the right time and at the right cost;

- According to Grant, D., Lambert, D., Stock, J. and Ellram, L. (2006), Supply Chain management refers to corporate business processes integration from end users through suppliers that provides information, goods, and services that add value for customers;

- The Supply Chain management (SCM) is defined by the Supply Chain Forum (SCF) as the integration of key business processes from end user through suppliers that provide goods, services and information that add value for customers;

- The Supply Chain Management Professionals' Council (2009) asserts that Supply Chain management (SCM) includes the designing and management of all activities involved in sourcing and purchasing, transformation, and all logistics management activities. Principally, it also includes coordination and partnership with network partners, which can be suppliers, mediators, third party service providers and customers. Fundamentally, Supply Chain management (SCM) coordinates supply and demand management within and across corporate;

- Chopra and Meindl (2007) define SCM as the control of all operations, resources, information and funds in order to maximize the supply chain surplus, given by the difference between the revenue generated from a customer's order and the costs incurred by the supply chain while satisfying that customer's order.

2.2 Sustainability

The concept of sustainability has been explored for the last decades. It has become a hot topic since the global community have realized the world where we live in is seriously damaged by human activities. The approach to sustainability and its increase in popularity among researchers and practitioners is due to the awareness of making the present world more respectful to the future generations. In 1987, the World Commission on Environment and Development (WCED) defined sustainability as the development that meets the needs of the present without compromising the ability of future generations to meet their needs. This principle, as indicated by WCED has been recognized as the starting point on which all business companies and organizations have to focus on.

Over these decades, researchers and practitioners have been approaching to the concept of sustainability giving their own interpretations. Starik and Rands (1995), for example, define sustainability as the ability of one or more entities, either individually or collectively, to exist and flourish for lengthy timeframes, in such a manner that the

existence and flourishing of other collectivities of entities is permitted at related levels and in related systems. They focus on the ability of a person, a group or an organization to work to improve their activities in a long term, without losing sight of the next generation. Konrad (1995) follows the same perspective, pointing out that the present and future people have the same right to find, on the average equal opportunities for realizing their concepts of a good human life.

The term of sustainability has been linked to the numerous facets of economics and management. At the base there are factors that have influenced companies to approach to the principle of sustainability. Firstly, it is explained in response to pressures from various external groups such as customers, regulatory bodies, non-governmental organizations, and even their own employees (Linton, J.D., Klassen, R. & Jayaraman, V., 2007; Carter & Rogers, 2008; Teuteberg, 2010; Gupta & Palsule-Desai, 2011; Rehman & Shrivastava, 2011; Aboelmaged, 2012; Kumar, Teichman & Timpernagel, 2012). Stakeholders are increasingly demanding that organizations address and manage the sustainable issues that are impacted by their operations (Carter, C.R. & Easton, P.L., 2011; Kumar, Teichman & Timpernagel, 2012). Secondly, legislation has changed worldwide over the last decades, becoming stricter to issues of environmental protection (Theyel, 2001; Zhu, Q. & Sarkis, J., 2004; Kumar, Teichman & Timpernagel, 2012). Consequently, countries have adopted new rules governing human and business activities (Linton, J.D., Klassen, R. & Jayaraman, V., 2007). Thirdly, companies and organizations recognize the global warming as a societal issue and they are aware that the change must start from their work (Srivastava, 2007; Linton, J.D., Klassen, R. & Jayaraman, V., 2007).

Maintaining the WCED definition, Shrivastava (1995) defines sustainability as the potential for reducing long term risks associated with resource depletion, fluctuations in energy costs, product liabilities, and pollution and waste management. The author notes five key elements that may drive business companies to become more sustainable such as resources, energy, product, pollution and waste. The interpretation of Shrivastava is connected to the environmental sphere. Sustainable development is often reduced to environmental improvements (Carter, C.R. & Rogers, D.S., 2008; Seuring, S. & Müller, M., 2008). Literature has similarly often considered sustainability from this ecological perspective without explicit incorporation of the social aspects of sustainability (Sarkis, 2001; Hill, 2001; Daily and Huang, 2001). Carter & Rogers (2008) claim the definitions of sustainability in the engineering literature have been more encompassing, and have

explicitly incorporated the social, environmental, and economic dimensions of the macro-viewpoint by defining organizational sustainability as, “a wise balance among economic development, environmental stewardship, and social equity,” (Sikdar, 2003) and as including “... equal weightings for economic stability, ecological compatibility and social equilibrium,” (Gonczi et al., 2007).

Sustainability is also considered as a driver for profitability. Kumar, Teichman & Timpernagel (2012) believe that making sustainability a priority in managerial decisions is more than dealing with risk and uncertainty. Companies have to view sustainability as an integral part of decision-making, rather than a constraint (Gupta et al., 2011). It drives companies to save costs, increase efficiency and gain new customers and suppliers. Besides, it incorporates the potential to achieve a competitive advantage and to make profits (Porter & Van der Linde 1995; Seuring, S. et al., 2008; Kumar, Teichman & Timpernagel, 2012).

Sustainability has been referred to the topic of Supply Chain Management. The attention is moved from local optimization of environmental factors to consideration of the entire supply chain during the production, consumption, customer service and post-disposal disposition of products (Linton, Klassen, & Jayaraman, 2007). In particular, many researchers and practitioners have focused on environmental problems arising from business operations. Greening the supply chain has emerged as an important issue in the process of industrial development (Srivastava, 2007; Minhaj, Rehman & Shrivastava, 2011). Gupta & Palsule-Desai (2011) believe supply chains must pay attention to environmental impact across the entire value chain, including those of suppliers, distributors, partners and customers: “Firms’ view of sustainability must transcend a narrow functional perspective and encompass a broader view that integrates issues, problems and solutions across functional boundaries”.

As mentioned in the previous paragraph, most studies have considered sustainability from the ecological point of view. Therefore, focusing on the environmental factor, many researchers have linked the word “green” to the topic of supply chain management, defining it as Green Supply Chain Management (GSCM) (Hassini, 2012).

In a recent literature review, Zhu & Sarkis (2004) explore the concept of Green Supply Chain Management, gathering definitions that consider

- the purchasing function’s involvement in activities that include reduction, recycling, reuse and the substitution of materials (Narasimhan and Carter, 1998);

- the environmental effects of the researching developing, manufacturing, storing, transporting, and using a product, as well as disposing of the product waste_(Messelbeck and Whaley, 1999);

- the practice of monitoring and improving environmental performance (Godfrey, 1998)

- innovations in the context of the environment (Green et al., 1996).

GSCM can be seen as the sum of green purchasing, manufacturing/materials management, distribution/marketing and reverse logistics when addressing all these functions into a more environmental and thus sustainable 'green' context, (Hervani et al. 2005; Kumar, Teichman & Timpornagel, 2012). According to this, Srivastava (2007) defines GSCM as the integration of environmental thinking into supply chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life.

However, considering supply chain management from an ecological perspective may be limiting (Carter & Rogers, 2008; Seuring & Müller, 2008). It is necessary to consider society and economic performance as factors that influence the achievement of sustainability. In fact, the concept of sustainability, as depicted by Elkington (1998) in his triple bottom line figure, must refer to an integration of social, environmental, and economic responsibilities . As GSCM, researchers and practitioners use Sustainable Supply Chain Management (SSCM) as a comparable definition but, this time, it incorporates a deeper perspective of sustainability, consisting of the intersection of those three aspects previously mentioned. Therefore, a supply chain is considered sustainable when all its activities and operations find a right balance between environmental, social and economic factors (Carter & Rogers, 2008; Seuring et al., 2008 (a) Seuring & Müller, 2008 (b); Carter, C.R. & Easton, P.L., 2011; Rogers, 2011; Gupta et al., 2011; Blackhurst et al., 2012).

Carter and Rogers (2008) integrate the triple bottom line with four supporting facets such as

- Strategy: it incorporates actions and initiatives aimed at achieving sustainability within the supply chain;

- Risk management: a plan to identify social, environmental and economic risks along the supply chain;

• Transparency: the information movement up and down the supply chain may increase the coordination of all supply chain operations, improve the relationship among each member and drive the whole supply chain to better performance without wrongdoings;

• Organizational culture: a sharing system of social, environmental and economic values built within a supply chain may stimulate people to work better and to achieve important goals.

Following Elkington's triple bottom line, Carter & Rogers (2008) define SSCM as the strategic, transparent integration and achievement of an organization's social, environmental, and economic goals in the systemic coordination of key interorganizational business processes for improving the long-term economic performance of the individual company and its supply chains. The adoption of sustainable responsibilities can drive supply chain to achieve better economic outcomes in short and long term. Firms which attempt to simultaneously maximize performance of all three dimensions of the triple bottom line will outperform organizations that attempt to only maximize economic performance, or companies that attempt to achieve high levels of social and environmental performance without explicit consideration of economic performance (Carter and Rogers, 2008).

Making a supply chain green and sustainable can save resources, eliminate waste and improve productivity (Porter and Van Der Linde 1995; Srivastava, 2007; Kumar, S., Teichman, S. & Timpernagel, T., 2012). In fact, the adoption of the triple bottom line drives firms to cost savings from packaging reduction, green design, reuse and recycling; health and safety goals due to green transportation, clean warehousing, working improvements; labor cost reduction as the effect of the increase in employment motivation and productivity; operating cost decrease, lead times shortness, and product quality improvement associated with the implementation of ISO 14000 standards; and corporate image growth as the result of ethical business purposes recognized by suppliers and customers (Carter & Rogers, 2008; Carter & Easton, 2011; Kumar, S., Teichman, S. & Timpernagel, T., 2012). What's more, it can potentially increase efficiency and flexibility (Wilkerson 2005). Furthermore, firms that adopt the triple bottom line may develop new sustainable goods and services cooperating with their supply chain partners and involve their stakeholders in making supply chain decisions (Kummer et al. 2006). According to this, Seuring, S. et al. (2008) give their SSCM definition, highlighting the

importance of relations with supply chain partners: cooperation along the supply chain is a key element in fulfilling environmental and social criteria as well as meeting customer needs is determinant to maintain competitiveness and economic performance.

Another SSCM definition, provided by Hassini, Surti & Searcy (2012), takes profitability into consideration. They define sustainable supply chain management as the management of supply chain operations, resources, information, and funds in order to maximize the supply chain profitability while at the same time minimizing the environmental impacts and maximizing the social well-being. Milton Friedman said that the primary social responsibility of business is to increase its profits (Rogers, 2011).

2.3 Knowledge Management

Knowledge has long been viewed as a vital intangible tool for the development of firms. It is a key element to understand firms' behaviour (Eisenhardt and Martin, 2000; Grandori and Kogut, 2002). Knowledge management (KM) guides business companies to better develop skills and capabilities and achieve a competitive advantage (Robinson et al., 2006). Drucker (1999) claims the main purpose of KM is to manage the amount of firm's competencies and skills and align it to business objectives and targets: it is a crucial driver to create value and it is defined as a process of creating, acquiring, capturing, sharing and using knowledge to enhance learning and performance in organizations (Scarbrough et al., 1999; Davenport & Prusak, 2000). Over the last decades, with the increase of studies in SCM, Knowledge Management has been juxtaposing with it. After all, only supply chains compete nowadays, not single companies (Christopher et al., 2006). Researchers and practitioners have explored both topics assessing the possible common links. Knowledge Management is a strategic supply chain tool. Its implementation may bring benefit across each stage of a chain (Hansen et al., 2002). The common sharing of skills and capabilities among each supply chain member may support a better use of business resource, increase productivity and decrease disruptions. A supply chain based on a shared system of values and competencies can only improve cooperation and bring motivation to each unit. In a study case conducted by Dyer and Nobeoka (2000), it is demonstrated that Toyota, allowing its employees to participate and share knowledge within the whole supply chain, achieves motivation and cooperation, and limits opportunism.

In his work, Robinson et al. (2006) demonstrates sustainability is strictly linked to knowledge management. Achieving sustainability in a supply chain requires a good KM strategy (Peterson, 2009). He provides a framework named “STEPS Maturity roadmap” in which defines all stages and activities to perform KM and enhance sustainable goals.

Despite the idea that KM can drive firms to successful performance (Hult et al., 2007; Fugate et al., 2009; Blackhurst et al., 2012), sharing knowledge, either in a business entity or in a supply chain (where more business entities are involved), is difficult. The main barrier is organisational culture considered as one of the most crucial factors (Robinson et al., 2006). Coordinating people and/or units with different cultural background require efforts.

More academic contributions from researchers and practitioners are necessary to assess the impact of KM on SCM. Particularly, further research is needed to explore the alignment of KM strategies with SC performance (Corso et al., 2010; Marra et al., 2012) and the concept of sustainability (Robinson et al., 2006).

2.4 Theoretical Framework

Starting from what is missing, this paper explores the topics of KM and SC within the principles of Sustainability. It provides a theoretical framework (Figure 1) in which it is highlighted how a sustainable knowledge management, in moderating a supply chain strategy, asset and inventory, can achieve successful performance in terms of revenues and costs.

Having a strong knowledge management within a supply chain strategy and business operations is a successful pattern. Generally speaking, a supply chain may improve if it shares all information and knowledge within each stage. This framework shows that a KM oriented to sustainability, if implemented within a supply chain strategy, either responsive or efficient, and a supply chain Asset and Inventory Management, may drive firms to successful outcomes in terms of revenue and costs.

Inventory is what is being passed along a supply chain (Chopra & Meindl, 2007), Asset is what is being used along a supply chain production system and Supply Chain Strategy is how is being planned. These supply chain elements are strictly connected one to another.

A Supply Chain Strategy is critical in making decisions for growth and developing SC should be approached with regards to the firm’s market strategies and priorities

(Christopher et al., 2006; Sharifi, 2013). It should be tailored to match the required “order winning criteria” in the market place (Ambe, 2010; Sharifi, 2013). These “order winning criteria” represent the key point to be better than competitors in a marketplace. Nowadays, facing competition does not mean being as good as competitors anymore. A supply chain has to achieve distinctive competencies, which are recognized as winning skills by customers and competitors. The fundamental changes in the environment require companies to develop supply chain strategies that are aligned to appropriate value propositions and customer markets (Ambe, 2010). Today, making a supply chain green and sustainable can save resources, eliminate waste and improve productivity and performance (Porter and Van Der Linde 1995a, 1995b; Srivastava, 2007; Kumar, S., Teichman, S. & Timpernagel, T., 2012). Furthermore, sustainability is recognized among customers as a synonym of success. Combining sustainability with a good SC strategy is worthy. In order to enhance this combination, all business units within a supply chain may share information oriented to sustainability. Therefore, training supplier with principles of sustainability, sharing a green and technology know-how among stakeholders and collaborating with environmental partners represent the pillar on which to base such combination.

Asset Management refers to a process of monitoring of tangible and intangible goods to a business unit or group. Managing assets effectively may achieve better return in terms of operating performance. It is strongly related to the facility system because it includes the monitoring of plant and equipment.

Inventory Management is the process of monitoring inputs, stored or used in a production system and outputs, stored and sold to customers. Inventory impacts all activities along a supply chain. A good Inventory Management may improve supply chain performance and avoid disruptions and risks. In doing this, a perfect knowledge management is necessary; and if KM is oriented to sustainability, the occurring outcomes are socially, economically and environmentally sustainable.

A Sustainable Knowledge Management is meant as the process by which sustainable information are shared within each business unit or entity. Sustainable information are about making a firm aware of disseminating a culture oriented to achieve social, economic and environmental goals. A sustainable KM, as a moderating effect of supply chain components driven to successful outcomes, should include:

- Supplier ESG Training: it represents a company provision in training on environmental, social or governance factors for its suppliers;
- Environmental Partnerships: it reports on partnerships or initiatives with specialized NGOs, industry organizations, governmental or non-governmental organizations that focus on improving environmental issues
- Technology Know-How Sharing: it measures a company voluntary sharing of licenses, patents, intellectual property or useful technology within a supply chain

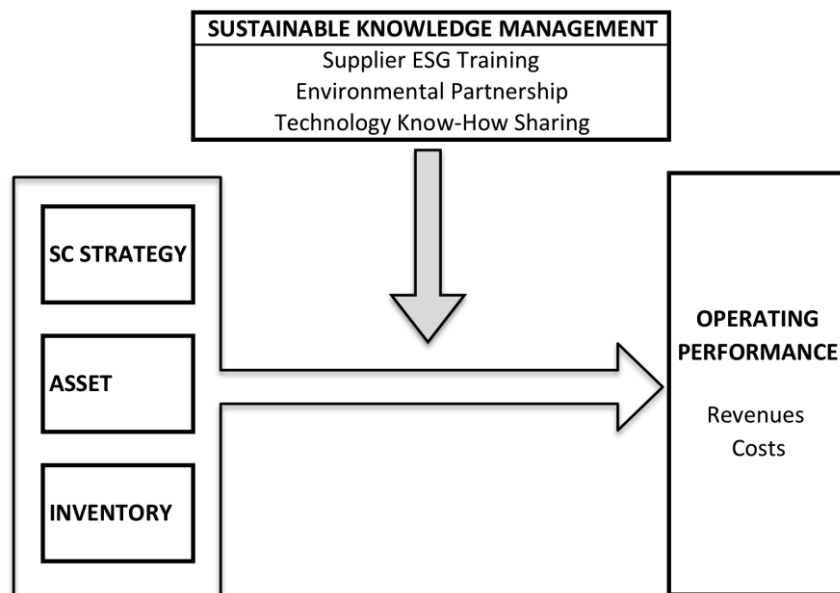


Figure 1 Theoretical Framework

3 Methodology

3.1 Research Objectives

This research attempts to assess how KM oriented to sustainability may effectively moderated on the relation between Asset Management, Inventory Management, Supply chain Strategy and Operating Outcomes (i.e. revenues and costs). Before evaluating these

hypothesis, this analysis firstly assesses how Asset Turnover Ratio, Days of Inventory Ratio and Supply Chain Strategy may relate to revenues and costs in a supply chain and, consequently, if they improve operating performance. This section discuss the data collection and the statistical testing of the following hypothesis:

H1: Asset Turnover Ratio improves operating performance

H2: Days of Inventory Ratio improves operating Performance

H3: Supply Chain Strategy (oriented to efficiency or responsiveness) improves operating performance

H4: Sustainable Knowledge Performance as moderating effects of Supply Chain Strategy improves operating outcomes

H5: Sustainable Knowledge Performance as moderating effects of Inventory Management improves operating outcomes

H6: Sustainable Knowledge Performance as moderating effects of Asset Management improves operating outcomes

3.2 Research Methodology

This paper is based on a study of global business companies operating in different sectors such as beverages, food and drug retailers, food producers, general retailers, household goods and home construction, leisure goods, personal goods and tobacco (ICB source). All these sectors belong to main industry categories, Consumer Goods and Consumer Services. In order to make this research easier, it is only considered the ICB industry classification as a dummy variable named “dINDUSTRY”; therefore, the ICB indicator classified by sectors is excluded. Using as a criterion Forbes List 2013 of Global 2000 Biggest Public Companies screened in four metrics (i.e. sales, profit, assets and market value), the sample frame has been restricted to 215 firms. The data for company performance were extracted from Thompson Reuters Datastream Software over a period of ten years, from 2003 to 2012: specifically, Asset 4 ESG Data for social, environmental and economic data points and Worldscope for financial indicators. The sample frame comprises 2150 discrete datasets. Social, environmental and economic data points collected from Asset 4 ESG Database do not cover all analysed period of time, due to the recent global companies’ awareness in performing sustainability reports. Therefore, the panel data results unbalanced. In order to simplify data analysis and minimize errors, we calculated a standard score for Supplier ESG Training, Environmental Partnerships and

Technology Know-How Sharing Performance basing on the mean of the sample. Supply Chain Strategy (SC Strategy) binary variables have been built considering three financial indicators such as Ebitda Margin, Asset Turnover and Inventory Turnover and their deviation from their own mean value. Each financial indicator has been calculated for each company included in the sample frame, extracting data from Worldscope over a period of ten years (from 2003 to 2012); subsequently, a mean value for each indicator has been provided, considering the industry classification factor. A value of 1 has been assigned to companies that had a more efficient strategic orientation. Specifically, a value of 1 has been given when:

- $Ebitda\ Margin_{nt} \geq \mu_{Ebitda\ Margin}$ $n = Company, t = Year$
- $Asset\ Turnover_{nt} \geq \mu_{Asset\ Turnover}$ $n = Company, t = Year$
- $Inventory\ Turnover_{nt} \geq \mu_{Inventory\ Turnover}$ $n = Company, t = Year$

All variables have been transformed in logarithm in order to minimize the range of data (except for Supply Chain Strategy Indicator, either efficient and responsive, and dummy industry).

3.3 Statistical Method

In order to test our hypothesis, we conducted the analysis using a pooled OLS regression for linear panel data on Stata Statistical Software. This model generates a Driscoll & Kraay standard error that is robust to general forms of cross-sectional and temporal dependence when the time dimension is large (De Hoyos & Sarafidis, 2006). This approach eliminates the inaccuracies arising from the use of the Parks-Kmenta and Becks-Kats methods, which are unsuitable for microeconomic panel with a large cross-sectional dimension N. This statistical method works for panel data both balanced and unbalanced. Pooled OLS regression was performed in order to describe a link between economic outcomes and financial and operational indicators, moderated by sustainable knowledge variables.

3.4 Regression Analysis And Results

The regression analysis assesses two different dependent variables: firstly, net sales and revenues and, secondly, cost of good sold. As independent variables, this study includes some financial ratios (i.e. Asset Turnover and Days of Inventory), a supply chain

strategy indicator (i.e. a measurement of Efficient and Responsive Supply Chain) and some sustainable metrics related to training, partnerships and information technology (i.e. Supplier ESG Training, Environmental Partnerships and Technology Know-How Sharing). All these data have been combined in order to evaluate the hypothesis. For all models, Market Value and Financial Leverage are mentioned as regressands, as well as a dummy variable related to industry classification.

Table 1 shows a Pooled OLS regression with a Driscoll and Kraay standard error using Net Sales variable as a regressor. For each independent variable, four regression models are provided in four columns. This study separately analyses the regression models of Asset Turnover Ratio, Days of Inventory and Supply Chain Strategy oriented to efficiency or responsiveness. Financial Leverage and Market value are mentioned as control variables, as well as a dummy variables classified by industry are mentioned per each model.

NET SALES	coeff.	t	coeff.	t	coeff.	t	coeff.	t
CONSTANT	7,161523	58,07 ***	9,596488	149,62 ***	8,03252	144,63 ***	7,710789	196,9 ***
ASST	1,634152	14,82 ***						
DOI			-0,889166	-13,62 ***				
SCEFF					-0,3217308	-10,97 ***		
SCRESP							0,3217308	10,97 ***
FINLEV	0,6568	20,59 ***	0,4418888	20,58 ***	0,5522103	24,25 ***	0,5522103	24,25 ***
MKTVAL	2,253088	219,09 ***	2,16926	218,91 ***	2,173645	163,36 ***	2,173645	163,36 ***
dINDUSTRY	-0,145539	-1,72 †	-0,421631	-8,42 ***	-0,5871444	-9,93 ***	-0,5871444	-9,93 ***
obs	1787		1762		1787		1787	
N. of groups	211		209		211		211	
F	31880,92		40952,55		53375,92		53375,92	
Prob>F	0		0		0		0	
R2	0,8936		0,8933		0,8751		0,8751	
Root MSE	0,757		0,7598		0,82		0,82	

LEGEND	p<0.1	†
	p<0.05	*
	p<0.01	**
	p<0.001	***

Notes:
NET SALES= Net Sales; CONST=constant; ASST=Asset Turnover; DOI=Days of Inventory; SCEFF=Supply chain Efficiency; SCRESP=Supply Chain Responsiveness; FINLEV=Fonancial Leverage; MKTVAL=Market Value; dINDUSTRY=dummy Industry.

Table 1 Regression Table

All four models are statistically significant ($p<0.001$) and high reliable (R-square between 0.88 and 0.89). All four independent variables affect net sales ($p<0.001$), as well as Financial Leverage and Market Value ($p<0.001$). Particularly, on one hand there is a positive relation between the dependent variable and Asset Turnover and Supply Chain

Responsiveness; on the other hand there is a negative relation between Net Sales and Days of Inventory and Supply Chain Efficiency. The dummy variable (dINDUSTRY) is significant for all models and negatively affect the variable Net Sales; referring only to the first regression model, the dummy variable is weakly significant.

Table 2 is as structured as Table 1. It shows a Pooled OLS regression with a Driscoll and Kraay standard error using Cost of Goods Sold (COGS) as a dependent variable, instead of Net Sales. For each independent variable, four regression models are provided in four columns. The regression models of Asset Turnover Ratio, Days of Inventory and Supply Chain Strategy oriented to efficiency or responsiveness are separately evaluated. Financial Leverage and Market value are mentioned as control variables, as well as a dummy variables classified by industry are mentioned per each model.

COGS	coeff.	t	coeff.	t	coeff.	t	coeff.	t
CONSTANT	6,624766	47,49 ***	10,08962	114,94 ***	7,837989	154,87 ***	7,440003	224,67 ***
ASST	2,298816	14,56 ***						
DOI			-1,280386	-15,92 ***				
SCEFF					-0,3979858	-14,45 ***		
SCRESP							0,3979858	14,45 ***
FINLEV	0,7366325	17,91 ***	0,431672	14,45 ***	0,5836713	21,7 ***	0,5836713	21,7 ***
MKTVAL	2,241139	206,62 ***	2,127488	187,7 ***	2,129987	125,79 ***	2,129987	125,79 ***
dINDUSTRY	-0,2025581	-2,03 *	-0,5905152	-14,23 ***	-0,8243	-13,14 ***	-0,8243	-13,14 ***
obs	1787		1762		1787		1787	
N. of groups	211		209		211		211	
F	23633,65		33204,54		34675,56		34675,56	
Prob>F	0		0		0		0	
R2	0,8481		0,8525		0,8118		0,8118	
Root MSE	0,9245		0,9124		1,0292		1,0292	

LEGEND	p<0.1	†
	p<0.05	*
	p<0.01	**
	p<0.001	***

Notes:
 COGS=Cost of Goods Sold; CONST=constant; ASST=Asset Turnover; DOI=Days of Inventory; SCEFF=Supply chain Efficiency; SCRESP=Supply Chain Responsiveness;
 FINLEV=Financial Leverage; MKTVAL=Market Value; dINDUSTRY=dummy Industry.

Table 2 Regression Table

All four models are statistically significant ($p < 0.001$) and high reliable (R-square between 0.81 and 0.85). All four independent variables affect COGS ($p < 0.001$), as well as Financial Leverage and Market Value ($p < 0.001$). Particularly, on one hand there is a positive relation between the dependent variable and Asset Turnover and Supply Chain Responsiveness; on the other hand there is a negative relation between Cost of Goods

Sold and Days of Inventory and Supply Chain Efficiency. The dummy variable (dINDUSTRY) is strongly significant for all models and affect negatively the dependent variable.

Table 3 shows a Driscoll and Kraay standard error regression method with two dependent variables (i.e. Net sales and Cost of Goods sold) and a main independent variable (Asset Turnover). Three models are provided for each regressor. These display the interactions between Asset Turnover Ratio and three different metrics related to sustainable knowledge performance (Supplier ESG Training, Environmental Partnerships and Technology Know-how Sharing). Each model includes two financial indicators (Market Value, Financial Leverage) as control variables, and a dummy variable based on ICB Industry classification.

NET SALES	coeff.	t	coeff.	t	coeff.	t	COGS	coeff.	t	coeff.	t	coeff.	t
CONSTANT	7,2196	43,7 ***	7,1664	46,22 ***	7,9272	43,36 ***	CONSTANT	6,6443	31,9 ***	6,535	35,72 ***	7,5126	34,75 ***
ASST	1,5319	20,81 ***	1,3499	13,43 ***	3,4522	5,91 ***	ASST	2,1616	13,85 ***	2,155	14,16 ***	4,9739	7,86 ***
SESGT	-0,0444	-0,71					SESGT	-0,0907	-3,3 ***				
EP			0,1308	3,57 ***			EP			0,210	5,6 ***		
TKHS					-1,6386	-22,84 ***	TKHS					-2,0527	-26,92 ***
ASST#SESGT	0,1624	5,21 ***					ASST#SESGT	0,3669	2,21 *				
ASST#EP			0,5176	3,39 **			ASST#EP			0,391	2,09 *		
ASST#TKHS					-3,9767	-3,48 ***	ASST#TKHS					-5,6898	-5,16 ***
FINLEV	0,4968	16,24 ***	0,4771	18,12 ***	0,5043	15,03 ***	FINLEV	0,5722	18,71 ***	0,552	18,05 ***	0,5831	19,02 ***
MKTVAL	2,2544	110,11 ***	2,2462	106,09 ***	2,2579	118,2 *	MKTVAL	2,2541	105,91 ***	2,243	101,22 ***	2,2585	115,86 ***
dINDUSTRY	-0,2002	-2,66 **	-0,1988	-2,52 *	-0,1713	-2,48 ***	dINDUSTRY	-0,2560	-2,91 **	-0,258	-2,8 **	-0,2205	-2,72 **
obs	1464		1464		1464		obs	1464		1464		1464	
N. of groups	211		211		211		N. of groups	211		211		211	
F	212991,72		14561,31		24777,92		F	357226,95		23628,94		36966,87	
Prob>F	0		0		0		Prob>F	0		0		0	
R2	0,8866		0,8875		0,8893		R2	0,8371		0,8383		0,8411	
Root MSE	0,7429		0,7398		0,7339		Root MSE	0,9196		0,9162		0,9083	

LEGEND	
	p<0.1 †
	p<0.05 *
	p<0.01 **
	p<0.001 ***

Notes:
NET SALES=Net Sales; COGS=Cost of Goods Sold; CONST=constant; ASST=Asset Turnover; SESGT=Supplier ESG Training; EP=Environmental Partnerships; TKHS=Technology Know-How Sharing; ASST#SESGT=interaction between ASST and SEGT; ASST#EP=interaction between ASST and EP; ASST#TKHS=interaction between ASST and TKHS; FINLEV=Financial Leverage; MKTVAL=Market Value; dINDUSTRY=dummy Industry.

Table 3 Regression Table

Referring to Net Sales as regressor, all three models are statistically significant (p-value<0.001) and reliable (R-square 0,89). Four companies have been cancelled due to the lack of data. Each interaction strongly affects business revenues (p-value<0.001), as well as Financial Leverage and Market Value. All other variables are statistically important, except for Supplier ESG Training (SESGT) in the first model. All interaction positively affect Net sales, except in the third model, where an increase of ASST#TKHS determines an increment of the dependent variable. Implementing Technology Know-How Sharing within a supply chain asset management seems not to be helpful in

improving economic performance. Similarly, where the dependent variable is Cost of Goods Sold, all three models show high significance (p-value<0.001) and reliability (R-square 0,84 approximately). Four companies have been cancelled due to the lack of data. The interaction effects are statistically important in affecting costs (p-value<0.001). The same consideration in terms of interactions' results may be also applied for this case. All moderations positively affect COGS, except for ASST#TKHS where the relation is negative; however, the latter result is not pessimistic: in fact, its increase determines a decrease in COGS that is very good in terms of operating outcomes. And, comparing the effect of this interaction with Net Sales firstly and COGS then, the emerging negative relation is not unfavourable. Financial Leverage and Market Value are also significant variables (p-value<0.001) and positively affect the dependent variables. The dummy variable has a negative relation, instead.

Table 4 displays the same regression using the same dependent variables (Net Sales and Cost of Goods Sold). It diverges from Table 3 because a different independent variable (Days of Inventory Ratio) is mentioned. The structure is similar: it covers the interaction between Days of Inventory ratio with three sustainable knowledge metrics previously mentioned, through three models per each regressor. As control variables, Financial Leverage and Market Value have been incorporated. The analysis includes a dummy variable related to industry.

NET SALES							COGS						
	coeff.	t	coeff.	t	coeff.	t	coeff.	t	coeff.	t	coeff.	t	
CONSTANT	9,5067	44,66 ***	9,4198	31,88 ***	11,3536	13,57 ***	9,7265	50,1 ***	10,005	27,6 ***	12,5484	14,44 ***	
DOI	-0,7741	-7,95 ***	-0,7686	-5,21 ***	-1,4022	-2,95 **	-1,0075	-12,32 ***	-1,218	-6,81 ***	-2,0815	-4,24 ***	
SESGT	0,4743	1,98 *					1,0660	4,93 ***					
EP			0,5111	1,52					0,378	0,88			
TKHS					-3,4849	-1,84					-4,9729	-2,49 *	
DOI#SESGT	-0,3290	-2 *					-0,6976	-5,11 ***					
DOI#EP			-0,2774	-1,57					-0,210	-0,89			
DOI#TKHS					0,9885	0,95					1,5614	1,42	
FINLEV	0,2831	6,09 ***	0,2843	7,25 ***	0,2753	5,82 ***	0,2688	5,81 ***	0,263	7,91 ***	0,2565	5,38 ***	
MKTVAL	2,1634	117,84 ***	2,1660	114,4 ***	2,1654	120,08 ***	2,1286	124,14 ***	2,131	114,96 ***	2,1314	126,75 ***	
dINDUSTRY	-0,4561	-10,43 ***	-0,4618	-9,51 ***	-0,4267	-10,32 ***	-0,6369	-19,07 ***	-0,644	-17,37 ***	-0,6015	-18,72 ***	
obs	1439		1439		1439		1439		1439		1439		
N. of groups	209		209		209		209		209		209		
F	147828,74		20401,91		20074,68		98749,56		17121,25		26021,69		
Prob>F	0		0		0		0		0		0		
R2	0,8899		0,8898		0,8926		0,8474		0,8468		0,851		
Root MSE	0,7335		0,7337		0,7245		0,8909		0,8926		0,8803		

LEGEND	p<0.1 †
	p<0.05 *
	p<0.01 **
	p<0.001 ***

Notes:
NET SALES=Net Sales; COGS=Cost of Goods Sold; CONST=constant; DOI=Days of Inventory; SESGT=Supplier ESG Training; EP=Environmental Partnerships; TKHS=Technology Know-How Sharing; DOI#SESGT=interaction effect between DOI and SESGT; DOI#EP=interaction effect between DOI and EP; DOI#TKHS=interaction effect between DOI and TKHS; FINLEV=Financial Leverage; MKTVAL=Market Value; dINDUSTRY=dummy Industry.

Table 4 Regression Table

Where Net Sales is a regressor, all three models are strongly significant (p-value<0.001) and reliable (R-square equals to 0,89). Six companies have been cancelled from the regression, due to the lack of sustainable knowledge management data. The variable Days of Inventory is statistically important (p<0.001) and negatively affect the dependent variable. Focusing on all interactions of each model, only the interaction between Days of Inventory and Supplier ESG Training has a weak significance (p<0,05) and negatively affects the relation. Financial Leverage, Market Value and Dummy Industry are statistically effective (p-value<0.001).

Similarly, where the dependent variable is Cost of Goods Sold, all three models show high significance (p-value<0.001) and reliability (R-square around 0,85). Stata software eliminated six companies from the sample frame, due to the lack of data. The variable Days of Inventory is statistically important (p<0.001). Equally to the previous analysis, the interaction between Days of Inventory (DOI) and Supplier ESG Training (SESGT) is the only one to be statistically significant and affects COGS in a negative way. This result explains how Inventory management if moderated by Suppliers' training in sustainability, improves a supply chain operating performance. An eventual increase of this interaction induces a decrease in costs more than a reduction in revenues. Financial Leverage, Market Value and Dummy Industry are strongly important in each model (p<0.001).

Table 5 follows the same structure of Tables 3 and 4. Supply Chain Efficiency is here analysed. Three moderating effects are provided, using the indicator of Supply Chain Strategy with three sustainable KM metrics. Furthermore, the analysis includes the same control variables and a dummy variable of Tables 3 and 4.

NET SALES							COGS						
	coeff.	t	coeff.	t	coeff.	t		coeff.	t	coeff.	t	coeff.	t
CONSTANT	8,0461	68,52 ***	7,9939	68,78 ***	8,8021	37,56 ***	CONSTANT	7,8400	57,9 ***	7,740	59,36 ***	8,7283	34,3 ***
SCEFF	-0,4668	-5,07 ***	-0,3614	-3,12 **	-0,6667	-4,76 ***	SCEFF	-0,6497	-5,02 ***	-0,427	-3,23 ***	-0,7687	-4,88 ***
SESGT	-0,0677	-0,85					SESGT	-0,1410	-2,21 *				
EP			0,0417	0,71			EP			0,057	0,76		
TKHS					-1,7611	-5,17 ***	TKHS					-2,1525	-6,09 ***
SCEFF#SESGT	0,2542	1,77 †					SCEFF#SESGT	0,5028	2,32 *				
SCEFF#EP			0,0520	0,23			SCEFF#EP			0,073	0,29		
SCEFF#TKHS					0,7660	2,21 *	SCEFF#TKHS					0,8812	2,38 *
FINLEV	0,4088	6,03 ***	0,4033	6,54 ***	0,3971	6,01 ***	FINLEV	0,4321	5,38 ***	0,423	5,6 ***	0,4167	5,29 ***
MKTVAL	2,1836	137,61 ***	2,1826	139,81 ***	2,1874	147,53 ***	MKTVAL	2,1514	146,81 ***	2,151	147,2 ***	2,1572	163,3 ***
dINDUSTRY	-0,6221	-9,37 ***	-0,6233	-9,05 ***	-0,6007	-10,08 ***	dINDUSTRY	-0,8764	-13,43 ***	-0,877	-13,1 ***	-0,8480	-14,97 ***
obs	1464		1464		1464		obs	1464		1464		1464	
N. of groups	211		211		211		N. of groups	211		211		211	
F	43795,73		45696,26		25097,36		F	36443,66		33077,6		30948,67	
Prob>F	0		0		0		Prob>F	0		0		0	
R2	0,8677		0,8677		0,8693		R2	0,797		0,7967		0,7991	
Root MSE	0,8024		0,8025		0,7975		Root MSE	1,0267		1,0273		1,0213	

LEGEND	
	p<0.1 †
	p<0.05 *
	p<0.01 **
	p<0.001 ***

Notes:
NET SALES=Net Sales; COGS=Cost of Goods Sold; CONST=constant; SCEFF=Supply Chain Efficiency; SESGT=Supplier ESG Training; EP=Environmental Partnerships; TKHS=Technology Know-How Sharing; SCEFF#SESGT=interaction between SCEFF and SESGT; SCEFF#EP=interaction between SCEFF and EP; SCEFF#TKHS=interaction between SCEFF and TKHS; FINLEV=Financial Leverage; MKTVAL=Market Value; dINDUSTRY=dummy Industry.

Table 5 Regression Table

Regarding to Net Sales as dependent variable, all three models are strongly significant (p-value<0.001) and reliable (R-square 0,87 approximately). Four companies have been deleted from the regression analysis, due to the lack of data. The interaction between Supply Chain Efficiency and Technology Know-How Sharing (SCEFF#TKHS) and Supplier ESG Training (SCEFF#SESGT) are lightly significant (p<0.1) and positively affect the dependent variable . SCEFF affects the relation in all the models (p<0.001), as well as Financial Leverage, Market Value and dummy Industry. Similarly, where the dependent variable is Cost of Goods Sold, all three models show high significance (p-value<0.001) and reliability (R-square 0,80). The same four companies have been cancelled from the pooled OLS regression, due to the same reason explained previously. The same interactions positively affect the relation, except for the second model where SCEFF#EP is not significant. All control variables are determinant (p<0.001); Financial Leverage and Market Value have a positive relation, while the dummy variable negative affect the dependent variables.

In table 6, the regression focuses on the other side of a supply chain strategy, that is when it is oriented to responsiveness. The selected variables are similar: Net Sales and COGS as dependent variables and SCEFF and its interaction with three sustainable KM metrics as independent variables and Financial Leverage, Market Value and Dummy Industry as control variables.

NET SALES	coeff.	t	coeff.	t	coeff.	t	COGS	coeff.	t	coeff.	t	coeff.	t
CONSTANT	7,5792	93,14 ***	7,6325	73,76 ***	8,1354	81,62 ***	CONSTANT	7,1904	73,17 ***	7,313	70,15 ***	7,9595	75,27 ***
SCRESP	0,4668	5,07 ***	0,3614	3,12 **	0,6667	4,76 ***	SCRESP	0,6497	5,02 ***	0,427	3,23 ***	0,7687	4,88 ***
SESGT	0,1865	1,1					SESGT	0,3618	1,67 †				
EP			0,0937	0,54			EP			0,131	0,71		
TKHS					-0,9951	-26,21 ***	TKHS					-1,2714	-17,73 ***
SCRESP#SESGT	-0,2542	-1,77 †					SCRESP#SESGT	-0,5028	-2,32 *				
SCRESP#EP			-0,0520	-0,23			SCRESP#EP			-0,073	-0,29		
SCRESP#TKHS					-0,7660	-2,21 *	SCRESP#TKHS					-0,8812	-2,38 *
FINLEV	0,4088	6,03 ***	0,4033	6,54 ***	0,3971	6,01 ***	FINLEV	0,4321	5,38 ***	0,423	5,6 ***	0,4167	5,29 ***
MKTVAL	2,1836	137,61 ***	2,1826	139,81 ***	2,1874	147,53 ***	MKTVAL	2,1514	146,81 ***	2,151	147,2 ***	2,1572	163,3 ***
dINDUSTRY	-0,6221	-9,37 ***	-0,6233	-9,05 ***	-0,6007	-10,08 ***	dINDUSTRY	-0,8764	-13,43 ***	-0,877	-13,1 ***	-0,8480	-14,97 ***
obs	1464		1464		1464		obs	1464		1464		1464	
N. of groups	211		211		211		N. of groups	211		211		211	
F	43795,73		45696,26		25097,36		F	36443,66		33077,6		30948,67	
Prob>F	0		0		0		Prob>F	0		0		0	
R2	0,8677		0,8677		0,8693		R2	0,797		0,7967		0,7991	
Root MSE	0,8024		0,8025		0,7975		Root MSE	1,0267		1,0273		1,0213	

LEGEND	
	p<0.1 †
	p<0.05 *
	p<0.01 **
	p<0.001 ***

Notes:
NET SALES=Net Sales; COGS=Cost of Goods Sold; CONST=Constant; SCRESP=Supply Chain Responsiveness; SESGT=Supplier ESG Training; EP=Environmental Partnerships; TKHS=Technology Know-How Sharing; SCRESP#SESGT=interaction effect between SCRESP and SESGT; SCRESP#EP=interaction effect between SCRESP and EP; SCRESP#TKHS=interaction effect between SCRESP and TKHS; FINLEV=Financial Leverage; MKTVAL=Market Value; dINDUSTRY=dummy Industry.

Table 6 Regression Table

All regression models with the regressors Net Sales and COGS are statistically significant ($p < 0.001$) and reliable (R-square 0,87 and 0,80 approximately). Four companies have been cancelled from all regressions, due to the lack of data. The interactions between Supply Chain Responsiveness and Environmental Partnerships are not statistically significant, either where the dependent variable is Net Sales or where it is COGS. All other interactions are significant and positively related to the dependent variables. Financial Leverage, Market Value are strongly important ($p < 0.001$) and directly affect the relation, instead of dummy industry, which is determinant ($p < 0.001$) but negatively correlated.

4 Conclusions, Limitations And Future Research

This research shows how supply chain strategy, asset and inventory management are important to achieve successful goals. All these components of a supply chain are strongly related to revenues and costs. Their increases or decreases affect the relation with the dependent variables. Referring to Asset Turnover, its coefficient positively affects both relations, either when the regressor is Net Sales or when it is COGS. Its increase determines an equal increment of both dependent variables. Therefore, as Asset Turnover increases, revenues and costs raise at the same level. Referring to Days of Inventory, the regression model displays a negative effect: when DOI increases, both regressors decrease. However COGS grows more than revenues. Companies may control their Inventory Management trying to store all stock materials as less days as possible. Considering a supply chain strategy, consumer service and goods companies, if they are oriented to efficiency, can decrease operating costs more than net sales; on the other hand, firms oriented to be responsive raise their costs more than their revenues. This analysis proves previous studies conducted by several researchers in the past (Fisher, 1997; Lee, 2002; Chopra & Meindl, 2007; Christopher, 2007).

When these indicators are moderated by three different metrics that define a KM oriented to sustainability, operating performance improve in a better. Despite the fact some interactions do not have a statistical significance, it is important to claim that training suppliers to sustainability principles, collaborating with environmental partners and sharing a technology Know-How, if implemented within strategy, asset and inventory management, let a supply chain grow sustainably. Specifically, this positive result can be

viewed when all sustainable KM metrics moderate Asset Turnover and Supply Chain Strategy oriented to Responsiveness. When moderated by Supplier ESG Training, Days of Inventory indicator reveals a different trend. Its increase determines a higher decrease in terms of costs. Therefore, consumer service and goods companies may control their stock expenditures if they train their supplier to be sustainable.

The limitation to this paper is that needs to better define a supply chain strategy. Supply Chain Strategy has been calculated from Worldscope Datastream, using financial data. Interviews are needed in order to collect such qualitative data that better define an adopted strategy. A supply Chain Strategy is also based on indicators related to time and order (i.e. order fulfilment lead time, order cycle time, order flexibility, time delivery, customer response time). These additional data help to distinguish a strategy oriented to efficiency from a strategy oriented to responsiveness.

The next stage of this research is to analyse how a sustainable KM metrics may affect transportation and delivery. Transportation is a crucial driver that strongly impact on supply chain performance.

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Modelling Smart Home Environments for energy-efficiency and quality of life.

Raffaele De Rose, Carmelo Felicetti, Cinzia Raso*,

Smart building: la nuova tecnologia per l'efficienza energetica e la qualità della vita (Social Innovation Research Project PON04a3_00506)
Pedro Alvares Cabral, 18
Contrada Lecco, 87036 Rende (CS), Italy

Alberto Michele Felicetti

Department of Mechanical, Energy and Management Engineering,
University of Calabria
Via P. Bucci, 42\C, 87036 Rende (CS), Italy

* *Corresponding author*

Structured Abstract

Purpose – Recent years have been characterized by a growing interest toward sustainability issues. In fact, themes such as a more efficient use of the energy resources have taken a central role in the debate on energy policies of developed countries. In particular, it has been demonstrated that energy efficiency in residential buildings is one of the keys to reducing overall energy consumption and greenhouse emissions. In this work, we propose an innovative system for monitoring and managing energy consumption in “Smart Home Environments” (SHEs), according to the needs of users and to the particular state conditions of the considered environment.

Design/methodology/approach – The paper focuses on a methodological approach to design a SHE based on the following steps:

- Identify and apply technological solutions to provide additional intelligence and connectivity services to existing heterogeneous home devices.
- Define an architecture of SHE, supported by a centralized management system featuring a smart Central Control Unit (CCU) and different peripheral devices of sensing and actuating.
- Define a data management model in order to handle machine-to-machine and machine-to-human interactions.
- Define a set of decision algorithms and interoperability rules to perform energy-control services, basing on quantitative forecasting methodologies for analysis of historical data.

Originality/value – Different approaches to the design of SHEs are emerging in literature, emphasizing the importance of such a type of applications as a mean to guarantee energy and cost saving. However, most of these approaches are essentially focused on the technological issues, relying primarily on the architectural characteristics of the Home Energy Management Systems (HEMS). In this work, we intend to highlight

how a knowledge-based management model can support the design of innovative HEMSs, providing the energy performance improvements of the considered environment and the adaptability to the user's habits and needs.

Practical implications – In line with the goals of Europe 2020 strategy, energy resource saving represent a key issue for sustainable development. Among the various technological solutions for reducing energy consumption in home environments, the so called “Building Automation and Control Systems” (BACS) represent high performance and low impact solutions for energy efficiency. In this context, the proposed system, whose development is ongoing, offers in prospect the opportunity to improve the energy performance and electricity cost saving of residential buildings, featuring at the same time a low architectural impact due to the use of wireless and/or powerline technologies.

Keywords – Smart Home Environment, Sustainability, Energy Efficiency, Home Energy Management System.

Paper type – Academic Research Paper

1 Introduction

Over recent years, interest in aspects related to sustainability and energy saving has been growing dramatically. In fact, the rising energy demand and the growing evidence for the climate change have created an increased need for energy-efficient and energy-saving solutions around the world. Particularly interesting is the context of energy consumption in the buildings sector: nowadays, commercial and residential buildings account for nearly 40% of yearly worldwide energy consumption and are responsible for a similar level of global CO₂ emissions. In particular, houses are becoming one of the major contributors to the countries energy balances: as a matter of fact, it is expected in the near future that the home energy consumption will probably exceed 40% of the total yearly consumption in most of the developed countries (D&R International, 2012). Therefore, energy efficiency in residential buildings is one of the keys to reducing overall energy consumption and greenhouse emissions.

A large number of concepts and solutions can be adopted in order to optimize the energy efficiency in buildings. These include improving the building envelope thermal characteristics, replacing existing heating equipment and household appliances, lighting with higher efficiency devices, and switching to less carbon-intensive fuels for space and domestic hot water heating (Aydinalp et al., 2002). Among the various approaches, Home Energy Management Systems (HEMSs) offer a proven and interesting alternative

to reduce energy consumption in home environments through the monitoring and the managing in real time of most of the home appliances (Niyato, 2012). Moreover, recent developments in ICT offer home devices featuring local intelligence and connectivity services, making such devices “smart objects”, i.e. able to acquire, manage and apply knowledge about an environment, to interact with other smart objects and to adapt their behaviour according to the needs of the home inhabitants (Elmenreich and Egarter, 2012).

Therefore, basing on the paradigm of the Internet of Things (IOT) (Atzori, 2010), it is possible to introduce the concept of “Smart Home Environment” (SHE) as a place where multimedia services are provided to users, while heterogeneous smart appliances are interconnected and interact allowing to save energy, to reduce costs and, at the same time, to improve comfort and safety.

In the scientific literature, different approaches to the design of SHEs are emerging, emphasizing the importance of such a type of applications as a mean to guarantee energy and cost saving. However, most of these approaches are essentially focused on the technological issues, relying primarily on the architectural characteristics of the HEMS (Son et al., 2010; Viani et al., 2013; Han and Lim, 2010).

In this work, we propose an innovative system for monitoring and managing energy consumption in SHEs, according to the needs of users and to the particular state conditions of the considered environment. In particular, we intend to highlight how a knowledge-based management model can support the design and the development of innovative HEMSs, ensuring the energy performance improvements of the considered environment and the adaptability to the user’s habits.

2 Methodological approach for the design of SHEs

The concept of Smart Environment evolves from the definition of Ubiquitous computing that promotes the ideas of “*a physical world that is richly and invisibly interwoven with sensors, actuators, displays, and computational elements, embedded seamlessly in the everyday objects of our lives, and connected through a continuous network*” (Weiser et al., 1999). Therefore, a Smart Home (see Fig.1) can be generally referred to a fully equipped environment, featuring interconnected smart devices and a management software which evaluates the gathered information and makes decisions with the aim of ensuring energy and cost saving, as well as improving comfort and safety.

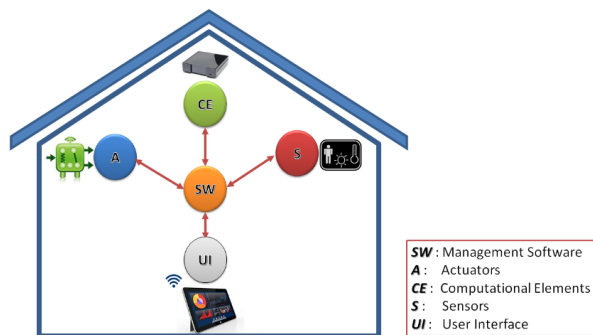


Fig. 1. Typical architecture of a Smart Home

According to these guidelines, the methodological approach adopted for the design of the proposed system is based on the following steps:

- Identification and implementation of technological solutions which provide additional intelligence and connectivity services to existing heterogeneous home devices in order to guarantee their interconnection and interoperability (Perumal et al., 2008).
- Definition of the SHE architecture, based on the use of a centralized management system featuring a central control unit (CCU) and different peripheral devices of sensing and actuating.
- Definition of a data management model for the software of the CCU in order to handle machine-to-machine and machine-to-human interactions (Moreno et al., 2014; Sayuti et al., 2014).
- Define a set of decision algorithms and interoperability rules to perform energy-control services, basing on quantitative forecasting methodologies for analysis of historical data.

3 System architecture

A typical smart home is characterized by a distributed system where heterogeneous devices and appliances need to perform joint execution of tasks in an efficient manner to be really interoperable. Indeed, being distributed architectures, smart home environments need a certain degree of interoperability to manage sub-systems which are usually developed in isolation and thus feature different operating systems and connectivity services (Perumal et al., 2008). Although recent advances in Information and

Communication Technologies (ICT) and Internet of Things (IoT) have led to the development of smart tools intended for smart home environments, the interoperability between typical home appliances still remains an open issue (Chen et al., 2009).

In order to overcome the issue of the interoperability between existing heterogeneous home devices, the proposed system features a centralized architecture model, shown in Fig.2, where the Central Control Unit (CCU) represents the data-aggregation gateway and the decision-making core of the system, allowing the interconnection and the interoperability of different home appliances, sensors and actuators within the smart home environment through powerline and/or wireless technologies. More specifically, the communication between the CCU and the existing heterogeneous home appliances is achieved by the use of a set of smart peripheral devices connected to such appliances, called “smart plugs” in Fig.2, which allows providing additional intelligence and connectivity services to the system. In particular, these smart objects carry out the monitoring of the energy consumption and the managing of the activation/deactivation of the connected electrical appliances.

Moreover, in the proposed model, the CCU communicates with another smart peripheral device, called “smart box” in Fig.2, which carries out the monitoring of the overall energy consumption in the considered home environment. The “smart box” is also able to integrate the energy supplied by the power grid with the energy provided by a local cogeneration system and/or a local energy storage system, and to manage the charging of the latter.

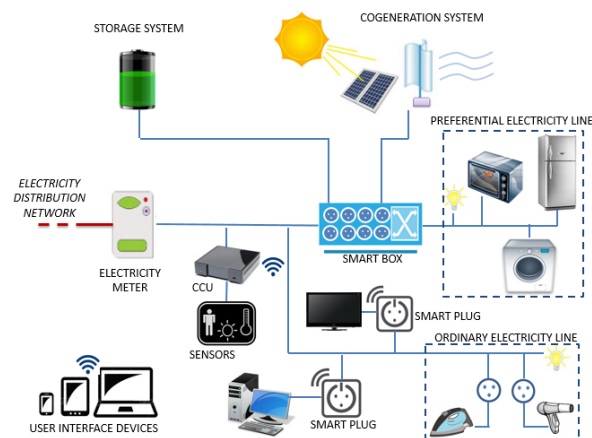


Fig. 2. Architecture of the proposed system

4 Data Management Model

According to the devices' interoperability and the users' needs, the information management is fundamental to achieve efficient solutions for SHEs in terms of energy and cost saving, as well as comfort and safety. In the proposed architecture model, the presence of a set of peripheral devices, such as sensors, smart plugs and smart box, makes available a large amount of data, which need to be collected and handled to make decisions.

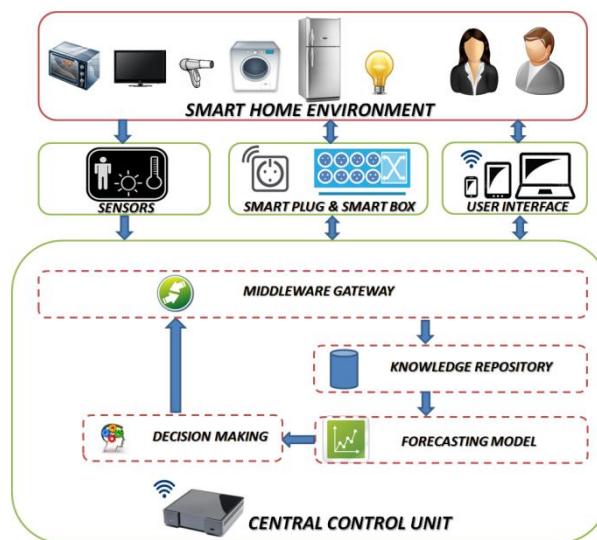


Fig. 3. Flow of information in the proposed knowledge-based management model

To this purpose, we propose a centralized knowledge-based management model, whose dataflow is shown in Fig.3. As already stated, the Central Control Unit (CCU) represents the data-aggregation gateway of the system. Indeed, it interacts with all the peripheral devices of the systems through powerline and/or wireless technologies, and with the users through web-based or mobile interface Apps. Every information related to machine-to-machine and machine-to-human interactions is collected through a Middleware Gateway and stored in real time in the Knowledge Repository. Then, by taking into account the different information categories and devices' functionalities, data from different devices of the system are interpreted and processed by the CCU for achieving smart home interoperability. Thereby, the management system can perform

automatic actions for intelligence-based energy-control services, associated for example to the charging of the energy storage system, to the activation/deactivation of an appliance connected to a smart plug, and so on, with reference to a specific set of decision algorithms and interoperability rules. Clearly, as described in Fig.3, the automated decision-making capability of the proposed system requires the implementation of quantitative forecasting methodologies for analysis of historical data in order to provide the successful prediction of energy consumptions and state conditions of the considered smart home environment and, consequently, the adaptability of the system to the user's habits and needs (Das and Cook, 2005). For example, accurate forecasting allows planning energy-saving and cost-saving actions, such as suggesting which are the best time slots for using some home appliances (e.g., the washing machine, the dishwasher, etc.), or choosing whether to activate/deactivate the electrical appliances connected to the smart plugs, or else suggesting when it is most convenient to recharge and use the energy storage system managed by the smart box or which energy source to be used for charging the energy storage system among those available (i.e., the cogeneration plant or the traditional power grid).

4.1 Forecasting methodologies for home energy consumption

Energy consumption forecasting is greatly challenging. Worldwide energy consumption is rising fast because of the increase in human population, as well as the continuous pressures for better living standards. Forecasting methodologies are essential not only for accurate investment planning of energy production and distribution, but also to promote best practices in energy consumption in smart home environments.

Over the years, different forecasting techniques have been proposed to model the electricity consumption, both in the classical literature on the time series modeling and in the machine intelligence research. In (Feinberg and Genethliou, 2005) and, more recently, in (Hahn et al, 2009), reviews of different forecasting methods are provided. In particular, Hahn et al. distinguish forecasting methods firstly by the time-horizon, highlighting the dominance of short-term load forecasting methods in the scientific literature

Taylor and McSharry (Taylor and McSharry, 2007) discuss short-term load forecasting (from one hour- to one day-ahead) using standard forecasting methods with seasonal autoregressions and exponential smoothing which are also carried out in a periodic fashion by treating each hourly load as a daily time series, while Cottet and

Smith (Cottet and Smith, 2003) adopt Bayesian procedures for forecasting high-dimensional vectors of time series. Mohamed and Bodger (Mohamed and Bodger, 2005) propose a model based on multiple linear regression analysis, taking into account economic and demographic variables, while Al-Ghandoor et al. (Al-Ghandoor et al., 2008) define a forecasting method based on multivariate linear regression of time series in order to identify the main drivers behind electricity consumption.

Zhao and Magoules (Zhao and Magoules, 2012) propose a review on forecasting methods for building energy consumption, classifying forecasting methods into two main categories: classical time series and regression methods, and artificial intelligence and computational intelligence methods, underlining benefits and limits of proposed approaches.

Moreover, several authors (Zhao and Magoules, 2012; Ahmad et. al, 2014) point out the importance of hybrid approaches which combine two or more different approaches in order to overcome some drawbacks of the original methods.

Starting from the approach presented in (Soares and Medeiros, 2008), we propose a hybrid methodology for forecasting energy consumption and appliances utilization in smart home environment by taking into account the quantitative analysis of historical data. In particular, this methodology is based on a deterministic forecasting method (that includes seasonal component and exponential smoothing) for predicting the overall home energy consumption, and a probabilistic approach for forecasting hourly energy consumption of each smart home appliance.

Firstly, in order to define appropriate models for energy consumption forecasting, it is necessary to identify the characteristics of time series related to the historical energy consumption data. Harris and Lon-Mu (Harris and Lon-Mu, 1993) has analysed a 30-years data series from South Eastern States of USA in order to study the dynamic relationships between electricity consumption and other variables, such as weather and user behaviour, finding a high component of seasonality in electricity demand.

Even if the exact shape of the load curve depends on the region, the climatic conditions and the consumers' behaviour, long-term time series (about one year) present a specific seasonality: indeed, the electricity demand is generically high on cold days (due to electric heating), as well as on hot days (due to the increased usage of air-conditioning) (Hippert et al., 2001). In particular, it is possible to observe two seasonal cycles in yearly home energy consumption: an intra-daily cycle (i.e., the daily load curve or load profile)

and a weekly cycle. Because of work habits of house occupants, the weekly cycle usually shows two main groups: weekdays and weekends (Taylor and McSharry, 2007). While in office buildings the operation time is normally in working hours, usually starting from 8am until 17pm, in the residential sector, the electricity usage is maximum in the evening when all family members are at home (Ahmad et al., 2014). Of course, additionally “regular” exceptional cases (e.g. holidays), can be identified (Soares and Medeiros, 2008).

These considerations about characteristics of time series related to home energy consumption lead to choose, among forecasting methods based on quantitative analysis of time series, those that take into account the seasonality component. To this purpose, the standard Holt–Winters exponential smoothing formulation has been extended in order to catch the two seasonal cycles (i.e., intra-daily and weekly) observed in the electricity demand time series. This leads to the introduction of an additional seasonal index in the original formulation, as well as an additional equation for the introduced index.

Let us consider $y_t, t = 1, \dots, T$ as the historical time series of hourly load in a smart home environment. We indicate with D and W , respectively, the intra-daily and the weekly seasonality components. Assuming that $y_t, t = 1, \dots, T$ is a continuous and regular time series, we indicate a and b as the smoothed level and the linear trend in the long run, respectively. Moreover, indicating with C_D the duration of the daily cycle and with C_W the duration of the weekly cycle, we assume, without loss of generality, that the available historical data are sufficient to cover an integer number $k_D = \frac{T}{C_D}$ of daily cycles and an integer number $k_W = \frac{T}{C_W}$ of weekly cycles.

Therefore, the formulation of the chosen forecasting model, based on the multiplicative seasonality, is given by

$$\left\{ \begin{array}{ll} a_t = \alpha \frac{y_t}{D_t W_t} + (1 - \alpha) a_{t-1} + b_{t-1} & t = 1, \dots, T \quad (1) \\ b_t = \beta (a_t - a_{t-1}) + (1 - \beta) b_{t-1} & t = 1, \dots, T \quad (2) \\ D_t = \delta \left(\frac{y_t}{a_{(t-C_D)} W_t} \right) + (1 - \delta) D_{(t-C_D)} & t = C_D + 1, \dots, T \quad (3) \\ W_t = \gamma \left(\frac{y_t}{a_{(t-C_W)} D_t} \right) + (1 - \gamma) W_{(t-C_W)} & t = C_W + 1, \dots, T \quad (4) \\ p_T(\tau) = (a_T + \tau b_T) D_{T+\tau} W_{T+\tau} + \omega^\tau \left(y_T - ((a_{T-1} + b_{T-1}) D_T W_T) \right) & (5) \end{array} \right.$$

Assuming that the forecast origin is T, in equation (5) $p_T(\tau)$ represents the τ -step-ahead forecast, while the term involving ω^τ represents an adjustment for first-order autocorrelation. The smoothing parameters $\alpha, \beta, \delta, \gamma \in [0, 1]$ and ω are estimated in a single procedure by minimizing the sum of squared one step-ahead forecast errors, while the initial values for the level, trend and seasonal components are estimated by averaging the early observations. In our implementation of the method, the duration of the daily and weekly cycles, i.e. C_D and C_W , have been set as follows: $C_D = 24$, $C_W = 168$.

While this approach is useful for appropriately predicting the overall energy consumption in a smart home environment (because of the regularity of the electricity demand time series), such model is not well suited for forecasting the energy consumption of each device/appliance within the SHE, essentially due to the presence of many null values in the time series of single appliances (because of their discontinuous usage). For this reason, in this case, we treat each hour of the day as a separate time series, according to what reported in (Soares and Medeiros, 2008).

Let us assume $A = \{A_1, \dots, A_n\}$ as the set of appliances in our SHE and $J = \{J_1, \dots, J_m\}$ as the set of days accounted in the time series horizon. Therefore, for each appliance A_i , and for each hour h of the day, we consider a binary vector $v^{i,h}$ where each element $v_j^{i,h}$ can assume the following values:

$$\begin{cases} 1 & \text{if the appliance } i \text{ was turned on at hour } h \text{ of the } j\text{-th day} \\ 0 & \text{otherwise} \end{cases}$$

In other words, for each appliance i , we have a set of 24 m -length vectors (where m represents the number of days accounted in the time series horizon), whose $v_j^{i,h}$ elements represents the state (on/off) of the i -th appliance during the h -th hour of the j -th day. Similarly, we consider a vector $w^{i,h}$, where each element $w_j^{i,h}$ contain the load absorbed by A_i during the h -th hour of the j -th day.

In order to identify a certain regularity in the binary sequence $v^{i,h}$, and then predict if the next value (i.e., $m+1$) will be 0 or 1, each vector has to be analysed. Initially, the pattern to be searched has unit length and corresponds to the last value of the vector $v^{i,h}$. Therefore, it is necessary to count the number of times that this pattern is repeated (*count pattern*) in the vector $v^{i,h}$ and the number of times that such pattern is followed in the

sequence by a 1 (*count one*) or a 0 (*count zero*). This allows calculating the probability of the next value as follows:

$$P(0|pattern) = \frac{\text{count zero}}{\text{count pattern}} \qquad P(1|pattern) = \frac{\text{count one}}{\text{count pattern}}$$

This procedure has to be repeated by increasing, in each iteration, the length of the pattern to be recognized (therefore, in the second iteration, the pattern will be composed by the last two values of the vector $v^{i,h}$, in the third iteration by the last three values of $v^{i,h}$, and so on). Of course, the predicted next value will be associated to the one with the highest probability among the various analysed patterns. If such value will be 0, the algorithm stops, otherwise it is necessary to estimate the load $w_{j+1}^{i,h}$ that the appliance A_i will absorb during the next day at the h -th time slot. In this case, we consider the probability distribution of the absorbed load $w^{i,h}$, excluding null entries.

5 Conclusions and future works

In line with the goals of Europe 2020 strategy, energy resource saving represent a key issue for sustainable development. Among the various technological solutions for reducing energy consumption in home environments, the so called “building automation and control systems” (BACS) represent high performance and low impact solutions for energy efficiency. In this context, the proposed system offers in prospect the opportunity to improve the energy performance and electricity cost saving of residential buildings, featuring at the same time a low architectural impact due to the use of wireless and/or powerline technologies. This makes such kind of solution well suitable to existing houses.

The development of the hardware components (such as smart plugs, smart box and Central Control Unit) as well as the knowledge-based management software of the system is still ongoing. Further works will concerns the testing of the system prototype in laboratory and in real home environments with different characteristics in order to validate our SHE architectural framework and the proposed management model in terms of cost and energy saving.

For what concerns the forecasting methodology, we intend to compare the performance of our model with other sophisticated models proposed in literature, such as

the seasonal ARIMA (Autoregressive integrated moving average) models, SVM (Support Vector Machine) and neural network approaches.

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Is crowdfunding a useful way for a sustainable growth of the territory?

Christian Rainero*, Simona Alfiero, Vania Tradori, Silvana Secinaro, Alessandra Indelicato, Francesco Venuti
Department of Management – Collaborative Economy Observatory
University of Turin
Corso Unione Sovietica, 218 bis
10134 Torino (Italy)

Structured Abstract

A. Introduction. Even though “crowdfunding” can be seen as a relatively recent phenomenon (especially in Italy), it has nonetheless been the subject of numerous studies, especially in recent years. We believe, however, that these studies have not provided a comprehensive examination of the phenomenon (Belleflamme et al. 2011; Lambert and Schwiendbacher 2010). So, it might be posited that the existing literature has only provided a description of the main and most general characteristics of crowdfunding, which is a vast and often many-sided phenomenon. Substantial areas of research and important aspects still remain to be covered. Even if it is now commonly held to represent an autonomous phenomenon (Mollick, 2013), the most common and well-known definition of crowdfunding refer to the phenomena of crowdsourcing (Poetz and Schreier, 2012) and microfinance (Morduch, 1999). More specifically, according to a wide number of authors (Larralde and Schwiendbacher, 2010), crowdfunding can be analyzed as a category of the wider ‘crowdsourcing phenomenon’.

On the basis of these definitions, the main components of crowdfunding are:

1. a large group of people (crowd),
2. a provision of financial resources (funds),
3. internet-based means, peer-to-peer, websites or other online tools (Lin and Viswanathan, 2013),
4. a specific objective: a project, specific initiatives or other specific purposes. Burkett (2011) also considers collections made by fans of bands to represent a form of crowdfunding,
5. a form of “return” for the crowdfunders, which can also be of a “moral” nature (for example in a free distribution or donation), or another type of “reward”, gratification or right to vote and to constitute a part or category of the wider, more general concept of crowdsourcing.

Analyzing the studies that have been achieved so far, it does not emerge clearly what could be the contribution on the territory and on the community, in terms of social, environmental and economic sustainability, that crowdfunding cause through its fundraising activities and the subsequent projects financing.

Too often the phenomenon of “crowdfunding” is limited as a new business model, exclusively aimed to achieve profits, without considering its potential as a mean of fundraising for the growth and development of the territory and the community.

B. Aim of the research. The aim of the research is to examine some Italian crowdfunding projects in order to assess the sustainability of the value-creating model for the community. In particular, the study will focus on:

1. firstly, the process and the criteria used to identify the platforms for the analysis. The study considers the 45 existing Italian “crowdsourcing” platforms (already active) on March 2014, identified through the platform crowdfunding.it and the analysis of the companies’ Ateco identification code.
2. secondly, the analysis of the platforms to find out if and how each project is addressed to the territory.
3. thirdly, the analysis of each project in order to find out:
 - the crowdfunding model;
 - type of project;
 - the amount that has to be financed ;
 - amount of financial resources already obtained;
 - donors characteristics;
 - type of sustainability (environmental, social, economic,).
4. finally, the identification of a sustainability measurement model developed through the correlation between the characteristics of the projects funded and the impact on the territory.

Keywords – crowdfunding, platform, crowdsourcing, sustainability, value creations

Paper type – Academic Research Paper

1 Introduction

The new social technologies have transformed the world-wide-web from a platform for passive use of contents in a place where users can actively contribute to the creation of content and sharing of ideas. The spread of social networks, that facilitate the communication and the exchange of messages by creating a personal network of contacts, made the communication between people (and often between people and companies as well) faster and more efficient.

This innovation and flexibility led to the creation and the development of crowdfunding, which represents the collaborative process with which many people participate with their own money to finance a project.

Crowdfunding in Italy is a very recent phenomenon ⁽¹⁾. The first platform was launched in 2005 (Produzionidalbasso), but recently it is having a remarkable success. In less than 10 years, the number of the Italian crowdfunding platforms increased up to 49.

It's indisputable that, as well as for social networks, this phenomenon represents a "fashion". Kickstarter, founded in 2009, is the best known and used platform in the world; it reached \$ 1 billion in funding, with the participation of more than 6 million people by funding more than 59,000 creative projects. But it should be immediately pointed out that the Italian situation is really far from these numbers. Currently there are 45 active platforms (plus 4 ready to get launched); considering that most of those were created just in the last 2 years, we can say that the Italian crowdfunding is still at an embryonic level.

The most important aims of a crowdfunding platform are:

1. communication: proposing projects and fundraisers, the crowdfunding platforms make themselves known to a global universe, by web;
2. financing: fundraising for a variety of purposes is the main goal of crowdfunding platforms;
3. philanthropy: fundraising is often the time to charitable or humanitarian projects.

Moreover, there is no doubt at all that these fundraisers have a strong impact on the territory and the environment. Some platforms, like "Finanziamilfuturo", operate exclusively at a local level to give priority to their own territory, enriching it with loans.

For this reason, we can say that crowdfunding has - in term of sustainability - an impact that is:

- economic,
- social,
- environmental.

The projects devoted to the environment find plenty of space among the "bottom up" loans. Among the platforms that are open to individuals and businesses ideas, one is entirely dedicated to sustainability and the protection of the territory. Its name is Kendoo and it requires projects to be submitted according to certain guidelines. First of all, the project should never be vague but must have a specific purpose, such as protecting the

⁽¹⁾ There are many studies about the phenomenon: for example, "Analisi delle Piattaforme di Crowdfunding Italiane", Daniela Castrataro (twintangibles & crowdfuture) e Ivana Pais (Catholic University of Milano), 2013, www.italiancrowdfunding.org and Collaborative Economy Observatory, Departement of Management, University of Turin, where many researchers works to study the phenomenon (www.collaborativeeconomy.unito.it).

environment, improving the living conditions of the community and other charitable initiatives. An example could be the reconstruction of the areas affected by the recent earthquake in Emilia where a sustainable development of these areas has been promoted through a participatory process that allows to formulate and share projects by putting them in a crowdfunding platform to implement their realization. An other example is the reconstruction of the “Città della Scienza” in Naples where 900.000 Euro had been collected by Deryv platform.

In other words, the crowdfunding platforms are not just fundraisers that have an aim in themselves, but they promote integration into a broader system that is the participation and the creation of value in the area, using alternative models that ensure sustainability in the contexts of reference. These platforms are, therefore, an attempt to build a model that starts from the people and facilitate a mechanism that fit best to the Italian specificity.

The paper proposes, therefore, at first, a theoretical discussion on the conceptualization of the phenomenon crowdfunding and sustainability, in its various dimensions, framed in the context. Next, we describe the structure of the interpretative model proposed for the assessment of the sustainability of crowdfunding. In this section, particular emphasis is given to the social aspects, which are then subject the empirical application, as described in the fourth part of the contribution. In the final part of the paper we discuss the results and draw attention to their implications for spatial development.

2 Literature review

The crowdfunding phenomenon can be defined as “a collective effort of many individuals who network and pool their resources to support efforts initiated by other people or organizations. This is usual done via or with the help of internet. Individual projects and businesses are financed with small contributions from a large number of individuals, allowing innovators, entrepreneurs and business owners to utilize their social networks to raise capital” (De Buysere, Gajda, Kleverlaan, Marom, 2012). The phenomenon concern anthropologic, social and economic aspects, in which we have three specific elements:

1. crowdsourcing
2. contribution

3. web

The crowdfunding can be defined on the basis of the needs that it satisfies. In particular, if the needs satisfied relates to sharing, on the one hand, and economic and financial support on the other, we are dealing with homogeneous companies, which belong to the crowdfunding sector. If, however, the needs satisfied relate to sharing and material or moral support, the relevant model is “crowdsourcing”, which describes a business sector with different characteristics from those of the “crowdfunding” sector. The two business-models belong to the macro phenomenon of “sharing economy” (Alfiero, Indelicato, Rainero, Secinaro, Tradori, Venuti, 2014).

The crowdfunding phenomenon has a sustainable, social and environmental impact, so that it could be considered a powerful instrument for economic and social innovation⁽²⁾.

Economic sustainability is defined as the ability to generate a sustainable income and employment and to ensure a rational use of available resources. This means the ability of a complex organization to perpetuate itself over time. Social sustainability can be defined as the ability to ensure fair and open access to goods and welfare conditions. Regarding the analysis of the concept of sustainability, its definition must necessarily be derived from a synthesis of the relevant scientific literature and politics. What emerges from this review is the vagueness of the concept, which, while it limits the definition, on the other hand it can be applied to many different fields of study (O’Riordan, 1988; Redclift, 1991; Jacobs, 1999). The most general definition of sustainability, which still represents the starting point for the world of politics and international science, can be found in the “Brundtland Report” (1987) of the World Commission on Environment and Development, chaired by the Prime Minister of Norway at that time, Mrs. Gro Harlem Brundtland. Sustainable development in this document refers to “ensure that it meets the needs of the present without compromising the ability of future generations to meet theirs. [...] Sustainable development, far from being a final state of harmony, it is rather the process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are made consistent with future needs as well as with the current” (WCED, 1987).

⁽²⁾ *Social innovation can be defined as development and implementation of new ideas (products, services and models) to meet social needs and create new social relationships or collaborations. It represents news responses to pressing social demands, wick affett the process of social interactions. Guide to social innovation, European Commission – 2013.*

So, it is important to define clearly the dimensions of sustainability as well. The most shared approach is the so-called “Triple Bottom Line” (TBL; Elkington, 1998), which locates the essence of the sustainability of any system in the three spheres of environment, society and economy. Despite many criticisms, especially theoretical articulation of sustainability in which this size has been submitted in time (Lehtonen, 2004), the TBL seems to be a useful practical tool for organizing the evaluation of the level of sustainability in a given system. At this point, it is necessary to define in a more detailed way the significance of these three spheres, considering the literature that has been largely concerned with environmental, social and economic sustainability. In particular, considering the environmental aspect, it refers to the work of Goodland (1995) that, following the approach of Daly (1988), identifies two categories of environmental services: “the use of renewable and nonrenewable resources on the source side, and pollution and waste assimilation on the sink side” (Goodland, 1995). Environmental sustainability is therefore identified as a series of restrictions on the use of such services. As for the “source side”, the use of renewable raw materials should not exceed their intrinsic regenerative capacity, while the use of non-renewable raw materials should be at such a rate as to permit the emergence over time of new technologies that can replace them. The maintenance of the “tank” is instead linked to the capacity of absorption and assimilation proper to a specific ecosystem, which must not be exceeded to avoid compromising in the future the functionality of absorbing waste and pollutants.

With regard to the social dimension, the literature has several conceptualizations, which can be found in the classification provided by Lehtonen (2004). The most convincing in terms of the applicability at an operational level, it is probably the one referred to the concept of ‘social capital’, defined by Robert Putnam as «features of social organizations, such as networks, norms, and trust, that facilitate action and cooperation for mutual benefit» (Putnam et al., 1993, 35-36). The capital thus refers to the associations and interactions between members of a community characterized by trust and reciprocity, which are expressed primarily in two forms: the construction of new ties between members (social capital “bridging”) and the fortification of existing relationships (social capital “bonding”) (Gittel & Vidal, 1998). Social sustainability can be seen, according to this point of view, as maintaining and strengthening social ties in order to facilitate action and cooperation among the members of the community, with the aim of pursuing shared goals.

Finally, regarding the economic dimension of sustainability, it is known the difficulty of a widely accepted conceptualization according to the neoclassical economy principles and the incompatibility of the assumption of perfect substitution between factors of production, in particular natural resources. More convincing seems the bio-economic approach (Georgescu-Roegen, 1971, Daly, 1973), which instead of focusing on the value (replaceable) it considers the physical substance of resources (irreplaceable and limited).

According to this perspective, the economic sustainability is the characteristic of a system that can perpetuate itself in an independent way within its physical limits. Moreover, the need of a sufficient flow of well-being which falls equally on all members of the systems should be considered as an output of the economic system.

Applying the concept of sustainability, as detailed below, it is now necessary to define what is meant by both “sustainability of crowdfunding” and “sustainable crowdfunding”.

In general, defining sustainability as a property of a system and the ability of a complex organization of processes to be perpetuated over time retaining its structure and its functions, it can be said that the level of sustainability of the crowdfunding phenomenon is related to the possibility that the way in which it is organized ensure that it will operate in the future in the same way as platforms operate at the moment.

Starting from the assumption that “if you can not measure a phenomenon, you can not even handle it” (Econometrics Sciences), we could wonder if sustainability can be really measured. The first major challenge to the development of this interpretation model is its hierarchical structure. The identification of indicators, in fact, must descend from a logical process that proceeds from concept to the object of measurement instruments for evaluation. This process is organized in a hierarchical way because each component must find its meaning in the context of what precedes it.

Adapting a well-known work of Lazarsfeld (1958), Maggino (2009) identifies four basic hierarchical levels:

- the concept, which defines the phenomenon, its context and the main aspects that characterize it;
- the survey areas, which represents a specific aspect of the concept;
- latent variables, namely the elements to be considered within each survey area; those that cannot be directly observed are expressed by indicators;
- elementary indicators, capable of describing each of the identified variables, which must be expressed quantitatively through special indices.

The result of this process is a tree model that, starting from the definition of the concept, comes to the identification of indicators to be measured through a logical procedure that ensures the consistency of the evaluation with the theory of reference.

3 Sample

Crowdfunding has now emerged as a viable, scalable alternative to public and private finance. These developments have implications for how governments frame economic development programs and leverage public investments.

Behind the scenes, big global companies are running the rule over crowdfunding as a way to leverage their innovation portfolios into the marketplace. Crowdfunding is helping enterprises interacting with their customers and validating R&D outputs.

The four crowdfunding categories are:

- Reward based ⁽³⁾
- Donation based ⁽⁴⁾
- Equity based ⁽⁵⁾
- Social Lending based ⁽⁶⁾

The platforms analyzed had been divided according to their “age” (birth year). The first platform was launched in Italy in 2005. In 2013, 24 platforms, slightly less than half

(3) This business model is used by project owners who want to collect donations for a specific project and can give (often small) non-financial rewards in return. The rewards are of a symbolic value and provided by the investee. They are usually much lower than the donation amount, to ensure there is enough money left for the project.

Nevertheless, the perception of the value can be much higher, for example special VIP tickets as a reward for a higher donation. A reward in this context should not be understood as a token of appreciation. In general, the parties do not consider it a legally binding obligation to provide the goods and do not classify it as a sale. When the different reward-levels are chosen wisely, it is possible to receive a much higher average donation than with a pure donation-based approach [A Framework for European Crowdfunding (2012)].

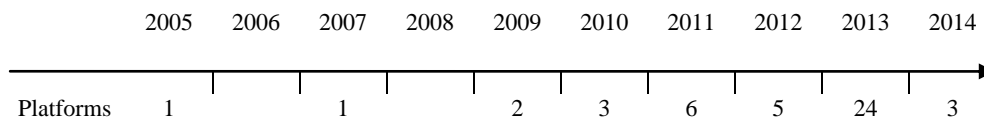
(4) This model is used to attract donations for specific projects. Unlike with traditional fundrasing, donations are collected and ear-marked for a specific project. Because funders know that their money will be used on a very specific project, they are more willing to donate higher amounts per person [A Framework for European Crowdfunding (2012)].

(5) When a company wants to attract an investment from a group of people, instead of funding by a business angel or another private investor, this is called equity crowdfunding. Some funders are primarily interested in investing in projects that share their own values, that are locally engaging, or that create jobs in their community. Others have a real knowledge of what the market, project, or company is addressing and desires to bring funds and expertise to the success of the project. This practice is very similar to business angels. Equity crowdfunding also generally includes equity-like arrangements, offering the same payoff as equity (shares), and where the “funder” is actually merely a creditor who has a contractual right to receive that payoff [A Framework for European Crowdfunding (2012)].

(6) With lending-based crowdfunding, a company will borrow money from a group of people instead of a bank. The role of the platform can be diverse. Some of the platforms will act as a middle-man and will also make the repayments to the lenders, where other platforms act only as match-makers and the borrower and lenders will be connected when the deal is closed [A Framework for European Crowdfunding (2012)].

of all those existing at the moment (45), were launched and in the first two months of 2014 three more platforms have appeared in the market and other four are ready to be launched soon. This numbers shows clearly how crowdfunding is a rapidly growing phenomenon in Italy, as can be seen from Figure 1.

Figure 1 *The Crowdfunding in Italy by year of birth*

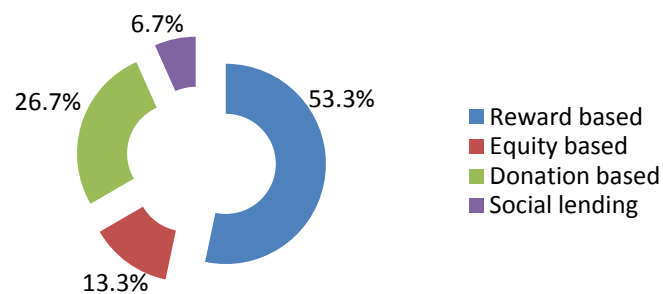


Source: own elaboration

The platforms analyzed are divided according to the type of service offered. The analysis shows that the number of platform is described as follow:

Reward based	24
Equity based	6
Donation based	12
Social lending	3
Total	45

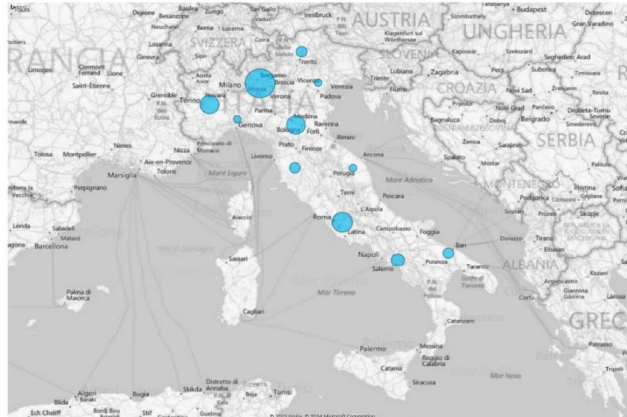
Figure 2 *Platforms analyzed according to the type of service offered*



Source: own elaboration

The platforms are located in Italy as shown in the next pictures.

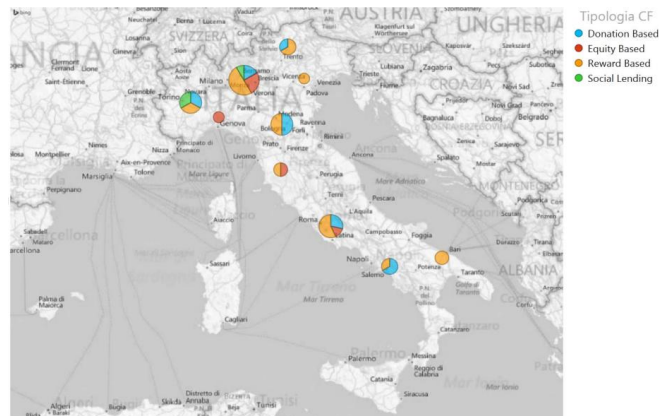
Figure 3 *The Platforms of Crowdfunding in Italy: geographical location.*



Source: own elaboration

In Figure 4, it is shown the different typology of crowdfunding platforms dislocated in Italy.

Figure 4 *The typology of Crowdfunding platform in Italy*

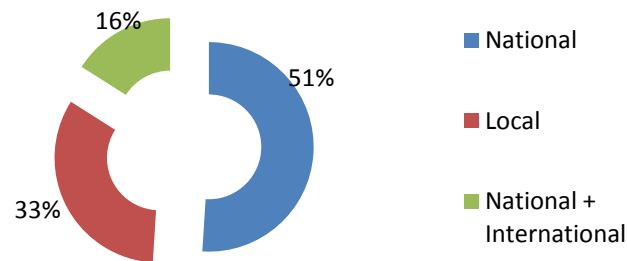


Source: own elaboration

The market in which they operate has been analyzed as follow:

National	23
Local	15
National / International	7
Total	45

Figure 5 Crowdfunding geografic market



Source: own elaboration

Analyzing the platforms, it has been noted that there are different ways of financing the projects. The three most important types of collection are:

a) **All or Nothing (Aon)**. There is a minimum threshold to be collected for the project by tying its implementation to a budget. At the expiry time of the collection two possible scenarios could appear:

- The collection has reached or exceeded the minimum constraint: in this case the amount collected will be credited to the applicant.
- The collection has not reached the minimum threshold: the money is entirely returned to the donors, without charges added by the platform, as the collection is based on a commitment to pay but not an actual transaction.

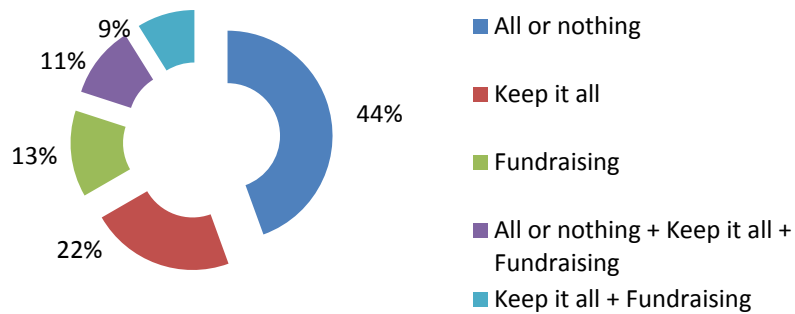
b) **Keep it All (Kia)**: in this case the achievement of all or only a fraction of the sum is a non-binding statement prefixed to the project. The proposer collects all the contributions as they are paid. This type of collection offer great support to those projects that can be started before the end of the collection, and would be carried out regardless of financial support resulting from the collection. The immediate collection of the author binds them to the realization of the project in relation to donors through the recognition of potential rewards.

c) **Fundraising (permanent collection)**: unlike the Aon and Kia, it does not require time or target constraints. The credit is immediate as for the Kia. It is normally used to finance continuing operations over time by entities such as legal association, institution or non-profit organizations.

The data obtained are:

All or nothing	20
Keep it all	10
Fundraising	6
All or nothing + Keep it all + Fundraising	5
Keep it all + Fundraising	4
<hr/>	
Total	45

Figure 6 *The types of fundraising*

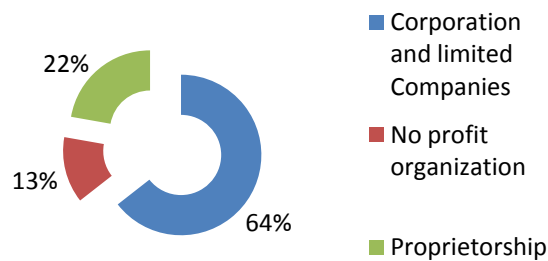


Source: own elaboration

The institution (entity) that runs the crowdfunding platform could be:

- Corporation or Limited Company
- No-profit organization
- Proprietorship (Sole trader)

Figure 7 *Institutions involved by crowdfunding*

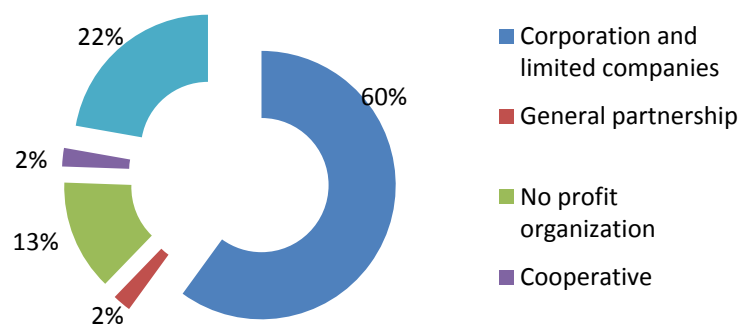


Source: own elaboration

The recipients of crowdfunding platforms are:

- Profit entities
- No-profit entities
- Public sector entities
- Individuals

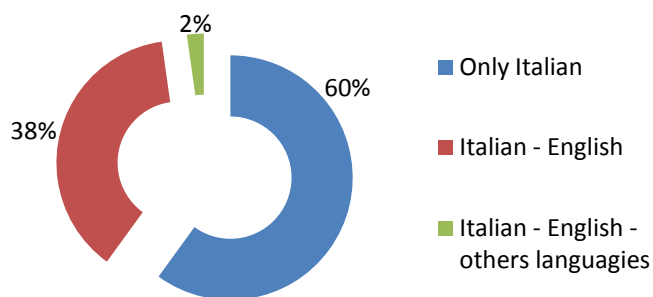
Figure 8 *Sectors of crowdfunding*



Source: own elaboration

All the Italian platform websites are, obviously, in Italian, but around 50% is also available in English and one of them in Russian too. This clearly shows how the Italian crowdfunding phenomenon is still largely limited to a national and local dimension.

Figure 9 *Platforms Language*

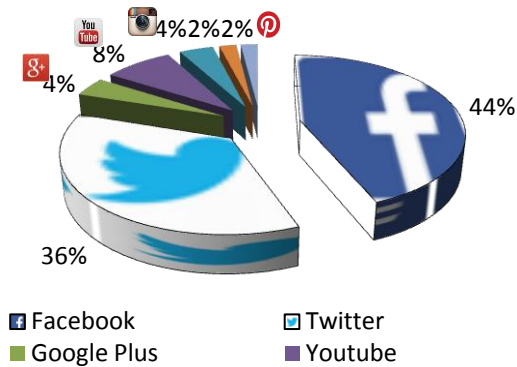


Source: own elaboration

Crowdfunding platform largely use social networks as an important channel of communication. Facebook is used by all the analyzed platforms, but also Twitter is

widely used. Other channels like YouTube, Google+ and Instagram are quite common, but in a much smaller way.

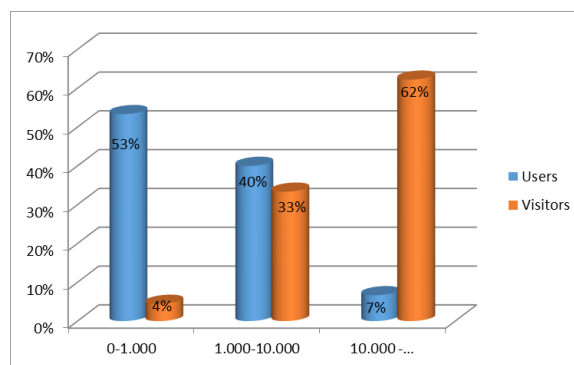
Figure 10 Social networks and crowdfunding



Source: own elaboration

Regarding the analysis of both the users (those who require or give funds) and the visitors (those who simply visit the site), it may be noticed that more than 50% of the crowdfunding platforms have less than 1.000 users. This could be also due to the fact that many platforms have been launched only recently and are linked only with the national market (24 platforms were born in 2013 and 33% refers to a local market).

Figure 11 Users and visitors of crowdfunding platforms



Source: own elaboration

The choices of the market, of the type of users and, of course, the “age” of the platform are all variables that affect significantly the number of users. Moreover, the number of visitors is larger than the number of users as there is a strong curiosity and an increasing interest in the platforms’ activities, but there is still some hesitation in taking advantage of this tool for the collection of funds. The largest number of users is registered for the social-lending platforms, while the highest number of visitors appears in the reward-based platforms.

4 Methodology

In order to reach the research objective, we adopted a double approach to the phenomenon of “*crowdfunding*”:

1. firstly, a qualitative approach, through a study of the Italian platforms and an analysis of the project that they offer for funding;
2. secondly, a quantitative approach, through the analysis of the data obtained from the sample survey of the crowdfunding platforms and some indicators of sustainability (economic, social and environmental sustainability).

As for the qualitative analysis, the research was articulated into different steps. Specifically, they are:

1. Presentation of the Italian crowdfunding projects: topics and platforms;
2. Study of the platforms’ projects through:
 - the analysis of the websites of the crowdfunding platforms;
 - on line questionnaires and surveys;
3. Creation of a database with the most important characteristics of the projects funded (amounts, recipients, territorial effects, ...)

As for the quantitative analysis, we identified some territorial indicators in order to develop a sustainability measurement model for crowdfunding. The indicators are divided into three categories (Economic sustainability, Social sustainability and Environmental sustainability) and are largely based on ISTAT statistics. Those indicators follow the three classical dimension of sustainability, as described in the literature review.

Specifically, the indicators considered are:

1. Economic sustainability:

- a. Regional GDP per capita (as mean deviation from the national average annual growth rate of GDP per capita in the last 10 years),
- b. Regional unemployment rate,
- c. Regional inflation rate (average annual percentage change in consumer price index in the last 10 years).

2. Social sustainability:

– health indicators:

- a. Public expenditure on health (average of the indexes of public health expenditure in the last five years),
- b. Health expenditure of families (average percentage over the GDP in the last 10 years),
- c. Hospital offering (average number of hospital beds per 1000 inhabitants in the last 5 years),

– social indicators:

- a. Social Services (average percentage of spending on social services and assistance over the GDP in the last 5 years),
- b. Municipalities with services for children (percentage of municipalities with childhood services compared with the regional supply in the last 10 years),

– Education indicators:

- a. Public expenditure on education and training (average percentage over the GDP in the last 10 years),
- b. Permanent formation (percentage of 25-65 years old people participating in educational projects in the last 10 years)),

– Culture indicators:

- a. Museum visitors (people aged six or more years old who visited a museum in the last 12 months),
- b. Spending on culture (percentage of household expenditure for cultural activities),
- c. Number of books read (people aged six or more years old who have read at least one book during the last 12 months).

3. Environmental sustainability:

- a. Expenditure on environmental protection (average percentage over the GDP in the last 5 years),
- b. Municipal waste deposited in landfills (Kg per inhabitant).

Then, for each dimension of the "triple bottom line model", three indicators had been computed by grouping Italian Regions in four big areas (NorthWest, NorthEast, Center and South+Islands). Those indicators are capable of expressing in a concise and effective way the degree of sustainability of each area in terms of economic, social and environmental features.

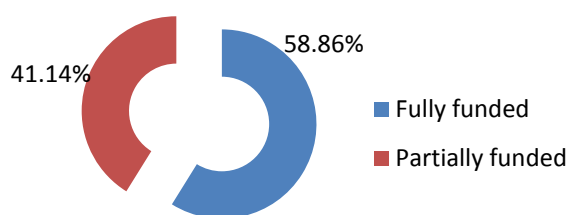
The sustainable impact of crowdfunding platforms, in terms of funds raised and used to finance projects in sustainable connection with the territory, had been compared with the three indicators previously defined, in order to understand and define the "role" that the crowdfunding platforms can play in a sustainable scenario.

5 Major findings

From the questionnaires (but without considering both the Equity-based and those which are still in the "launch phase" and thus not active yet), we found out that the total projects successfully presented at the beginning of February 2014 were 24.447, among which:

- Fully funded 14.390 (58.86%)
- Partially funded ⁽⁷⁾ 10.057 (41.14%)

Figure 12 *Projects of crowdfunding platforms*



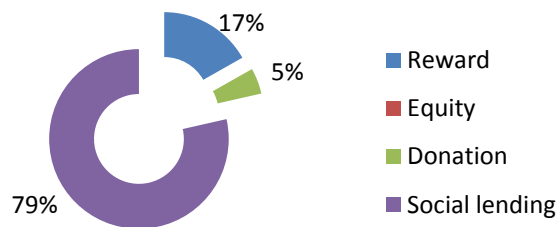
Source: own elaboration

⁽⁷⁾ This category includes projects that, at the date of completion of the questionnaire, had reached at least a fifth of the total required for those projects submitted on the platforms that adopt the model All or Nothing, or a value at least equal to one-fifth of that required for those adopt the model Keep It All, or a value of 800 euro for projects of fundraising.

The total amount of funds collected for the projects (both fully and partially funded) is 42.734.723 Euro⁸, distributed as showed in the picture below.

Reward-based	7.178.123
Equity-based	(not considered)
Donation-based	1.992.600
Social lending	33.564.000
Total	42.734.723

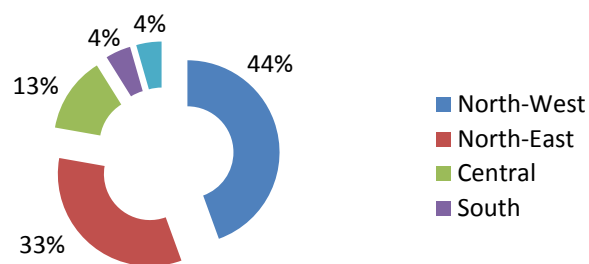
Figure 13 Distribution of funds collected according to the type of service offered



Source: own elaboration

The geographical distribution of funds collected is described in the following picture.

Figure 14 Distribution of funds collected according geographical area



Source: own elaboration

⁸ At February 2014.

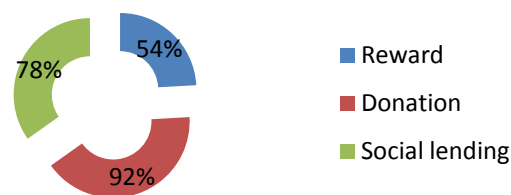
To determine the sustainable impact of the crowdfunding Italian platforms, the study is directed to the analysis of those projects and the relative amounts of funding reached that can be considered with “sustainable social aims”. This “sustainable social aims” are referred to the three dimension of social, economic and environmental sustainability. The projects have been divided in the following categories:

- Social Assistance
- Health care
- Social and health support
- Education
- Cultural, historical, artistic heritage
- Environment

For each category, the total amount of funds collected with the crowdfunding platform has been computed. Around 75% of the total funds raised (approximately equal to EUR 32 million) are intended to finance projects with a social-economic impact in at least one of the considered categories.

As shown in the picture below, almost all the funds collected by the donation-based platforms have a social impact (92%), followed by the lending platforms (78%) and the reward-based ones (54%).

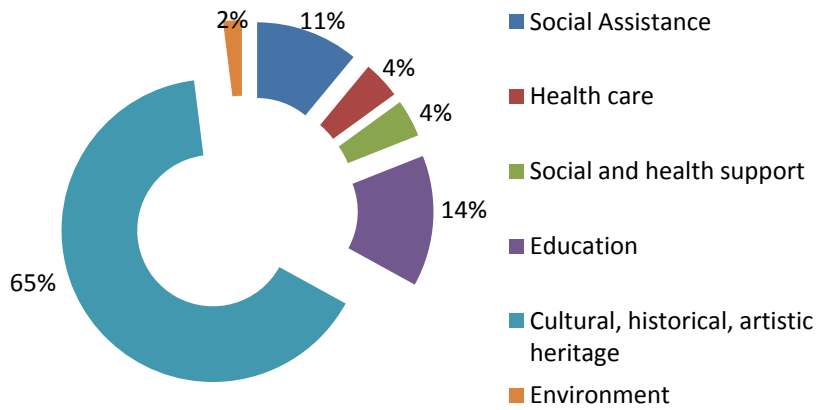
Figure 15 *Distribution of fundraising.*



Source: own elaboration

Around 65% of the funds is devoted to the development, the preservation, conservation and protection of cultural, historical and artistic heritage. Education projects are the second most funded, followed by social assistance. The environment protection, management and development, at the moment, is the category that received the lowest amount of funds.

Figure 16 Destination of fundraising

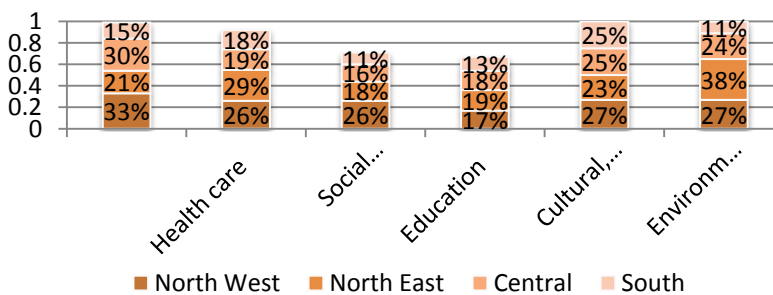


Source: own elaboration

To understand the impact of the phenomenon on the territory, we analyzed the distribution of funds by geographical area, considering 5 categories (4 national zones: NorthWest, NorthEast, Center, South and Islands, plus a residual general category for foreign projects). The geographical impact of the projects has been identified for each type of sustainable project considering the area in which the object or the purpose of the project is located.

The picture below shows the percentage of collected funds for each category and their impact on the territory.

Figure 17 Categories and geographical areas of funds



Source: own elaboration

Finally, to define the "role" that the crowdfunding platforms can play in a sustainable scenario, we compared the amount of funds raised in each geographic areas, with the highlights coming from the economic, social and environmental KPI (based on Istat datas) of the same zone.

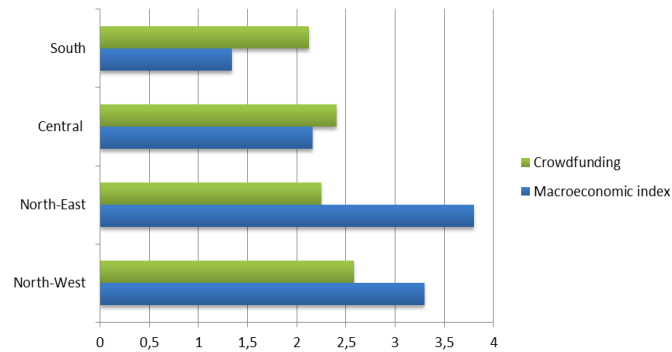
In the following graphs, each dimension of sustainability is compared with the value created by crowdfunding in the same area.

It is especially in the South and in the Center of Italy that crowdfunding could be a really valuable tool to improve the economic sustainability of the area.

Under a social perspective, crowdfunding is a tool that is already widely used throughout the territory, in particular is a good alternative to finance all those projects, with a specific social value, that cannot rely any more on funds coming from the public sector (mainly because of the increasing shortage of public funds).

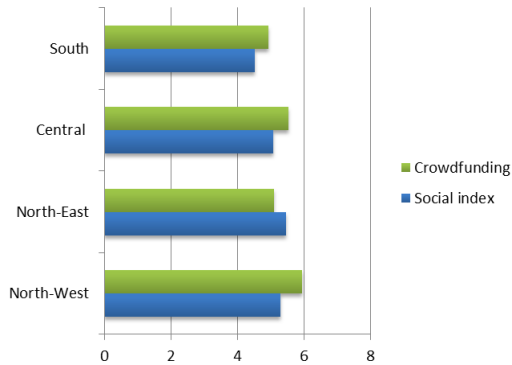
Finally, looking at the environmental dimension, it is clear that the crowdfunding platforms are also used to finance projects for environmental protection and the preservation of the eco-system mainly in those areas (like North-East) where the territorial indicators already show a significant attention to environmental concerns.

Figure 18. *Dimension of crowdfunding and macroeconomic indexes*



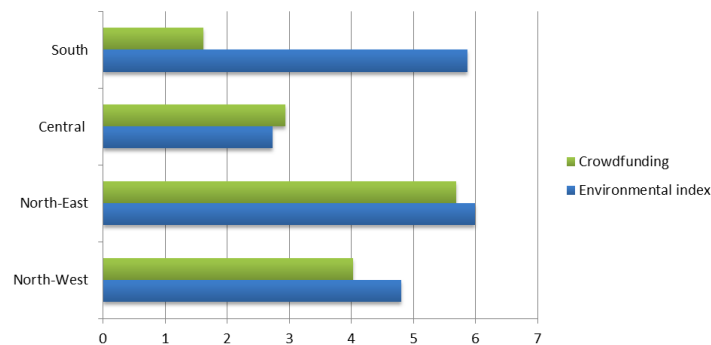
Source: own elaboration

Figure 19 Crowdfunding and social dimensions



Source: own elaboration

Figure 20 Crowdfunding and environmental index



Source: own elaboration

6 Conclusions

The study shows that crowdfunding is a way for sustainable growth of the territory in Italy. In particular, we studied the sustainability as declined in three “classical” dimensions (environmental, economic and social). As for the social dimension of the phenomenon it is possible to assess that crowdfunding starts to be used in Italy, mainly as a good alternative to finance those projects, with high social value, that cannot rely any more on funds coming from the public sector. Looking at the environmental dimension emerges that the crowdfunding platforms are mainly used to finance projects for environmental protection and the preservation of eco-system in those geographical areas (North-East), where territorial indicators already show significant attention to

environmental concerns. Our analysis also showed that crowdfunding can be a valuable tool also to improve the economic sustainability of each territory and geographical area. It is therefore important to consider the high-impact and multi-faced possible spillovers of this phenomenon, that represents an important form of support financing the socio-economic growth of any area.

It should be pointed out that in Italy at the moment the crowdfunding phenomenon, although it presents considerable growth rates, is still at an embryonic level, especially compared with the international situation. This limit clearly appears in the “national” dimension of the Italian crowdfunding platform (around 90% of the users are national ones) and the lack of international extent.

The study will be developed further more with the identification and application of a quantitative sustainability measurement model for crowdfunding.

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The Social Option Matrix to assess social innovations

Donatella Ettore*, Nicola Bellantuono, Barbara Scozzi, Pierpaolo Pontrandolfo

Department of Mechanics, Mathematics, and Management
Politecnico di Bari
viale Japigia 182 – 70126 Bari (Italy)

* *Corresponding author*

Structured Abstract

Purpose – The goal of the paper is to clarify the concept of social innovation, by assuming a compact working definition of social innovation, which keeps its key elements, and providing a tool to understand which actors intervene in the process, in which phase, and according to which driver.

Design/methodology/approach – Following the example of Dangelico and Pontrandolfo (2010), who developed the Green Option Matrix to characterize green products and practices, we propose a three-dimensional matrix called Social Option Matrix (SOM): its dimensions correspond to feature of social innovation mentioned by the literature, and the attendant cells represent the possible combinations of the values assumed by the dimensions. Finally, we populate the cells of the SOM by 25 real instances of social innovations discussed in the extant literature.

Originality/value – The paper provides a tool to investigate those aspects raised by the scholars which needs deeper search. Moreover, by observing the population of each cell of the matrix, the tool can be used to investigate the existence of patterns in the distribution of the instances and to analyse whether other variables, besides the dimensions of analysis, generate specific patterns.

Practical implications – Beside the theoretical implications (i.e. to make the concept of social innovation clearer and narrower), the identification of eventual patterns can be useful for practitioners. The actors involved in the development of social innovations, indeed, can adopt the SOM to better understand what a social innovation is as well as to increase their awareness on what they (can) do with respect to social innovation, and to improve communication towards stakeholders.

Keywords – social innovation, social option matrix, SOM, literature review, user involvement

Paper type – Academic Research Paper

1. Introduction

The literature on innovation analyses the features, the necessary resources, the processes, the effects, and the implications associated with the development of different typologies of innovation, for example organizational (Wolfe, 1994), technological (Utterback, 1971), architectural (Henderson and Clark, 1990), and, lately, open (Chesbrough, 2003), green (Chen, 2008), user (Morrison *et al.*, 2000), jugaad (Radjou *et al.*, 2012), and responsible innovation (Owen *et al.*, 2013).

Since the seminal work of Schumpeter (1942), the social implications of innovation have been deeply discussed in the literature (Moulaert *et al.*, 2005). Moreover, the sweeping changes concerning the civil society in the last century (let's think for example at the women's suffrage, the spread of kindergartens, the national health service, the growing number of elderly people, and so on) suggest that the pace of social innovation will accelerate also in this century (Mulgan, 2006). This is coherent with the growing number of scholars that in the last two decades have investigated social innovation, as well as with the growing number of centres (in Canada, Australia, USA, UK, Germany, Austria, France, New Zealand), foundations (Young Foundation, Social Innovation Exchange, NESTA), and incubators (Ashoka) spreading all over the world. Recently, the financial and economic crisis has further stressed the importance of the social dimension of innovation even for businesses (Mulgan, 2006; Barroso, Jose Manuel Durao, 2011).

According to Mulgan (2006) social innovation concerns all those fields characterized by issues such as ageing populations, growing diversity, chronic diseases, behavioural problems, crimes, climate change. In these fields the existing models of innovation are failing or stagnant or new possibilities are not being adequately exploited (Mulgan *et al.*, 2007).

Even though the role played by social innovation is presented as crucial, there is an on-going (and growing) discussion about the notion itself, which remains no more than a "buzzword", a "container concept" (Edwards-Schachter *et al.*, 2012), or a "passing fad" (Pol and Ville, 2009).

Among the available definitions: Holt (1971) affirms that "social innovation deals with the application of new social patterns of human interaction", which means "finding new ways for cooperation between people who work and interact in organizations for common objectives"; Moulaert *et al.* (2005) state that social innovation refers to "those changes in agendas, agency and institutions that lead to a better inclusion of excluded

groups and individuals in various spheres of society at various spatial scales”; Tanimoto and Doi (2007) describe social innovation as “the development of new social goods and services addressing social issues, such as welfare, education, the environment, and support for developing countries”.

Regardless the definitions, a few features are considered as key for social innovation. Social innovation may concern a product or service. It improves efficiency, sustainability, effectiveness (van den Hove *et al.*, 2012; Bellantuono *et al.*, 2014) and is able to increase the overall satisfaction of the beneficiary or improve their quality of life (Mulgan, 2006; Pol and Ville, 2009). Solutions provided by social innovation are persistent. The social innovation process consolidates norms (Pavan *et al.*, 2011), reconfigures institutional relationships (Weber, 2012), creates new relationships and social structures, or provides organizational changes.

The literature seems not to have reached a consensus on the definition of social innovation: while there is a general agreement on some features, some others are not always considered. The aim of this paper is to fill this gap: first we assume a compact working definition of social innovation (which keeps its key elements), then we analyse the remaining features, as mentioned by the literature, contrasting them with a set of real instances of social innovation. In particular, we propose a tool named Social Option Matrix, which characterizes every considered instance along each of the features not included in the definition.

The paper is organized as follows. Next Section gives and argues our working definition of social innovation. Section 3 describes the Social Option Matrix. Section 4 presents the considered instances of social innovation and applies the Social Option Matrix to them. Finally, Section 5 shows results and discusses the main findings while Section 6 draws the conclusions.

2. Definition of social innovation

We adopt the following working definition: social innovation is peculiar in that its output addresses the need of a weak social category and its process implies interaction between user and developer (Bellantuono *et al.*, 2014).

The definition above emphasizes two features that shape social innovation, namely the social category to which it is addressed and the social process that is performed.

As to the former, the literature stresses that the potential beneficiaries of a social innovation are categories of people having some common needs or personal conditions (e.g. elderly people, students, women). They include underserved (Young, 2011) or vulnerable population (Cahill, 2010), homeless, poor, disabled, and mentally ill persons (Antadze and Westley, 2010), gender or age categories that are marginalized by the existing power hierarchies (Rodima-Taylor, 2012), unprivileged groups in society (Nussbaumer and Moulaert, 2004), or categories affected by deprivation or lack of quality in daily life and services (Moulaert and Mehmood, 2010). This is consistent with the goal of social innovation, namely the inclusion of these marginalized categories (Loogma *et al.*, 2013; Moulaert *et al.*, 2005; Stam, 2012)

The needs of these potential beneficiaries are compelling (Krull, 2008), urgent, unmet (Mulgan *et al.*, 2007), and emerging (Loogma *et al.*, 2013); in a word, genuine. Nonetheless, the beneficiaries' bargaining power is so low that their needs do not turn into marked demand and therefore remain unsatisfied (Loogma *et al.*, 2013), poorly served, or unresolved within the traditional market rules. Examples of the above concepts are given by microcredit (people may get loan even though they have low income or assets) or time-banks (work can be exchanged without using money).

A second key aspect of social innovation is its social process. Mulgan (2006) notes that people are competent interpreters of their own lives and solvers of their own problems. Based on that, the beneficiary of any social innovation should play an active role during the innovation process: the interaction between beneficiaries and developers helps make bottom-up the process.

Moulaert *et al.* (2005) state that social innovation changes the dynamics of social relations including power relations, thus suggesting that innovation is in the process. Mumford (2002) highlights social interactions among multiple parties, Bock (2012) refers to co-design and co-construction, and Kinder (2010) to co-production. Finally, Edwards-Schachter *et al.* (2011) not only recall the combination of tangible forms of capital (physical, financial), but also include the combination of intangible forms of capital, especially social capital.

The idea of consumers' co-creation alongside producers and users' integration in the innovation process is not new (Edwards-Schachter *et al.*, 2012). It represents a big difference between social innovation and other types of innovation. With this respect,

Bouchard (2012) stresses that social innovations aim at transforming the social relationships at the roots of a social problem.

The role of users is important even in business innovation. Firms are interested in users' opinions on their products and they rely on this feedback, because they can improve or adjust their products to adapt them according to their preferences. This will give them a warranty to succeed. Von Hippel (1985) introduced the concept of lead users as responsible for a larger proportion of innovation (Edwards-Schachter *et al.*, 2012). Morrison *et al.* (2000) argue on user innovation, i.e. innovation by intermediate users or consumer users. Toffler (1981) and Ritzer and Jurgenson (2010) define "prosumers" as people who produce many of their own goods and services.

The social process involved by a social innovation makes beneficiaries and developers interact. Such interaction may occur with diverse intensity. In the case of Aravind Eye Clinics (Bessant *et al.*, 2012) the beneficiaries are involved in the process, but doctors as well as companies providing technical equipment play a key role. On the contrary, in the case of self-build housing, developers and beneficiaries significantly overlap as the houses are developed by the persons that will use them.

To sum up, social innovation empowers people – the beneficiaries who share a common genuine need – through a social process that makes them able to fulfil their need. The social process is a key aspect of social innovation in that it gives emphasis to a large community (rather than a single innovator) in the innovation process. This occurs for microcredit (the guarantee of the community makes the loans to low income people possible), Wikipedia (volunteers produce contents freely available to public), Aravind Eye Clinics (the few who pay – with donations – make the service available to a whole community), Pledgebank (crowdsourcing makes entrepreneurial initiatives affordable to people without adequate personal funding), neighbourhood nurseries or wardens (few volunteers empower parents or take care of security of a given area), and so on.

3. The Social Option Matrix (SOM)

In the previous section a working definition of social innovation has been given and commented. Here, we address some aspects of social innovation that the literature has not so far fully covered: the driver of innovation, the involved actor/s, and the phase wherein such an involvement occurs.

3.1. Driver

The driver is the reason that urges the innovator to develop a social innovation.

It is a general belief that business innovation is profit-seeking, i.e. the final aim to innovate is to make money. Conversely, to generate a positive effect on society is not a primary target for business innovation and in fact only few of them reach this result (Pol and Ville, 2009). On the contrary, it seems that profit is not the key driver for social innovation. Nonetheless, there exist some borderline cases of social innovation (e.g. models of distance education) that have later moved into business (Mulgan, 2006). Indeed, Nicholls and Murdock (2011) suggest that social innovation may be a good business opportunity. According to Serrat (2010) the profit goal is not primary.

Based on the proposed definition, a genuine need seems to be the main driver of social innovation. Yet, other drivers cannot be neglected. For instance, as suggested by Mulgan (2006), technology enables certain social innovations (e.g. Timebanks would not be possible without an infrastructure to host the needed website). However one may not affirm that social innovations enabled by technology are similar to the so called technology-push innovations, which may well concern goods non associated with genuine needs. (Edwards-Schachter *et al.*, 2012).

According to Green and Vergragt (2002) and Kinder (2010), social and technological innovations should be combined, whereas Medvedeva (2012) reports that technological innovation is a consequence of social innovation. With respect to the link between social and technological innovations, Fink *et al.* (2013) find that disruptive technologies should be accompanied by social innovations to be more easily adopted by communities

3.2. Actor

The actor is the subject who develops the social innovation. Even though it seems that the role of future users or beneficiaries is prominent, other actors are involved in promoting, developing and adopting social innovation: for example, individuals, especially when they are “heroic, energetic and important” (Mulgan *et al.* 2007). For instance, Fundación Paraguaya (Maak and Stoetter, 2012), which promotes education and agriculture in Paraguay by making an extensive use of microfinance initiatives, was launched by a single man, Martin Burt.

In most cases, social innovations leverage on structured groups of individuals, such as movements, foundations, or organizations, which can have different natures (e.g.,

religious or political) and can promote or start social innovations in concert or separately (Westley and Antadze, 2010). Often, such groups pre-exist, in other cases they are ad-hoc established.

Another potential actor involved in social innovation is government. Typically, governmental agencies are characterized by low creativity, so giving a limited contribution to the idea generation; nonetheless, they have the means to socially innovate and design effective social innovation, they can usually afford huge investments, and are often in the position to “purchase” the innovative social program or products on behalf of a community.

Social innovations are affected by uncertainty and could imply a long period (sometime infinite) of negative revenues. For these reasons, the role played by charities, foundations, philanthropists, no profits, governments can be crucial. Social innovations are risky and they can, exactly as other innovations, easily fail (Mulgan, 2006). That is why governments and, in general, politics can and should intervene in the collective action and common vision needed to produce social value or to solve societal problems (Kooiman, 2003).

The recognition of the actors involved in social innovation can also be led from another point of view: many of the most successful innovators have learned to operate across sector boundaries, and innovation thrives best when there are effective alliances between small organisations and entrepreneurs (the ‘bees’, who are mobile, fast, and cross-pollinate) and big organisations (the ‘trees’ with roots, resilience, and size) which grow ideas to scale (Mulgan *et al.*, 2007). For instance, CEO of Danone Group and Muhammad Yunus, founder of Grameen Bank and later winner of the 2006 Nobel Peace Prize, discovered that their areas of expertise were complementary and then decided to create (in 2006) a joint venture called “Grameen Danone Foods”, as an attempt to contribute to the development of poor countries: the goal is to provide children with many of the key nutrients that are typically missing from their diet in rural Bangladesh, and run on a “no loss, no dividend” basis (Yunus *et al.*, 2010) with the aim of reducing poverty by creating business and employment opportunities for local people, given that raw materials, including milk needed for production, will be sourced locally.

Social innovation can definitely take place within government, within companies or within the non-profit sector (also known as the third sector), but it is increasingly seen to

happen most effectively in the space between the three sectors (Lundströma and Zhou, 2011).

3.3. Phase

As any innovation, social innovation occurs along three main phases: idea generation, development, and implementation (Damanpour, 1991). We believe that considering the phase, especially in connection with the actor/s, is useful to comprehend the concept of social innovation.

3.4. From the dimensions to the SOM

To characterize social innovations we adopt the above described dimensions: actor, driver, and phase. The three dimensions aims at addressing to different questions: Which are the actors involved in social innovation? Which driver motivate them? In which phase of the innovation process? The values which each dimension can assume are the following (Fig. 1):

- driver: need, profit, technology;
- actor: company, government, NBO/NGO (i.e. non-business/non-governmental organizations, e.g. charities, groups, and movements);
- phase: idea generation, development, implementation.

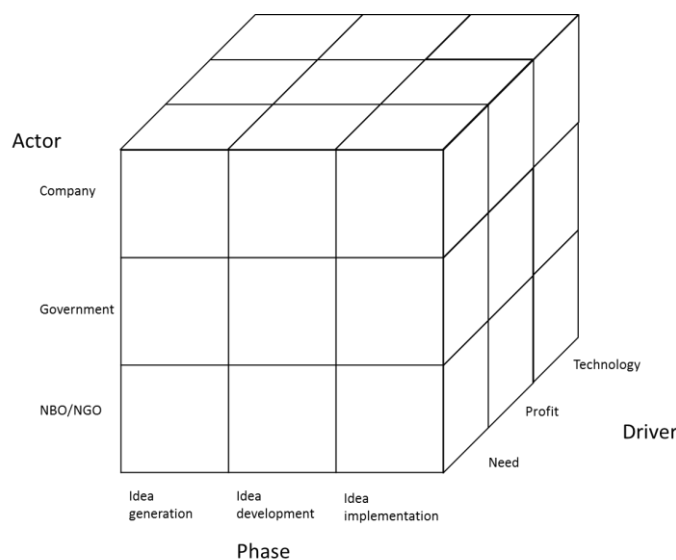


Figure 1 – The Social Option Matrix (SOM).

4. Application of the SOM to real cases

The literature reports several cases of social innovation, having different scopes and goals. Some of them relate to well-known problems with new approaches (e.g. Positive Deviance, Therapeutic Communities, Restorative Justice) or alternative solutions (e.g. Timebanking, Pledgebank), other ones aim at lowering the cost of services, especially in the field of healthcare (e.g. Aravind Eye Clinics, Lifespring Hospitals, Nrayama Health Hospitals), other put emphasis of particular aspects (e.g. slow-food, biological agriculture). We decide to use these cases to populate the matrix by characterizing the actors, the drivers, and the phase of the whole social innovation process. A similar approach has been proposed by Dangelico and Pontrandolfo (2010), using dimensions that are critical in the definition of green products.

For our research, we excluded those cases too broad or for which literature presents too weak descriptions that are not suitable to characterize them.

4.1. Fair trade movement

It is a form of commercial collaboration based on transparency, dialogue, and respect, finalized at selling products such as tea, coffee, cocoa, or craftsmanship. The origin of fair trade movement dates back to the early 1950s, when a religious group (Mennonite Center Committee) and a no-profit organization (SERRV International) developed supply chains in poor countries wherein trades were based on the principles of fairness and equity, instead of the common arm's lengths approaches. About one decade later, fair trade movement expanded in terms of both shops and no-profit organizations. The growth of the phenomenon came with the commercialization of the products with its own brands and labels.

4.2. Microcredit

Microcredit consists in granting very small loans (microloans) to poor borrowers, who typically lack collateral, steady employment and a verifiable credit history and therefore cannot access to traditional credit channels. Microcredit, which is based on the societal warranty on loans, is designed to support entrepreneurship and alleviate poverty, but also to empower women. It was born from Muhammad Yunus, a Bangladeshi economist awarded with the Nobel prize in 2006, who founded the Grameen Bank, a no-profit organization that then turned in a credit institute.

4.3. *Open Source Software*

The idea to make the source code of a software available to anyone so as to let them change or distribute it for any purpose dates back to the late 1970s, when some groups independently theorized that the access to the code and the freedom to redistribute and modify it are fundamental rights. So doing, these groups configured themselves as a real alternative to proprietary software systems. Nowadays, companies take advantage from this kind of innovation as they are kept abreast of technology development.

4.4. *Aravind Eye Clinics*

This is an alternative healthcare model, performed in developing countries in a large volume following a quasi-assembly line process. The goal is to provide eye care to patients, two thirds of which are treated for free. Dr. Venkataswamy acted as starter to solve this growing problem, using his own money at the beginning, and then he established the GOVEL Trust, a no-profit trust.

4.5. *Time Banking*

It can be considered a pattern of reciprocal service exchange that uses units of time as currency. Edgar Cahn started this practice and today it is articulated as charity constituted by volunteers. A UK no profit organization (Echo) provides infrastructure, free support and web solutions. It is financed by NESTA and delivered in partnership with London legacy Development Corporation (no-profit organization for the public sector).

4.6. *Pledgebank*

It is a website wherein everyone can post his/her own pledge which has the basic format "I'll do something if other people pledge to do the same thing". It was established in 2005 by a British charity called Mysociety.

4.7. *Slowfood*

It is a no-profit organization established in Italy 1989 to prevent disappearance of local food and preserve gastronomic traditions, and nowadays spread in several countries. Slowfood is promoted by NPOs and developed thanks to farmers and companies sharing the goal of opposing the standardization of taste and culture, and the unrestrained power of food industry multinationals and industrial agriculture.

4.8. Kindergarten

A kindergarten, also called neighbourhood nursery, is a pre-school educational approach addressed to childhood. The first British and probably globally infant school was opened in 1816 by a philosopher, Robert Owen, in conjunction with his venture for cooperative mills, to give education to his employees' children. Then, the idea was spread by Friedrich Frobel in 1837 with the opening of the kindergarten. Later, this free model turned into private solutions.

4.9. Skunk works

They are advanced or secret projects conducted by groups of people and concerning technology, aerospace, business, avoiding managerial or institutional constraints in order to create a radical innovation. The first project was realized by the company Lockheed Martin Corporation for the Advanced Development Program.

4.10. Which?

It is a brand name used by the Consumers' Association, a registered charity and a private company limited by guarantee (primarily a no profit organization) to promote informed consumers' choice in the purchase of goods and services and to raise the awareness of their rights. The Association owns several businesses (magazine, financial services, and so on).

4.11. Healthline Networks

It is a private owned provider of health information and technology solutions. The company, before known as YourDoctor.com, was founded in 1999 by Dr. Norman, an endocrine specialist and Internet health education pioneer and now it counts 21 millions of dollars in revenues.

4.12. Restorative justice

It is an approach to justice that focuses on the needs of the victims and the offenders, as well as the involved community: victims take an active role in the process while offenders are encouraged to take responsibility for their actions in order to repair and avoid future crimes. The idea was generated by an exponent of Mennonite Community, Howard Zehr, and then developed by NGOs.

4.13. Drug court

These are special courts that handle cases of non-violent criminals who abuse drugs under duress. They operate through a specialized model in which there is a strict application of the law but the mental health, social services, therapeutic communities and collective work are seen as a means to help nonviolent offenders find restoration in recovery and become productive citizens.

4.14. Community court

It is a neighbourhood-focused court that applies a problem-solving approach to local crime and safety concerns, emphasizing collaboration, crime prevention, and improved outcomes. It was set in the 1990s as a partnership between private organizations, state and local enforcement, and justice departments. For example, in New York they are successfully integrated into the larger court system.

4.15. Positive deviance

It is an asset-based problem-solving and community-driven approach to behavioural and social change based on the observation that in any community there are people whose uncommon but successful behaviours or strategies enable them to find better solutions to a problem than their peers, with no extra resources or knowledge. The approach was first operationalized by Jeff and Monique Stermin through their work with Save The Children, and then adopted by several organizations.

4.16. Therapeutic Community

It is a participative, cohesive, group-based approach to long-term mental illness, personality disorders and drug addiction: patients have a significant involvement in decision-making and the goal is to avoid unhelpful dependency on professionals in order to enhance collective responsibility and empowerment. With its roots in various religious and political movements, the first community arose thanks to the doctor Maxwell Jones. Some of these realities are also integrated in NHS.

4.17. Participatory budgeting models

It is a process of democratic deliberation and decision making in which ordinary people decide how to allocate part of the municipal or public budget. The first fully

participatory budgeting process was developed in Brazil, in Porto Alegre, starting from an innovative reform program, and later the model has been adopted all over the world.

4.18. *Charity shops*

It is a retail establishment run by a charitable organization to raise money; it is a kind of social enterprise which uses goods donated by members of the public and staffed by volunteers. The first one was set up by a centre for blinds. The widespread came later with the Red Cross.

4.19. *Lifespring Hospitals*

It is an expanding chain of maternity hospitals established in 2005 to provide high-quality health care to lower-income women and children in India through affordable rates. It is a joint venture between a no-profit global venture philanthropic fund and Government of India - owned corporation, a manufacturer of condoms.

4.20. *Nrayama Health Hospitals*

It is a multi-speciality low-cost and high-quality hospital chain in India. The doctor who promoted the initiative, Dr. Shetty, is supported by the Asian Heart Foundation and the Indian Space Research Organization. Approximately one third of the patients do not pay out of pocket.

4.21. *Grameen Danone*

It is a local business enterprise launched in 2006 to provide children with many of the key nutrients normally missing in the diet of rural Bangladesh, through the creation of very nutrient yogurt. It is run on 'no loss, no dividend' basis. At the beginning 1% of revenues was divided with shareholders, but since 2009 the board decided to waive any monetary return.

4.22. *Distance learning*

It is a model of delivering education and instruction to students which are not physically present in the traditional setting like a classroom. The first education course of shorthand was provided by Sir Isaac Pitman in the 1840s; three years later the

Phonographic Correspondence Society was founded to establish formal courses. The spread happened through Universities and Colleges and by Internet at the end.

4.23. *World Wide Web*

It is the well-known system of interlinked hypertext documents accessed via Internet with a web browser. The 1.1. World Wide Web was developed by a CERN employee and computer scientist in 1989 to achieve an effective communication system within the CERN. The CERN is an European Research Organization.

4.24. *Magazines sold by homeless*

So called street papers are newspapers or magazines sold by homeless or poor individuals and produced to support and cover them. Street News, for example, was founded in 1989 by a rock musician and it gained donations for the advertisement. There are also other cases like The Big Issue, The War Cry, linked to a religious and charitable organization.

4.25. *Biological agriculture*

It is about looking at the whole agronomic, environmental picture, nutritional, and biological components of what constitutes a healthy soil.

5. Discussion and implications

In the above Section we positioned different real cases within the proposed matrix and discussed which actors intervene, why, and when.

With respect to the actor dimension, in the analysed cases NBO/NGO are more involved in social innovation than governments or companies. Moreover, while the former are involved in all the phases (Fig. 3), the involvement of companies and government tends to increase moving from the idea generation to its development and implementation (Figg. 2 and 4). This seems to suggest that the pattern is essential in generating, developing, and implementing this kind of innovations.

In most cases, social innovations are need driven, conversely, the technology driver is quite rare. When the latter is relevant, it concerns companies (Fig. 2), whereas it is negligible for groups and organizations (Fig. 3) and absent for governments (Fig. 4).

Actor: Company

Driver	Technology	2	4	5
	Profit	1	1	4
	Need	5	8	9
		Idea Generation	Idea Development	Idea Implementation
		Phase		

Figure 2 – The SOM for the company.

Actor: NBO/NGO

Driver	Technology	1	1	2
	Profit	0	0	0
	Need	22	21	20
		Idea Generation	Idea Development	Idea Implementation
		Phase		

Figure 3 – The SOM for NBO/NGO.

Actor: Government

Driver	Technology	0	0	0
	Profit	0	0	0
	Need	2	3	4
		Idea Generation	Idea Development	Idea Implementation
		Phase		

Figure 4 – The SOM for the government.

With respect to the phase dimension, in the majority of cases the idea generation involves NBO/NGO, whereas companies and governments are seldom involved (Fig. 5). Also in the idea development, the role of companies and governments, although increasing, remains low (Fig. 6). During the idea implementation, the number of involved companies grows, but the majority of cases still refers to groups and organizations (Fig. 7).

Phase: idea generation

Technology	1	0	2
Profit	0	0	1
Need	22	2	5
	NBO/NGO	Government	Company
	Actor		

Phase: idea development

Technology	1	0	4
Profit	0	0	1
Need	21	3	8
	NBO/NGO	Government	Company
	Actor		

Figure 5 – The SOM for the idea generation. **Figure 6** – The SOM for the idea development.

Phase: idea implementation

Technology	2	0	5
Profit	0	0	4
Need	20	4	9
	NBO/NGO	Government	Company
	Actor		

Figure 7 – The SOM for the idea implementation

During the idea generation and, to a less extent, during its development, need driven social innovations are largely prevailing (Fig. 5 and 6); also during the idea implementation, the majority of cases are need driven, but technology driven social innovation count several occurrences, too (Fig. 7).

Finally, the analysis can be carried out under the perspective of drivers. It emerges that, regardless the developer and the phase, need is the most frequent driver (Fig. 8). Technology plays a limited role, which tends to be relevant only when the driver need is less important. Specifically, technology is a driver only for companies (in all the phases), as well as for groups and organizations (in the implementation phase only) (Fig. 9). Of course, profit (Fig. 10) drives only companies, especially in the phase of implementation, when profit is more likely given as the innovation is more mature and less risky.

		Driver: need		
		Idea Generation	Idea Development	Idea Implementation
Actor	Company	5	8	9
	Government	2	3	4
	NBO/NGO	22	21	20

		Driver: technology		
		Idea Generation	Idea Development	Idea Implementation
Actor	Company	2	4	5
	Government	0	0	0
	NBO/NGO	1	1	2

Figure 8 – The SOM for need as driver. **Figure 9** – The SOM for technology as driver.

		Driver: profit		
		Idea Generation	Idea Development	Idea Implementation
Actor	Company	1	1	4
	Government	0	0	0
	NBO/NGO	0	0	0

Figure 10 – The SOM for profit as driver.

In addition, we can focus on the role of business, and note that different categories of social innovations emerge, each characterized by a diverse business model: in some cases, companies are not involved at all (see for example at the Pledge Bank) or are present for philanthropic reasons only (Grameen Danone); in other cases the social innovation allows a profit to be obtained, though low. Moreover, in some cases the role of companies is substantial as they are the weak category to which that social innovation is addressed (e.g. skunk works), in other cases their role is subordinate (e.g. in Aravind Eye Clinics the companies provide the lenses), finally there are further cases in which the companies limit their role to business, making profit from the product or service (e.g. selling products from the fair trade or the biological agriculture).

6. Conclusions

In this paper, an innovative tool to characterize social innovations has been proposed. Moving from the literature review, we have adopted a compact working definition of social innovation (SI) based on the literature review and, observing that there is no clear agreement by researchers on some features of SI (which then we kept out of the adopted definition), we have used them to build the Social Option Matrix (SOM). The latter is a multi-dimensional matrix aimed at investigating which actors intervene in the social innovation process, in which phase, and according to which driver.

Each cell of the SOM, represents a possible combination of the values assumed by the above dimensions. Then, we have populated the SOM with 25 real instances of social innovations derived from the literature. The analysis has shown that, relatively to our sample, in all the phases of social innovation groups and non-business/non-governmental organizations are more involved than governments or companies; the involvement of companies and government, however, tends to increase moving from the idea generation to its development and implementation. The analysis of the selected case has also confirmed that social innovations are mostly need driven: the technology driver, indeed, is quite rare whereas the profit driver pertains to companies only, and occur mostly in the last phase of idea implementation.

The actors involved in the development of social innovations can adopt the SOM to better understand what a social innovation is as well as to increase their awareness on what they (can) do with respect to social innovation: for example, governments could pick the opportunity up to enter in this field and to provide means to achieve social innovations; companies could allocate themselves in the matrix to improve their communication towards stakeholders.

We are also aware of some limitations of this analysis. In particular, given the quite high number of the analysed cases, it has not been possible to carry out an in-depth investigation for each of them. Nonetheless, we think that the adopted approach has been effective as a starting point to explore the role of companies in social innovation and which are the drivers to get them involved. Based on our preliminary results, some implications can be derived for companies, which concern when and why they should participate to social innovation initiatives, and whether some strategic alliances could be convenient to achieve a broader goal.

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How to facilitate social innovation? The “Innopresence-method” as a tool towards sustainability

Virpi Koskela*, Suvi Konsti-Laakso

Lahti School of Innovation
Lappeenranta University of Technology
Saimaankatu 11, Lahti

* *Corresponding author*

Structured Abstract

Purpose – This study will introduce the new practice-based method of facilitation which may be useful in the battlefield of misunderstandings, preconceptions, and outdated attitudes of working life, but also as a fruitful tool towards social innovation. The seed for the birth of Innopresence-method came from the practice-based experience of organizational working life – from the workers’ experiences of presence.

Design/methodology/approach – The Innopresence is based on the collected data of the (social) innovation development work executed in Finland during the years 2011 – 2014 with the help of 277 worker’s experiences. The qualitative, phenomenological analysed study submits that the most important part of facilitation is to make people open enough to share their practical and tacit knowledge in a common space, in the *ba of equality*, which could be seen as a place of open dialogue where everybody is treated equally.

Originality/value –Social innovation may be seen as a process where a new solution is found for a problem by considering it from a new point of view by for example developing ‘common spaces of sharing’ together equally with everybody in the community - where participants of dialogue are valuable resources of knowledge and (social) innovation (Heikkilä & Heikkilä, 2001). These spaces of sharing seem to be an important part of social innovation -these ‘*bas*’ (arenas for social interaction; Pässilä, Uotila & Melkas, 2013) *of equality* are the “seedcases” and significant constituents of new (social and sustainable) innovations.

Practical implications – The outcomes of the application of the creation process and use of Innopresence-method has showed that there is a need for common spaces of sharing in the field of Finnish working life. Through the emerging themes of experiences it appears that together built and shared spaces have helped employees to change their thinking models of daily work towards more sustainable and innovative ways to develop it – and create new kind of social innovations. Workers in organizational playgrounds should have time and space to share concrete experiences of their work to develop new, socially sustainably ideas and innovations.

Keywords – facilitation method, social innovation, innovation, interaction, presence

Paper type – Academic Research Paper

1 Introduction

Social innovation is a counterpart of technological and scientific innovation. Already Schumpeter identified social innovation that should take place in economical arena as well as culture, politics and society's way of life in order to guarantee the economic efficacy of technical innovations (Howaldt & Schwarz, 2010). In management studies and in innovation research, innovation is often seen as technological and scientific progress. Therefore Mumford (2002) called social innovation a lost domain in innovation studies.

Social innovation is described for example as a broader umbrella concept that includes ideas of social entrepreneurship (Weber, 2012). Social innovation is nowadays also seen to be closely associated with interorganizational and intersectoral collaboration which finds alternative solutions to some of the most intractable social problem in our world. Both social innovation and social entrepreneurship are about new and innovative ways of organizing, collaborating, and managing that influence actual practices and technologies. (Lawrence, Phillips, and Tracey, 2012.)

The birth of social innovation is linked to the human ability of interact, work, develop and innovate together with others (Centre for Social Innovation 2010) and the changing of the ways of thinking that increase novel solutions to social problems with societal value (e.g. Phills et al. 2008; Ståhle et al. 2004) or new ideas that work in meeting social goals (Mulgan et al. 2007). Many important social innovations have developed through workers' daily practice-based development work inside the organizations. Development of social innovation is connected to the interaction of the people inside an organization - and the participatory processes are important parts of it. Social innovation of working life could be a new idea created by an individual or group of communities; it brings, for example, added value in the wellbeing of individuals in the organization (Taipale & Hämäläinen, 2007).

One key tool of interaction in an organization is the worker's ability to be present – with a workmate, with a customer or attending to his or her own work. But nowadays there is a lack presence due to the stress of everyday life. People are in rush to 'already-be' in the next moment, next place, next project, and almost the "next life". More fast you are the more effective you are, even if that you do not know what for you are running and rushing. Faster and faster.....fast food, fast everything, you have to answer to your e-mail, this offer or phone immediately, now! Before somebody else do that earlier. When society pressures workers to increase effectiveness and ability of competence it occupies

their process of thought which makes people lose their way to be present in their work – and evaluation of it. All the anterior observations were very common among the workers who were an important part of this research.

A worker's individual capacity of being present in a moment has not been researched thoroughly. The experience of presence belongs to the field of tacit knowledge, which is – because of its 'invisible character' – a challenging field to study. Also perception and bodily awareness have important roles in tacit knowledge (Parviainen, 1998). Otto Scharmer's "Theory U" (Leading from the Future as It Emerges, The Social Technology of Presencing, 2009) is one of the previous organizational management studies which highlight the meaning of the experience of presence as a learning factor in organizations, work teams and in the field of leadership.

This study attempts to tackle two research questions: How the experience of presence can be facilitated in organisations? And the second question is what the experiences of presence in organisations are? With the guidance of these questions and their relationships to more sustainable way of innovation this study will introduce a new facilitation method that builds on social innovation and Scharmer's concept of 'presence'. This paper is constructed as follows: first, the theoretical foundations are presented. The empirical part of this paper introduces the method and empirical observations that were obtain from testing the method in organisations.

3 The researched phenomenon: Presence

The phenomenon of 'presence', 'the state of condition of being present' (by the Illustrated Oxford Dictionary 1998) has not been researched extensively. Presence is described as being the moment when one no longer waits for the following moment to fulfil this current one (Tolle, 2002), or as being a state which is not analysed but experienced as immeasurable and endless (Beck, 2007). Presence makes every moment appear constantly new, reorganises itself and changes individual denotations of phenomena (Varto, 2011).

In this article, the concept of 'presencing' is used to signify a combination of sensing and being present, that is according to Scharmer being "connected with the source of the highest future possibility and bringing it into the now" (Scharmer, 2009), or a flexible state of mind (mindfulness), in which people are actively engaged in the present and notice new things (Langer, 2000). The challenging part of presence is that it is situated

outside the text in the past experiences; you can only write about it when it is not there anymore (Bäck, 1995).

3.1 Scharmer's new social technology as a tool towards more sustainable innovations

Otto Scharmer has worked with many governments in Africa, Asia, and Europe and has innovated award-winning leadership programs for companies (including for example Daimler, Fujitsu, Google, and Natura) (Gunnlaugson, Baron, and Cayer, 2014). He focuses on a holistic, “new” way of understanding which means that mankind needs to take into consideration wider perspectives, such as common values that uphold all living on our planet in order to cope. The holistic attitude relates to the way of life where goal is to achieve sustainable development in every dimensions of organizational living. It is necessary to change technological and organizational thinking because of the global environmental and social threats (climate change, hunger, pollution etc.) that humanity and the Earth are facing. (Lähde, 2004; Macy, 2007; Scharmer, 2009; Sveiby & Skuthorpe, 2007.) Scharmer helps groups of diverse stakeholders from business, government, and civil society to innovate at the level of the whole system using his Theory U and presencing as a landmark. He wants to help people gain access to and learn to work from the deeper levels of knowing and being. He thinks that “*what can save business and society already exist, but we need to attend to it more mindfully*”, and that is what he tries to do with Theory U and presencing. (Gunnlaugson, Baron, and Cayer, 2014.)

One important part of this ‘to be present’ -attitude is spirituality, which can be said to be another word for personal awareness (Fairholm & Fairholm, 2009) and an element of creativity and that is the reason why for example, Scharmer recommends silencing the mind to be incorporated in leadership training (Scharmer, 2009). Today’s organizational leadership needs a new type of social technology based on three instruments which everybody already has – an open mind, an open heart and open will. Refining these capacities from the individual level towards a collective level leads to new technology. (Scharmer, 2009.)

In the experiences of presence, these three capacities are linked. The first one, the open mind, is based on the ability to access the intelligence to see with fresh eyes. The second instrument, the open heart, relates to the ability to access emotional intelligence, the capacity to feel empathy. The third is open will, which relates to the ability to access

one's authentic purpose and self. This "three-type of intelligence" is also referred to as spiritual intelligence, as a moment when something "new" can emerge changing the quality of our attention by letting go of old identities and intentions and allowing some emerging future purpose to enter your life. (Scharmer, 2009.)

Social innovations are introduced for example by an entrepreneurial spirit and through solidarity; they may improve the functioning of the organisation or to transform the organisation into a social enterprise, an enterprise with social objectives or to empower it with a more participatory governance system (Nussbaumer & Moulaert, 2007). During recent years, the subject of sustainability has slowly aroused more interest for example through an ecological view of organizations (Harle, 2007). It has been noted that modern society requires a social consciousness and global ecological responsibility as well as a new focus for innovation (Sveiby & Skuthorpe, 2006). John Dewey argues in his philosophy of experience that the most sustainable results of frugal operation will obtain then, when all the participants/workers of the action give their most free and creative parts of them, and when they work in an open, reciprocal interaction (Alhanen, 2013).

In this research the place, where to accept our experience and make it reality is a "deeper place of stillness where it is easy to let go of the old and connect with higher-order intentions" (Scharmer, 2009), the place called "presence", may be seen as a place or space for a new, more open interaction, the possible to develop a more sustainable social innovation.

2 Methodology

2.1 Phenomenological approach

The investigation is qualitative, because all the data of people's experiences is collected and analysed through the phenomenological thematic analysis. The experience of 'presence' is a special state of awareness where we find ourselves in the realm of presencing and learn to sense the future that is seeking to emerge (Scharmer, 2009) connected to the phenomenological conception of silence and particularly to the exercise of silence which slows us down to be present with that something which is shining through itself despite of our will and representations (Varto, 2011). The moments of presence can be seen as the moments of collective awakening which may lead to the consequent changes in social systems (Senge, Scharmer, Jarowsky, and Flower, 2004).

This study is an experience-based try to verbalize the more or less silent and hidden parts of the certain phenomenon – the presence – in human existence. In order to understand a phenomenon in research and describe its essence – the essence of the experiences of presence – we have to understand ‘the nature’ of our experiences in a phenomenological way problematizing what we experience but take for granted that what we see is what it seems to be. This is the reason why phenomenological approach was selected. This means that the researcher (and a facilitator) is “actively waiting” for the phenomenon, and its meaning(s), to show itself, even if it is never finally completely explored or described (Dahlber, 2006).

The data of this study has collected through 23 workshops, where the researcher (first author of this paper) has been not only as a researcher, but as a (social innovation) facilitator trying to be the activator-link between the participants and their inner activity being sensitive and respective to their original descriptions (of presence), the phenomenon, and its open horizons. Phenomenological approach offers a suitable way of processing for the experiences of tacit knowledge, to learn about human experience, to open for it, and real understanding of phenomenology can only be accomplished by “actively doing it” (Van Manen,1990).

2.2. Data

All the data of this paper has collected in Finland during the years 2011 – 2014 in various (social) innovation development workshops mostly in the fields of public sector (elderly care, dental care, public health, and youth work). The amounts of the workshops (23) and participants (243) are viewed in the next Table 1.

Table 1. Collected data 2011 – 2014

F= women, M = men

Workshops:	where	organization	when	amount	participants
1. Workers of elderly care	Lahti	Public sector	2011	2	44F
2. Workers of dental care	Lahti	Public sector	2011-2012	8	30F, 2 M = 32
3. Workers of child welfare	Tampere	Public sector	2011-2012	7	13F
4. Theatre sessions for workers of public health	Lahti	Public sector	2011	2	84
5. Participants/interns of theatre workshop	Tampere	3. sector – employment	2011-2012	2	14F, 12M = 26
6. Youth workers	Kuo-pio	Public sector	2013	1	14F, 6M =

					20
7. Adult education	Lahti	University	2014	1	23F, 1M = 24

The main themes of following workshops (including two theatre sessions) have been customer oriented approach and (social) innovation, and the ability to be present in your life and work, especially when you encounter another person (for example a customer, client, and colleague). All the experiences of presence of this paper have been collected in many participatory ways by using art-, contemplation- and body –based tools in workshop work (see Table 1.), but also by having three deep interview, and collected self-written narratives (31). The amount of people who have been participated this research is hence 277.

The dissection of the whole data is still preliminary and needs more exact processing and analysis, consequently all the results of this paper are directional.

4 Innopresence-method

4.1 Innopresence-method as way of working

Table 2. presents a typical way of facilitate the Innopresence-workshop. Even if the way of facilitating is different in every time because of many things (the tasks, the atmosphere, the level of energy, the place, and so on.), here it is seen some common, and also the most important, features of it.

Table 2. Some typical way of facilitate Innopresence-method in workshop working

1. Warming up – > free movement in space, gently awaking body and senses, finding a new perspective to move your body
2. Finding own space and body position in a room > Why did you pick that position? <i>“I can see outside...---... the sky is a beautiful element: stars, sun, moving clouds, there’s still light in middle of gray sky...---...At this moment I have some pain in my back, I get this movement from the movements of the clouds...”</i> > getting to know each other from a new point of view
3. Changing places: a chance to go through all the places and positions – “jumping into another’s shoes”
4. Observations of the movement exercise in the “round floor discussion” (f.e. sitting on the floor in the circle)
5. How has the subject of presence been in your thoughts at your work? Talking in groups/pairs, sharing experiences.

6. “Common space of sharing” > Sharing the found experiences by talking together in a bigger group – in equal, all participants together. > In this part the role of facilitator is to be very alert to hear all the important insights people have shared about their experiences
7. What was the ‘main theme’ of the discussion? What is now the most important task we should take care in our work (organization)? > The first part of the workshop may end with a discussion about the emerged ‘main theme’. In some cases the discussion may be a start to a new (social) innovation.
8. The next part of workshop is possible to facilitate inside or outside. In this example it happens outside in a large park nearby the place where people are working. This part is called ‘silencing your mind and contemplating nature’.
9. Find yourself a nice place to be at one with yourself. Try to it in unique way, for example by just “hanging around”. Think about your subjective relationship to nature.
10. When you’re in your place, clear your thoughts by silencing your mind. Be aware, observe and sense all around you. If you feel comfortable enough, let one issue from work (the one you maybe have been worried about lately/some task from the last discussion together) to come to your mind. Accept it and let the answer come from this situation, from nature, from yourself.
11. Coming back together and sharing the thoughts and insights. This is much alike than parts 6. and 7. before.

4.2 Experiences of presence – and some effects of them

In the start of creating a new facilitation method the main interest was in the experiences of presence: What were they like? Where they used to happen? The first characteristic and repeated observation in the creation process of Innopresence after the first workshops and interviews was, that the most important place for the experiences of presence seemed to be somewhere in nature.

“When I am in nature and experience those moments, the world is not ‘somewhere far away’, instead it comes to me. I would not say that I am a part of nature or the universe or anything else, but I feel at home during those moments.” (Man, 37 years, Project Manager)

Many participants have found the nature-exercises (/their own nature-experiences) easy to do because it is ‘so normal’ to Finnish people to go outside to nature almost every day. Scharmer finds similarities between aboriginals and Finns in the concept of power-places, “*simple cabins in the woods*” and heartfelt relationship with nature, which children are encouraged to develop and parents teach their children to listen to the forest. This kind of relationship with the presence of places in nature is special, even sacred, and it may have contributed to Finnish children excelling at school and the many successful social and technological innovations in Finland (Scharmer, 2009). Biomimicry also testifies how nature is full of all kinds of innovations and that is why the future belongs to

the “nature-smart” people who develop a deeper understanding of the transformative power of the natural world (Louv, 2011).

Some people found that experiences in nature for example help to “let go”, “surrender” and “connect to your real family (Nature) who is always present”. People sensed feelings of peace, flow and positive thoughts (projecting to the future, towards a challenging meeting in the following week). According to international studies, the power of nature and connection with the natural world are fundamental for human health, intelligence, well-being, spirituality and survival (Louv, 2011; Frumkin, 2001), and observations of nature can evoke a sense of spirituality (Louv, 2009) and a desire to protect the environment (Chawla, 2007).

Another interesting ‘sustainable’ result after various experiences with Innopresence-method was that the most common word people used when they described their experiences of presence was ‘connection’, but their connections were different. There were many main characteristics with different emphasis: feeling of connection, connection with nature, connection with another person (client, customer, colleague, friend, and so on), connection with harmony and stillness/empty mind / flow (intensive action, strict observation of little details), and connection with something bigger than oneself. We may easily see that all these experiences are seen to belong to the holistic attitude of creativity (Scharmer, 2009; Sveiby & Skuthorpe, 2007) which lies in the flux between harmony and conflict and connecting with it enables us to reconnect with the innate human impulse for creation and evolution, the flow that makes change possible (Halprin, 2005). Modern quantum physics teaches us that all living creatures and elements are connected. Mankind depends on its relationship with the environment (synergy) which is why we now face many global challenges (climate change, hunger, pollution, economic crisis etc.) and we need to change our outdated technological and organisational thinking in relation to planet Earth and all life forms on it (Lähde, 2004, Macy 2009, Scharmer, 2009 and Sveiby & Skuthorpe, 2006).

Common for all the observations of ability to be present at work (and life) were that they have been shared together in the *ba of equality* (Nonaka & Takeuchi, 1995) which could be seen as a place of open dialogue or a certain space where everybody is connected to each other – and treated and listened equally without any status or hierarchies. In that way the all participants of dialogue may be the valuable resources of knowledge and (social) innovation (Heikkilä & Heikkilä, 2001).

The participants/workers of the organizations achieved many practical changes after creating (processing) and using the Innopresence method. For example in one organization of child welfare and in the dental health care the workers had noticed that the consciousness about their own processes and attitudes had increased, they were more aware of it. They had started to pay more attention to their resources, and how to develop hope both within their client relations and within the relations towards themselves. *“This work is never ready. You rarely get positive feedback; you must also have to give it to yourself.”* (Woman, 59 years, Social Worker)

Many participants of the whole Innopresence-process described in their feedback that they learned to pay attention to the strength of positive thinking (and observation) and to things which disturb their ability of presence. They found ways to be calm in middle of a rush, possibilities to recognize and become aware of their working methods and a way to develop their work and themselves as workers. They awoke their consciousness of the importance of presence. These all are important aspects if we think about more sustainable way of innovate, and develop social innovations. But it needs vigilance and self-discipline to change one’s thinking routines and break the formality of work towards a collective creativity. Collective creativity requires courage to have an open and safety surroundings to act differently (Frantsi, Pässilä and Parjanen, 2008; Parjanen, 2012). Breaking our daily routines by seeing things from more than one perspective (Parjanen, 2012) and by trusting senses may open up to the world around us (Thorsted, 2008; Scharmer, 2009). The creativity contains also co-operation and service without competition – but with co-operation and symbioses (Lecture notes of the Neijing Dance Seminar, 2012).

When workers who had participated in Innopresence creation process -workshops evaluated themselves, they were assessing what they already knew, did not know, and what they would like to know recognizing their own strengths and weaknesses. They became more familiar with their own beliefs, and possibly their misconceptions and cynicism. They were able to set goals that they felt they could attain with the new knowledge they had gathered about themselves. Insights inside the group and workshops were bettering the quality of their work and giving more tools to develop it. The shared awareness of presence seems to also to be strongly connected to the wellbeing at work: *“Presence means that you know yourself as a worker, too; what are your strengths, and in what areas you still need to develop. This way you may benefit from your own resources*

as a worker and not burn yourself out. The presence has a big influence on the work community. Presence affects wellbeing and the structures of the (work) community.”
 (Woman, 35 years, Social Worker)

It seemed that workers’ experiences of presence are related to innovativeness, shift and development of the organization, and it is possible to use experiences of presence also as one’s key tools for the evaluating of her/his own work. But we have to build spaces, places, possibilities and time in organizations to do that intentionally. The “common space of sharing” is not so common and usual thing in the working cultures. Indeed we have lots of team-, week- and management –meetings, but we do not have the intentional and facilitated space for common and equal/non-hierarchical sharing the experiences of work.

4.3 Innopresence and Scharmer

The following table (Table 3.) displays certain similarities between Scharmer’s three key instruments to use the new type of social technology (open mind, open heart and open will) and the Innopresence-method.

Table 3.

Scharmer’s three instruments of social technology to use in organizational development work

(Scharmer, 2009)

Open mind

A fresh look

Perceiving objects and facts

Open heart

Connection with surroundings

Tuning in to different contexts

Empathy towards other

Empathy listening

The parts of Innopresence

1. Warming up –> free movement in space, gently awaking body and senses. Finding a new perspective

2. Finding one’s own space and body position in a place: “---... *when being alone by myself, I do not control my thoughts or what I say to myself. It is easier to drift to a situation and a state of mind where something grabs my attention, empties my mind of all thoughts and I no longer see my surroundings the way they are.*” (Man, 45 years, Stage Worker)

3. Changing places: a chance to go through all the places and positions – “jumping into another’s shoes” – empathy listening of another person

8.9. ja 10. ‘Silencing your mind and contemplating nature’ – empathy listening of nature and your inner voice: “*to be at peace and silence with yourself*”, “*to be authentic, to be who you are*”, “*reciprocal interaction*”/“*listening and hearing*”, “*concentrating on one thing and moment at a time*”, “*identifying your*

own emotions” and “emphasizing another person’s emotions”.

Open will

Letting go and letting come

The place of ‘presencing’ which connects open mind, open heart and open will

Cannot be described with words

Authentic purpose and self

“I can’t express what I experience in words. My whole being has slowed down. I feel more quiet and present and more my real self. I am connected to something larger than myself.” (Scharmer 2009, 12)

5., 6., 7. and 11. The sharing parts of Innopresence when people share their experiences in pairs, groups, or altogether. This is called ‘the common space of sharing’ where everybody is listened equally. It may also be a moment of inner insight or idea, which is sometimes even difficult to share because of its ‘tacit nature’: *“Actually words cannot describe my experience; I do not believe that there is any way to describe that moment...---... I believe that the moment of presence is the moment when that mind awakens.”* (Man, 35 years, Project Manager)

There were seen also many strong similarities between the workers’ descriptions of experiences of presence and Scharmer’ three main instruments of new social technology (*open mind, open heart and open will*). People even used same words when they describe their sensations: ‘open mind’, ‘open heart’, ‘authentic self’ and ‘letting go’ were common expressions. Some of the workers/participant were also very conscious about their “blind spots”, the place within us where our intention originates (Scharmer, 2009) for example during customer meetings.

In Innopresence workshop processes, through the equal encounter between participants and the group field, there was born a collective, a common space of sharing, coming into presence both in silence (feelings, images, and body awareness), in art-based expressions (authentic movement, improvisation) and in language (shared words and thoughts), opening the way for new meaning and discoveries to be discovered. Olen Gunnlaugson, who has researched collective wisdom and leadership development writes about that kind of encounter between participants and the group field, that: *“Such shifts have the potential to shift the conversation in the direction of presencing or greater collective intelligence, increasing the collective process and quality of attention, with the proof of discernment being its knowledge and lifetransforming fruits (increased presence, clarity, acuity of thinking, feeling, etc.)* (Gunnlaugson, 2011, 16)”.

If a person gets in touch with his or her inner spiritual being (awareness of presence), it enables him or her to identify and use his or her best qualities, such as, confidence,

quickness, courage, perseverance, hope, and love, and help leaders to motivate, inspire and to intensify the unity of the group (Fairholm & Fairholm, 2009; Scharmer, 2009).

6 Conclusion and discussion

“I have been more present by myself; I am more aware of my body, senses, attitudes and emotions....---...What could this mean in working life?” (Woman, 37 years, Social Worker)

Innopresence-method provides a very different approach to more rationalist approaches such as commonly used ideation techniques. The use and research of Innopresence and all same kind of methods of experiences of presence (meditation, mindfulness, and so on) in work organizations is challenging today because of the demand for productivity and rationality. Productivity requires performance and constantly fastened routines but a common space of sharing requires time, presence, ability to stay still and share together in the present moment. But it is not the only challenge of this phenomenon of presence, which is difficult to research because of its ‘invisible nature’. Already in 1996 when Otto Scharmer did his first interview with Francisco Varela, Varela said: *“I maintain that there is an irreducible core to the quality of experience that needs to be explored with a method. In other words, the problem is not that we don’t know enough about the brain or about biology, the problem is that we don’t know enough about experience....”* (Scharmer, 2000).

The phenomenon of presence is subjective, dynamic and based on one’s own experience, but there is still seen various amount of similarities in the descriptions of participants. One common perception was that the more you pay attention to your presence the more your awareness of it increases. People who are working in organizations are not separated from their ‘outer lives’ or civil lives – their ways of thinking, feeling and acting. Their ways of work and live are connected in the same lively way like they are connected to the nature. Through the experiences of Innopresence process it seems that there is still some aboriginal inside the western individual, an urban “aboriginal” who wants to shift his way of living towards more sustainable, and connected way of living and working? What needs to be done to reawaken it?

It is very common nowadays that interaction, crucial element of any knowledge transfer activity, inside organizations does not function well enough because of stress,

communication silos between people and their levels of acts, thoughts and emotions in the working communities which are not relevant in the building process of social innovation.

What would happen if working groups could coalesce and share their ideas without being censored by hierarchical interventions? Maybe the capacity for dynamism in the workplace could change for a more sustainable, even limitless direction. Almost all the 277 workers who were participated in the creation of the Innopresence in a way or another wished that they could have more daily 'common space' to share intentionally their experiences at work. The kind of shared 'presence-awareness' could possibly be a fruitful way of thinking and acting for work organizations who want their workers to participate in the development of their work - and increase the ability of creating more sustainable and social innovations, as well. But it is obvious that much more future research and more exact analyzes of the data is needed.

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The Albergo Diffuso as an example of management model for sustainable growth of organizations and communities, the case study of Gal Cosvel in Basilicata

Angela Passarelli, Roberto Carella *, Giuseppe Colucci
University of Basilicata

Antonella Desiati
University of Salento

** Corresponding author*

Abstract

In last years there has been a change in the choice of tourist destinations due to a grow of alternative forms of hospitality. In fact new generation of tourists shows a certain impatience with standardized holiday and starts searching for most authentic products reflecting the culture of the place. The success of these new tourist practices manifests the cultural change that has affected all aspects of today's society, moving from the sphere of values, finds expression in behaviour and consumption patterns. In fact the new generation of tourists shows a certain impatience with products of the standardized and comprehensive holiday, and starts searching for most authentic products which are closer to the culture of place. In Basilicata a project promoted by the Gal Cosvel (Group of local action, Consortium for the development of the local economy), supported AD because is a sustainable formula and doesn't modify in some way the territorial order and encourage to reuse of the existing patrimony.

Keywords – Tourism, Sustainability, Widespread hotel, Organization

1 Sustainability and new Tourism demand

In this context, rural tourism as a form of tourism that respect the environment, is becoming increasingly desirable for the preservation and enhancement of environment and local communities. Rural tourism must be understood in the reception in rural areas which provides the ability to perform specific activities (cycling, fishing, horse riding, country life and healthy) and stay on farms with activities related to them. Looking at the size of fruition ", there is a rural tourism when tourists visit different places from everyday life in areas with low population density, a primarily agricultural and economic condition in the presence of traditional social structures; basic motivations are looking for

peace and tranquillity, expectations of scenarios and the provision for social contact with a human dimension" So there are important sociological factors that determine the desire for uniqueness and authenticity. Policies to promote local quality products therefore meet the growing need for safety and quality: the naturalness and authenticity of typical products are the new shelter that goes beyond the city gates, and can not be " out of town ". The authenticity implies by involved actors, a work of reinvention and reinterpretation of the past : we see the use of procedures of certifications, formal and informal , which tend to justify the originality of a given product recalling its conformity to tradition , local cultures and identity of the place. To better define the uniqueness of a product , the European Union has created a regulatory system of food production that , through forms of labelling or certification of quality, as the definition , protection and preservation of the identity of the products identified in the marks . Tourists of today love the small villages, local cuisine, explore the traditions and customs of local communities, the warm reception and ultimately show a growing demand for quality, the search for authenticity and lifestyles and emotions typical of villages and communities. The selection of a positioning through this kind of hospitality, may be able to put in value the relevant public and private real estate capital renovated with the massive public investment in post-earthquake and largely unused and / or underutilized , a real capital available in many small towns in Basilicata, which, if accompanied by policies of integrated services and entertainment, which proposes to a certain target travellers the experience of living in small villages, with the pace and tranquillity typical of these areas. These trends find their natural outlet in the hospitality widespread forms of hospitality that the preservation of places, environment and lifestyles have made their *raison d'être*.

The widespread phenomenon of hospitality, understood as a hotel Countries, Villages hotel , apartment hotels and popular hotels , is now a reality that has joined the tradition, encouraged by European Union regulations as deemed to be more consistent with the sustainable development . The estimates and the available data are very encouraging and discussing a range of hospitality widespread phenomenon in Italy that involves several small and medium-sized dimension . The success of the phenomenon is also shown by the boom in publishing initiatives related to it and the increasingly wide spaces dedicated to this topic in newspapers , magazines, tourism as well as dissemination of tourist specialized guides. The most interesting model and one of the most innovative forms of hospitality is widely "Albergo diffuso", an original model of hospitality that is

configured as a phenomenon with historical and cultural roots in our country. We start talking about "Albergo diffuso" (Widespread hotel), in the early 80s in Friuli Venezia Giulia, in the process of rebuilding after the earthquake ; but it is only at the end of the decade that can be seen concrete and precise proposals and actions . At first the idea is the result of the need to recover in terms of architectural and building entire villages destroyed by the earthquake and abandoned, and takes the form of offering accommodation houses and apartments in villages mainly inhabited. The tourist offer that results is rather that of scattered houses that can be used for tourism purposes, not being provided or a hotel management of the property, or the usual hotel services to guests. It will be only from the mid-nineties , thanks to the action of intervention for disadvantaged rural areas of the European Union , with the " Leader" (Liaison Entre Actions de Développement de l'Economie Rurale) that we see a considerable increase of the achievements of widespread hospitality , which often play a central role in projects aimed at creating a stable culture of local development and to develop tourism in collaboration with the sectors of agriculture, crafts and services.

The growth of such projects , however, did not follow a harmonious and uniform spread in the peninsula , but it was more significant in some regions as compared to other Italian Sardinia , Friuli, Marche and Umbria , which have also prepared a regulatory framework by classifying the hotel widespread as distinct category of hospitality. In addition, we must specify that these innovative forms find their ground in rural areas which suffer most from the economic point of view and development. These are small towns , often, because their location and their geo-morphological characteristics are cut away from the main commercial and tourism routes, but are full of a priceless heritage in terms of culture, history, traditions and environment . These areas can find in the development of their villages a possible solution to the development and preservation of the area, focusing on the widespread hospitality formula. The first experiences of these kind of hospitality was born in 1998 in Basilicata, as a form of receptivity inserted in centres, through the initial experiment of a Country Hotel in the "Lucan Dolomites ." These various structures linked together made a hospitable village , based on structures linked together and with a unified management .This reveals that the two poles of interpretation of the concept of hospitality widespread: the widespread Hotel and the Village Hotel.

2 Widespread Hotel

According to Wikipedia Albergo Diffuso (Widespread Hotel), is an innovative concept of hospitality, which was launched in Italy in the early 1980s as a means of reviving small, historic Italian villages and town centers off the usual tourist track and is conceived as a hotel that is not in a single block, but converted out of various historic buildings in a small community. The Widespread Hotel model intends to sustain strategies for a sustainable development in harmony with social values and economic activities and respecting the cultural, environmental and landscape identity of territories. The definition that has long been used for building hotels provides "a structure deployed in more stable close to each other, with unified management that can offer hotel services to all guests", and makes explicit reference to the definition of property contained in the law May 17, 1983 n. 217. "A little 'house a little 'hotel', this is the new formula of hospitality that takes the name of "common property". The adjective "widespread" denotes, therefore, a horizontal and not vertical like that of traditional hotels. This type caters of staying in an urban setting and live in contact with residents than with the other tourists, to take advantage of the normal hotel services such as breakfast room and restaurant service. The proposal of the "Borghi hotel" was, however, exposed the first time in 1998 at the International Conference in Krakow, organized by the World Tourism Organization (WTO), with the approval of the Global Code of Ethics of the Tourism, which had an important echo in countries that had implemented policies to relaunching their "rural villages" and that they saw the solution to the problems of tourism revival of the resorts in the new concept of "Village Hotel and B & B". Since 1995, Basilicata, take away some experiments resorts urban, characterized by the "widest possible dissemination of rooms and services for tourists." It begins, therefore, to outline an initial definition of the phenomenon in Italia. A further definition of Borgo Hotel speaks of "accommodation micro structures released by strict numerical parameters and legislative constraints too stringent, closer to the concept of B&B that is not true to the hotel hospitality and proper. The key concept underpinning the formula "Hotel Borgo" is to foster the development of historic urban centres receptive, through the transformation and adaptation of rooms and houses to be allocated to the receptivity and make them available to tourists through the City, the Pro Loco, Cooperatives and Associations. The Village Hotel is certainly a form of hospitality widespread, but does not have the features or services specified by the experience of popular hotels. For this reason, in fact, the first realizations emerge quite a

few weaknesses , which are regularly encountered in operational projects . It follows that the experiences of Diffuse Hotel achieved so far corroborate a number of major strengths of this model of hospitality , as compared to other formulas such as the Village Hotel and B & B Essentially, it was the work of the GAL and the Community Leader programs , which have made a number of loans for the construction of these projects. This hospitality formula subverts the principles of traditional hotel, because it starts from the premise that less is built and the less you spend , the more you invest in culture restores and greater integration with the culture of an area and its sustainability .In the recovery of the housing is no longer used and transformed into small accommodation of quality and value, the diffuse hotel pays great attention to the environment and is in line with current standards in terms of sustainability , allowing it to be perceived as authentic. The local characteristics are also found in the interiors of apartments and rooms , each different from the others, in the name of the same, whose names are often linked to the characteristics of the territory, but which is also found in all other environments and services offered from the Hotel widespread , contributing greatly to the growth of the local and the opening of new markets for the products of the same territory .It follows that the strength of this new accommodation is the strong link with the territory, the ability to recover and promote the small Italian towns often intended abandonment and subject to depopulation , to tell the memory , art, flavours with the authentic witness of the local community .The Widespread hotel is a formula soft and is the mirror of the context in which it lies , is the cross-section of the territory in which the guest is not just a tourist, but it becomes a temporary "resident", who lives in contact with its inhabitants and their activities .Tourists first of all want to live and stay in an urban context of value, in close contact with the natural environment and cultural heritage of the locality, in constant dialogue with the own resources of the area (art, traditions, flavours , crafts , events) , but also want to experience the local flavour, breathe tradition and expects to be treated as a person , not as a common customer. Due to its characteristics the Diffuse Hotel can have the function of " animator historic cultural and economic centres " , its reception can be used as an office location information through agreements with the various Info-point in the area, so that the historic centre can revitalize maintaining an internal complexity of functions, residential , business and commercial , but especially can become a gathering place not only for tourists, but especially for the locals .The widespread Hotel, unlike traditional hotels, allows visitors to experience the authenticity of experience with living

in renovated houses and other buildings designed for tourists ; also the tourist who is focused on a widespread hotel may have at its disposal a varied range of choices offered by the operator receptive, since the product itself provides diffused hotel policies also differentiation of prices with the intent to consult with proposals diversified in different supplies .

3 Methodology

Given the relative paucity of research on AD in the south of Italy, we propose an approach for this study based on an exploratory case study (Yin, 1994) with a qualitative research design that allows a detailed exploration of the topic (Eisenhardt, 1989). Data collection involved accessing organizational documents and conducting semistructured interviews from December 2012 to March 2013 with managers directly involved with planning and implementing AD. The interviews were designed to identify specific AD practices used by Gal Cosvel, and tourist operators. These practices were explored to identify how they are implemented, and the perceived impact of these practices on tourism innovation capacity. The interviews lasted approximately two hours each and were tape recorded and later transcribed.

4 Case Study: Cosvel GAL and Widespread Hotel

In the experience gained with the Community Initiative LEADER II, the awareness that tourism grew , more and more , the almost natural location for the development of Europe's rural areas , has been the main focus for projects initiated by the Cosvel GAL : in these territories , rural tourism has been the starting point to trigger new socio-economic opportunities for growth. Even in financial terms , rural tourism has represented to this program, the most important section . A proposed rural tourism at the local level then , with a driving force of its own, creative activity in other sectors. The action had strong elements of innovation for the area where an intervention of recovery of the housing of the historic centres for tourism , had not yet been realized .The key feature of this activity was to be " open," ready to recover interest and sensitivity of the population, to define a path that would meet their needs and the intent to create a body that will assume responsibility for the management of tourism rural area .To achieve these objectives it was necessary first of all and above all that the local entrepreneurs , current and potential,become the active participants , subjects and not objects of social

transformation ; they were put in a position to develop a mentality of entrepreneurs and a business culture that is still weak and sometimes absent .The aim of the action was to determine the minimum conditions for the start of a process of tourism in the area. The owners of the houses, public or private , to obtain the leading contribution , pledged to cede use in their homes for a period of time not less than ten years.To facilitate the innovative path to the owners of the houses was given the opportunity to use the property , to the only family in the periods in which they remained free from tourist bookings.

a) Objectives and territories involved

The project is part of continuity from the previous experience gained within the Leader II , and in the context of the priorities outlined in the documents of the Regional Government and aimed at rebalancing the inland areas than in coastal areas, through the revitalization of city centres and many communities at risk of depopulation , raising new interests and new forms of investment, both public and private . The whole proposal is intended to support strategies for sustainable development, that it is placed in harmony with the social values of economic activities in being and in respect for the cultural , environmental and landscape of the territories. The specific objective is to safeguard and enhance a local heritage from decay and neglect , through attraction of financial resources, new enterprises , new jobs , giving a new economic sense to their local communities, in a manner consistent with the principles of tourism sustainable . Development , therefore , designed and managed at the local level, self-centred on the needs of a better quality of life of local residents .Administrations and areas involved include n . 9 Common: Bernalda Colobraro , Ionic Montalbano, Nova Siri , Pisticci Rotondella , San Giorgio Lucano , Tursi , Valsinni .

b) phase and feasibility study management

Assumptions regarding how receptive the unified management of the assets recovered

The widespread Hotel needs to be managed in a new way , different from traditional norms , to build its own appeal that is the ability to offer a personal and distinctive . The activity must, indeed, improve the characteristics of the offer, that is composed of a mix done by:authenticity and originality ;strong interrelationship with local resources , especially environmental and cultural ;product diversification ;proximity to tourist centers "strong" ;proximity to historical- cultural material. The feature of the service is to offer , as regards the receptivity , the substantial self-management of the stay by the tourist and therefore the possibility of maintaining a streamlined structure in the aspect of

organizational management. At the same time , however , the host must be considered , even in its autonomy , assisted in the knowledge of the area and the local culture and in the case of emerging needs and to solve everyday problems , providing real-time services .At the same time the heart of the multi- turn space used to serve as a reception, the place where the customer will be accepted, which will provide information and documentation on the territory of the village on the routes , as well as where they will be developed more technical tasks , such as the delivery of the keys, the registration of documents , etc. .It must also develop and offer ancillary services such as catering and the definition of cultural routes aimed at the enhancement of historical sites, archaeological and natural , and to enhance the scenic beauty of Metaponto. The idea is to aim at enhancing the area not only in summer, but for most of the year , creating a union between the living and the mountain resort , offering and enhancing , as well as marine areas , as well as mountain very fascinating for their purity and beauty. The peculiarity of the reference area compared to many places "quiet", which remain desolate just after the peak season , is given by the vitality of the historic centres of the country, full of events , traditions and customs, offering typical local products , which have an important role in the qualification of a place to hang out .From the point of view of the customer must be emphasized that the service is aimed at discerning travelers interested in our territory, but also to schools and social groups usually the most disadvantaged , to clarify that the product can not be offered to only one type of customers, but to a large tourist target .The problem to be solved is essentially the seasonal adjustment of the tourism proposal , today addressed , in particular through the promotion in big cities not far from the historic centres , the so-called " weekend at issue."For the future it will be necessary, therefore, create a network of potential of tourism cities and through their coordination, create the premises of a self-development, which avoids the risk of the irruption of highly disruptive form of investments in the area.

5 Results

At the end of the project were made 165 beds in 29 homes. The apartments consist of three to ten beds . Every room (from one to three beds) have private bathrooms . The average daily cost is € 15/18 per bed . The price includes utilities, the cost of cleaning the apartment (once a week) and change of linen (sheets, once a week , and toiletries , twice a week).During 2013 summer the apartments are all occupied and , in some cases, there

was insufficient with respect to the requests .The latter figure , has meant that the network would develop a " secondary " of private houses, suitably adapted to the requirements laid down standards , which are inserted into the main circuit of the house- hotel made through the Leader II program .

6 Conclusions and ideas for future research

The management model of widespread hotel is undoubtedly one of the most complex aspects of this new formula . Very often it happens that the widespread Hotel is regarded as a normal hotel business and as a result you are likely to treat it as such. This approach, in addition to being in the wrong part is especially limited . It is limited because thinking of running a Diffuse Hotel as any enterprise, regardless of the area and all its manifestations in which it is rooted , does not produce satisfactory results in terms of development and competitiveness .We already had have noted in several occasions that one of the peculiarities and characteristics of a popular hotel is its full integration with the region , its culture and its economy.This integration leads inevitably to conceive widespread Hotel and surrounding area as a single product , and as such to be managed in an integrated manner . As a result, the new generation of managers will have to consider not only the Diffuse Hotel as a new form of hospitality, but should be considered a piece of incorporation of actions, activities and projects directed towards the enhancement and especially towards the protection of the territory .No widespread Hotel is in fact accomplished if not at the time in which it moves within the territorial resources . The territory , in particular, is a key resource especially for businesses in it, not only as physical and geographical context within which performs business management, but also as a set of elements, resources, skills and knowledge accumulated over time that is a driving force for the business activity for which the individual actors that operate within it, therefore, a potential source of advantage competitive. The enhancement of the resources and skills available in the area would allow the transformation of local specificities in distinguishing factors globally, enabling companies to develop competitive strategies because the original enriched by reference to the context in which they are based. .The territory then becomes a form of economic development and as such must be managed in a strategic way .

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Meetings of Minds: art and science dialogues for *sustainable* knowledge

Marina Wallace

Department of ARTAKT (Research)
University of the Arts London
University Address Central Saint Martins 1 Granary Square London
NIC 4AA

Structured Abstract

Purpose –The focus of this paper is to highlight process and outcomes of interdisciplinary communication. In particular, the starting point is an established dialogue in the field of art and science. The background to this dialogue is constructed so as a response to the request by a community of scientists to communicate to the general public their research in human cell division and mitosis.

Design/methodology/approach - The proposed approach is an arts-based practical approach, reflecting on a series of actual collaborations created between pairs of renowned artists and scientists, analysing the process and the outcome using as reference point the established field of dissemination of knowledge through comparisons and differences between professional activities and cultures.

Originality/value –This methodology puts in evidence the actual process in action of generating an exhibition and making a documentary film with the artists and the scientists, against a firm background of historical information and contemporary scientific developments.

Practical implications - The project that serves as the basis of this paper has a practical realisation of three exhibitions and one documentary film, with a series of meetings and exchanges that have taken place throughout a period of five years between artists and scientists.

Keywords – art/science, mitosis, dissemination, dialogue, documentary

Paper type – Academic Research Paper with a practical element

1 Introduction

“..a form of free dialogue may well be one of the most effective ways of investigating the crisis which faces society, and indeed the whole of human nature and consciousness today. Moreover, it may turn out that such a form of free exchange of ideas and information is of fundamental relevance for transforming culture and freeing it of destructive misinformation, so that creativity can be liberated.”

(Bohm, 1990)

The focus of this paper is to highlight process and outcomes of a specific kind of interdisciplinary communication. In particular, the starting point is a dialogue established in the field of art and science. The dialogue was constructed as a response to the request made by a consortium of scientists, to communicate their research in human cell division and in mitosis to the general public.

This paper draws on a series of collaborations created between four sets of prominent artists and four distinguished scientists, and analyses the context of the dissemination of knowledge. Parallels and differences between professional activities and cultures are under the lens. Creativity, and issues of disciplinary rigour are at the core of many of the questions posed in the project that includes a documentary film, *Meetings of Minds*, and an exhibition, *Lens on Life*. The project was devised for *MitoSys*, a scientific European research consortium. The broad aim was to establish a common ground for a new form of communication to the general public of the research carried out over a period of five years by molecular biologists, physicists, chemists, mathematicians and computer modellers working across a number of high-level European institutions. The initial proposal included an exhibition in three European cities. The final proposal had the added element of a documentary, filmed in the scientific institutions and in the artists’ studios to narrate the process and the outcomes of the dialogue established between four scientists and four sets of artists.

In retrospect, the fundamental concepts that underpinned the whole project are of a nature that may well be useful for other interactions between different disciplines, using diverse approaches and aiming to create new meanings. The idea of the Dialogue, as intended by physicist David Bohm (1917-1992), became the *leitmotif* of the whole project. Below the narrative is developed with a clear emphasis on Bohm’s ideas.

2 Dialogue

“ In a dialogue, when a person says something, the other person does not in general respond with exactly the same meaning as that seen by the first person. Rather, the meanings are only similar and not identical. Thus, when the second person replies, the first person sees a difference between what he meant to say and what the other person understood.

On considering this difference, he may then be able to see something new, which is relevant both to his own views and to those of the other person. And so it can go backward and forward, with the continual emergence of a new content that is common to both participants. Thus, in a dialogue, each person does not attempt to make common certain ideas or items of information that are already known to him. Rather, it may be said that the people are making something in common, i.e., creating something new together.” (Bohm,1990)

In spite of a plethora of different kinds of communication generated through digital and social media, it appears that “good” communication is often ailing and that new forms of effective communication are sought in order to create connections between individuals or groups of individuals. The American theoretical physicist, David Bohm, who contributed innovative and unorthodox ideas to quantum theory, philosophy of the mind and neuropsychology, advanced the view that the old Cartesian model of reality (with two interacting kinds of substance - mental and physical) was limited. Bohm established his thoughts in the light of contemporary advances in quantum physics. His contribution, amongst other things, was in the development of detailed mathematical and physical theory, of implicate and explicate order. Bohm believed that the workings of the brain, at the cellular level, obey the mathematics of quantum effects. Using the language of molecular dynamics, he postulated that thought was *distributed* and *non-localised*. The parallel with quantum entities is valid in that these do not readily fit into our conventional model of space and time. In a similar way, thought does not conform to such conventions. Bohm warned of the dangers of rampant reason and technology, advocating instead the need for genuine supportive dialogue, which, he claimed, could broaden and unify conflicting and troublesome divisions in the social world. In this his epistemology mirrored his ontological viewpoint. Bohm stated:

Dialogue can be considered as a free flow of meaning between people in communication, in the sense of a stream that flows between banks. It may turn

out that such a form of free exchange of ideas and information is of fundamental relevance for transforming culture and freeing it of destructive misinformation, so that creativity can be liberated. (Bohm, 1990)

These “banks”, were understood by Bohm as representing the various points of view of the participants.

Dialogue – he further maintained - is not to communicate. It is much deeper. It addresses the blocks in communication, not merely to understand them, but to meet them directly. It is aimed at seeing resistances to communication. In Dialogue we are ready to raise topics serious enough to cause trouble. But while we are talking we are interested in being aware of what's going on inside us and between us.

It is apparent that the word "dialogue" has many connotations. Bohm chooses to give it a particular meaning. According to the physicist, Dialogue is not about trying to make one's points prevail. The challenge is to see when one is focused on prevailing, because, if anybody prevails, it means that the dialogue has failed. Or else, if a simple agreement emerges, the dialogue may also have failed because this means that one has not gone deeply enough into the process or into the consciousness behind it.

3 Systems

3.1 Thought as system

Bohm's lectures, delivered at MIT and in Ojai, California, from the 30th November to the 2nd December 1990, addressed societal problems. In summary, Bohm wrote a proposal for a solution that has become known as "Bohm Dialogue", in which equal status, and "free space", form the most important prerequisites of communication and the appreciation of differing personal beliefs. He suggested that if these "dialogue groups" were experienced on a sufficiently wide scale, they could help overcome the isolation and fragmentation in society. Bohm proposes in his book, *Thought as a System*, a pervasive, systematic nature of thought:

What I mean by "thought" is the whole thing – thought, felt, the body, the whole society sharing thoughts – it's all one process. It is essential for me not to break that up, because it's all one process; somebody else's thoughts become my thoughts, and vice versa. Therefore it would be wrong and misleading to break it up into my thoughts, your thoughts, my feelings, these feelings, those feelings... I would say that thought makes what

is often called in modern language a system. A system means a set of connected things or parts. But the way people commonly use the word nowadays it means something all of whose parts are mutually interdependent – not only for their mutual action, but for their meaning and for their existence. A corporation is organized as a system – it has this department, that department, that department. They don't have any meaning separately; they only can function together. And also the body is a system. Society is a system in some sense. And so on. (Bohm, 1990)

Thought, according to Bohm, includes the state of the body and the whole of society – as thought is passing back and forth between people and a system can be identified in a process by which thought evolved and through which it continues to establish itself.

A system is constantly engaged in a process of development, change, evolution and structure changes although there are certain features of the system, which become relatively fixed. We call this the structure.... Thought has been constantly evolving and we can't say when that structure began. But with the growth of civilization it has developed a great deal. It was probably very simple thought before civilization, and now it has become very complex and ramified and has much more incoherence than before.

What is highly relevant to the *Lens on Life / Meetings of Minds* project is that Bohm identifies a fault in the system. He calls it a “systematic fault”. He states that the fault is all throughout the system.

You may say "I see a problem here, so I will bring my thoughts to bear on this problem". But "my" thought is part of the system. It has the same fault as the fault I'm trying to look at, or a similar fault. Thought is constantly creating problems that way and then trying to solve them. But as it tries to solve them it makes it worse because it doesn't notice that it's creating them, and the more it thinks, the more problems it creates. (Bohm, 1990, pp. 18–19)

3.2 The Cell as a System

MitoSys, stands for Systems Biology of mitosis. The brief given by the EU and the consortium of scientists included explaining to the general public the meaning of Systems Biology, an emerging approach applied to biomedical and biological scientific research. One of basic explanations generally offered includes thinking about a cell as a system, helping to understand individual cell organelle functions, and how they operate within the larger context of the cell. Other systems may be school system, the solar system, the

digestive system. What makes these “things” systems? How would one define a system? The inclusion of parts, of a whole, of inputs and outputs may be enumerated as making up a system. However, one loses the sense of the whole when focusing on the parts. It is the sense of the whole that escapes as soon as the attention is brought to the part. The initial intuition, taking into account current research but also referring back to the history of the discovery of the cell, was that looking and seeing were fundamental to the understanding that there are very small parts, invisible to the naked eye, that compose our bodies, plants and all living things. These small units, seen for the first time with the use of a microscope – hence the title of the exhibition, *Lens on Life* – were named cells by Robert Hooke in the 17th century and have been the main subject of modern biology since their discovery. This new way of seeing revolutionised how the world of living things had been previously perceived. New theories have since developed that have depended on the physical and sensory act of looking and experimenting. With this background the parallels between the creative processes in science and those in the field of the arts, became a fundamental part of the *Lens on Life* project.

3.3 Art and Science as Systems

The question that generally arises whenever a science & art project includes forms is constructed with the inclusion of artists functioning in a scientific background, or vice versa, is: what do scientists gain from the exposure to artists? And, how can artists mingle within the environment of scientists? Or, how can scientists merge within an artistic environment? It is apparent that here one is not concerned with the individual, but with the system that produces artists and scientists, even though the question is not framed as such. Systems of knowledge shift with the times. Up to the 19th century art and science were not as separate as they are now, and technology had a place that was indicative of a link between the arts and science. In the Renaissance there was no such thing as an “artist”. There were painters, architects, sculptors, etc., but the term “artist” was not invoked.

Science itself is a generic term: there are very different types of science and different kinds of investigation into the natural world. A better term might in fact have been the one used up to the 19th century, *Natural Science*, that did not exclude individuals or groups of individuals who were fascinated by the classification of natural phenomena, either experimenting with painting and sculpture or with chemistry and physics.

Paradoxically, contemporary artists may fit better into the category of *Natural Scientists* as contemporary art has, significantly since the 1930s, broken boundaries and created new paradigms. Technology, coupled with science and with art, often serves as a useful link between disciplines that would, otherwise, be separate.

4 Meaning and Metaphors

In *The Structure of Scientific Revolutions*, Thomas Kuhn describes the steps through which one paradigm, that is the set of theories, practices, applications and instrumentation that represent a model of reality to scientists, is replaced by a new paradigm. Scientific progress, according to Kuhn, does not represent a gradual accumulation of knowledge. Instead, it consists of periods of "normal" science, during which scientists operate from within a dominant paradigm, which determines the very nature of questions asked and problems posed, punctuated by paradigm shifts, when anomalies arise that the normal science is unable to deal with. Metaphors are particularly useful as models, because we use them to borrow ideas from the familiar in order to understand the unfamiliar.

The works made by the artists for the exhibition *Lens on Life* use a language that developed from their own practice, and with close exchanges with the scientists. For example, choreographer Shobana Jeyasingh, who took part in the *Lens on Life* project for MitoSys, labelled her filmed choreographed piece of dance, *In Flagrante*, in dialogue with scientist Kim Nasmyth, with these words:

Ways of Saying: Metaphor and Science

In Flagrante reflects on the flux of movement from the margins to the centre. This piece, establishes a parallel with the movement of the microtubular structures involved during mitosis and presents a physical journey filled with tension and instability, hits and misses, of search and hard won capture. The music has been treated so that the tension is condensed and the words are carved out in keeping with the extreme instability of both the microtubules and the dancer's body. (Lens on Life, 2014-2015)

5 Meetings of Minds

Throughout the project, as the definitions of cell division, mitosis and cell parts, of life and death, of movement and statics were being sought, so were the meanings of creativity, invention and experiment. It became increasingly clear that it was not possible

to give a single, comprehensive *meaning* to any of the big ideas examined in the project. If everyone knew the *meaning*, the project would have been redundant and the *Dialogue* between the scientists and the artists would have been superfluous. As it happens, in the *Meetings of Minds* and *Lens on Life* project, we got close to meanings, or to parallel meanings, to ideas that were common to thought processes, with different outcomes. The dialogue was not aimed at settling anything, as Bohm himself also predicated. The meanings were explored together - the creative perception of meaning - thinking together, looking and feeling together and, last but not least, *making* together (the art works, the exhibition, the documentary, the films, etc.). Artists Ackroyd&Harvey, labelled their drawings like this:

Ways of Being: Growth, Transition and Transformation.

Jan-Michael Peters (Institute of Molecular Pathology [IMP], Vienna) investigates the biology of chromosomes. He has been in dialogue with UK based artists, Ackroyd&Harvey, whose work focuses on processes of growth, transition and transformation across the disciplines of sculpture, photography, architecture and ecology. With Jan-Michael Peters they have experimented with random gestures and markings on paper that verge on the organic.

The restless movement of cells, and thus of our bodies, is the driving force of the piece. Working with only pencil and paper as a starting point this work has emerged from hundreds of drawings that grow, evolve and mutate. The motion appears as random, yet it is controlled and contained by a process of refinement, and suggests ambiguity of scale between the intimacy of the cell and vastness of the universe. The drawings have been inverted and painstakingly animated in a film, evoking laboratory images and the unique beauty of mitotic shapes. (Lens on Life, 2014-15)

The word “beauty” appears unapologetically, as it does in the works produced by artists Lucy and Jorge Orta in dialogue with Dresden based scientist, Tony Hyman, and by artist, Rob Kessler, in dialogue with Cambridge based scientist, Melina Schuh. But meaning is active. It is not merely sitting there. The consideration of this meaning may act - or it may not.

The idea of making a documentary, so as to record the exchanges taking place between the artists and the scientists, was paramount in the mind of the curator vis-à-vis the idea of establishing effective communication of the knowledge of cell division and scientific research for a general public. The traditional device would have been that of

explaining, in more or less successful terms, facts that are already contained in textbooks or that may be extracted from laboratory papers. The language conventionally used is often obscure for the non-initiated. The sections devised for the *Meetings of Minds*, *Ways of Saying*, *Ways of Being*, *Ways of Seeing*, *Ways of Growing*, were intentionally chosen with a poetic tone, and were instrumental for punctuating the process and attributing “portions of meaning” to the whole. Once the Dialogue was established between the artists and the scientists, the question of the chunks of knowledge that had to be imparted to the general public evaporated, and a sense of creating a new system of communication between the project participants was determined. This communication became, as it increasingly appeared, a means for “talking” to the general public through the Dialogue established between the artists and the scientists. The point of having the Dialogue is that, in spite of the task to produce an exhibition that explains the concept of cell division to the general public, one is not trying to produce a static result. That is very important. One may never do it, or it may be done at some moment when least expected. The seed has been planted. And, as David Bohm stated, “*the meaning is naturally, spontaneously active and transformative*”.

5 Conclusions

In Dialogue or in our own meditation, or whatever, the attitude is one of exploration and emptiness - that is, not having fixed assumptions but rather an empty space where there is the possibility of exploring all sorts of things. This is a proposal for exploration. But even this is not final. It too has to be constantly open to exploration - seeing whether the proposal, as made, is coherent. In other words, we're not even saying exploration is the answer. The purpose is constantly changing and flowing out of the meaning. (Bohm, 1992)

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Overcoming the Seven Barriers to Innovating Personal Knowledge Management Systems

Ulrich Schmitt

University of Stellenbosch Business School
P O Box 610, Bellville 7535, South Africa

Structured Abstract

Purpose - Recently, suggestions to advance Personal Knowledge Management (PKM) have been voiced in order to provide the missing support tools for the rising Creative Class. Based on the assumption of autonomous capacities and nourished by the creative conversation of many individuals' PKM devices, the systems are supposed to support the notion that knowledge and skills of knowledge workers are portable and mobile and that a technology ought to back their options on how to maintain and develop their knowledge and on where, how, and for whom they will put it to work.

Design/methodology/approach - Currently, a prototype system pursuing this concept is about to be converted into a marketable PKM system (PKMS) by the author. This applied research paper complements a series of twelve papers which share the common verdict that a technology is overdue that aims to aid teamwork, life-long-learning, resourcefulness, and creativity of individuals throughout their academic and professional life and as contributors and beneficiaries of organizational performance. This particular paper focusses on an important concern since the realization of these kind of novel PKM solutions presently face severe barriers caused by the current paradigm, logics and logistics of centralized institutional systems thinking.

Originality/value - PKM has been placed historically in a narrow individualistic confinement negating its importance relating to group member performance, new technologies, or business processes. The recent papers have discussed different views and expectations and introduced a concept and prototype system following a novel meme-based rather than document-centric approach. One of the current papers 'PKM Devices - The next Co-evolutionary Driver of Human Development?!' also looked at it in the context of human civilization and has fully agreed with Levy's statement: "Just as computer science underwent a revolution in the 1980s with the widespread use of personal computers, it is possible that KM will in the twenty-first century experience a decentralizing revolution that gives more power and autonomy to individuals and self-organized groups."

Practical implications - As enablers of personal development and people empowerment, decentralized autonomous PKMS capacities will give individuals a better chance of navigating today's abundance of information and changing career patterns. At the same time, one of the most important functions of teaching will be to encourage in students the sustainable growth of autonomous capacities in Personal KM. It follows, that PKMS are also predestined to offer appealing and viable opportunities for other stakeholders in the educational, professional, societal, and developmental context.

Keywords – Personal Knowledge Management Systems, Knowledge Society, Creative Class, Memes, Knowcations.

Paper type – Academic (Applied) Research Paper

1 The Plight of the Knowledge Worker and Knowledge Organizations

Just a century ago, Frederick W. Taylor, considered to be the father of scientific management, stated: “In our scheme, we do not ask the initiative of our men. We do not want any initiative. All we want of them is to obey the orders we give them, do what we say, and do it quick” (Will, 1997).

Since then, the world has experienced an accelerating co-evolution of Physical and Social Technologies (Beinhocker, 2006), including ever-adapting management techniques which thoroughly transformed Taylor’s hierarchical leadership thinking.

Fittingly, Florida backs this notion in the ‘Rising Creative Class’ by referring to Barley’s observation that bosses – unlike in the old days – do not know their business better than their subordinates any more. With the growth in specializations and the evolving clusters of domain-specific knowledge, the identification of people has shifted from their company to their occupation and profession, and “the vertical hierarchy and traditional career ladder have been replaced by sideways career moves between companies, [a more horizontal division of labor], and a horizontal labor market” (Florida, 2012).

With competitive pressures on organizations continue to grow, so does the need for greater flexibility and skill sets, but “responsibility for self-development and lifelong learning is now in the hands of the individual, who increasingly controls the development of his/her career and destiny. [...] In the world of the modern knowledge worker, it has become necessary for individuals to maintain, develop and market their skills to give them any chance of competitive advantage in the job market in both the short and long term” (Pauleen, 2011).

However, the advancing development and widespread diffusion of Information and Communication Technology (ICT) has brought about profound changes in the way of working and living and caused significant organizational, commercial, social and legal innovations. As a result, work is undergoing a process of fragmentation which will continue to accelerate. Personal mastery, on the other hand, requires a capacity to concentrate on developing skill for long periods of time. To prepare for personal career

scripts that can bring fulfilment and meaning, Gratton recommends attending to and growing not only one's intellectual and social capital but also one's emotional capital as the source of self-understanding, self-reflection, emotional resilience and fortitude (Gratton, 2011).

Yet, time and concentration to become masterful is in short supply. The familiar past problem of information scarcity (few sources/channels, high associated costs) has been substituted by a never before experienced ever-increasing attention-consuming information abundance. As Simon already noted over forty years ago, the "wealth of information is creating a poverty of attention and with it a need to allocate that attention efficiently among the overabundance of information sources that might consume it" (Simon, 1971).

In our digitalized and wired world, "information in the form of pure energy can easily fly out of the door and morph into a thousand variations of the product and service we used to think we owned" (Tarlow, 2002). Similarly, "knowledge and skills of a knowledge worker are portable and mobile. Unlike manual workers, they have numerous options on where, how, and for whom they will put their knowledge to work" (Rosenstein, 2009).

What this means to enterprises has been summed up by Hamel in 'What matters now': "Today, no leader can afford to be indifferent to the challenge of engaging employees in the work of creating the future. Engagement may have been irrelevant in the industrial economy and optional in the knowledge economy, but [in today's creative economy] it's pretty much the whole game now" (Hamel, 2012).

Thus, the developments and ensuing expectations have led to a collective insight that the most valuable asset in any organization or society is investment in intangible, human and social capital and that the key competitive drivers are knowledge, creativity, and innovation.

In introducing their program on building knowledge economies, the World Bank Institute wrote: "The countries that thrive will be those that encourage their people to develop the skills and competencies they need to become better workers, managers, entrepreneurs, and innovators. Today's policy makers must extend their country's existing strengths through careful investments in education, institutional quality, and relevant technology. They must create enterprises that are knowledgeable enough to

recognize new competitive opportunities - and skilful enough to convert those opportunities into wealth” (WBI, 2008).

2 The Potential of Personal Knowledge Management (PKM)

Unfortunately, adequate responses from the worlds of academia and technology are still lacking: “About 100 years ago, higher education restructured to meet the needs of the industrial age. It has changed little since, even as the internet has transformed life. Another revolution is needed to modernize universities and prepare graduates for a 21st-century working environment. [Instead,] we continue to prepare students as if their career path were linear, definite, specialized and predictable. We are making them experts in obsolescence. We are doing a good job of training them for the 20th century” (Davidson, 2011).

Indeed, the pressing needs and resulting inefficiencies are felt strongly and manifest themselves not only as being critical of higher education not being able to transform adequately, but also as e-Learning technologies failing to deliver, academic-paper-based citation and reputation systems lagging the pace, scope, and openness of online scholarship, organizational knowledge management systems neglecting sense making and innovation as well as the detrimental effects caused by the digital and innovation divides.

As a way out of the dilemma, recent suggestions urge advancing Personal Knowledge Management (PKM) to provide the overdue support tools. Regarding its scope, Wiig reminds us that “the overall performance and viability of societies and enterprises result from innumerable small actions by individuals. Small personal 'nano actions' combine with larger departmental actions that combine to create consolidated enterprise actions that result in the performance of the whole organization. The quality and extent of knowledge possessed by people - their competence - and structural Intellectual Capital assets available to them determine the realized enterprise performance.” Hence, Wiig’s “root objective of PKM is the desire to make citizens highly knowledgeable. They should function competently and effectively in their daily lives, as part of the workforce and as public citizens. In a society with broad personal competences, decision- making everywhere will maximize personal goals, provide effective public agencies and governance, make commerce and industry competitive, and ensure that personal and family decisions and actions will improve societal functions and Quality of Life” (Wiig, 2011).

In this all-embracing context, Levy puts PKM right at the center stage of Knowledge Management. Based on the assumption of decentralized autonomous capacities and nourished by creative conversations of many individuals' personal knowledge management, PKM systems are envisaged to constitute "the elementary process that makes possible the emergence of the distributed processes of collective intelligence, which in turn feed it." In Levy's view, "one of the most important functions of teaching, from elementary school to the different levels of university, will therefore be to encourage in students the sustainable growth of autonomous capacities in PKM" (Levy, 2011).

The need for such a solution had already been articulated back in 1945. Vannevar Bush (then President Truman's Director of Scientific Research) imagined the 'Memex', a hypothetical sort of mechanized private file/desk/library-device. It is supposed to act as an enlarged intimate supplement to one's memory, and enables an individual to store, recall, study, and share the "inherited knowledge of the ages". It facilitates the addition of personal records, communications, annotations, contributions as well as non-fading trails of one's individual interest through the maze of materials available - all easily accessible and sharable with the Memexes of acquaintances (Bush, 1945).

Back to the more recent times, Davies states that PKM is continuing to be "a real and pressing problem", and also concludes - sixty-six years later - in 'Still building the Memex': "Yet it does not appear that Vannevar Bush's dream has yet been fully realized on a wide scale" (Davies, 2011). And Kahle fittingly complements: "While today we have many powerful applications for locating vast amounts of digital information, we lack effective tools for selecting, structuring, personalizing, and making sense of the digital resources available to us. [...] Designing interoperable tools with personal agency in mind empowers individuals and institutions to build, adapt, and integrate custom educational solutions in a manner that best meets their needs" (Kahle, 2009).

Indeed, the tools available disappoint: "Existing solutions address PKM needs only partially; they concentrate on more specialized as well as wider unrelated tasks and, accordingly, are usually grouped into categories such as Office Suites, Document and Bibliographic Management, Contact and Relationship Management, Group and Collaboration Software, Web Databases, and Organizational Knowledge Management" (Schmitt, 2012). Unfortunately, the realization of more appropriate solutions presently face severe barriers (the focus of this paper) caused by the current paradigm, logics and logistics of centralized institutional systems thinking.

In the author's view, what is needed is a technology "to aid teamwork, life-long-learning, resourcefulness, and creativity of individuals throughout their academic and professional life and as contributors and beneficiaries of organizational performance" (Schmitt, 2013b). During the 90s, the author started to develop a PKM prototype system which has been continuously expanded and used personally for career support as a management consultant, scholar, professor, and academic manager. Recent advances in development/hosting platforms have now provided a viable opportunity for innovation and the conversion and advancement of the prototype into a marketable application across multiple platforms and environments. The prototype's name 'Knowcations' is meant to reference our knowledge and know-how as well as the locations and spaces or the vocations and abilities which are vital to further our expertise and careers.

3 In Pursuit of the Meme-based Personal KM System 'Knowcations'

In parallel to the ongoing software migration process, fifteen papers/posters have explored pertinent issues to be briefly summarized or referenced where relevant. They share the common verdict that today's abundance of information and changing career patterns would be better addressed with a PKMS technology for individuals to create and share sustainable personalized knowledge bases/repositories over the users' life time of careers.

Levy's term 'Creative Conversations' (Levy, 2011) best describes this scenario and inspired the sketching of an exemplary network of autonomous individual PKMSs depicting potential conversation clusters, beneficiaries, and benefits (figure 1).

The underlying dynamic authoring process has been described from an individual's point of view in "How this Paper has been created by leveraging a Personal KM System" (Schmitt, 2014d). The implications and potential impact of PKM Systems have been further examined in the context of knowledge workers, organizations, and society (Schmitt, 2014c, 2014a, Schmitt, 2013f), higher education (2013a), and human development (2014b). The latter publication fully supports Levy's view: "Just as computer science underwent a revolution in the 1980s with the widespread use of personal computers, it is possible that KM will in the twenty-first century experience a decentralizing revolution that gives more power and autonomy to individuals and self-organized groups" (Levy, 2011).

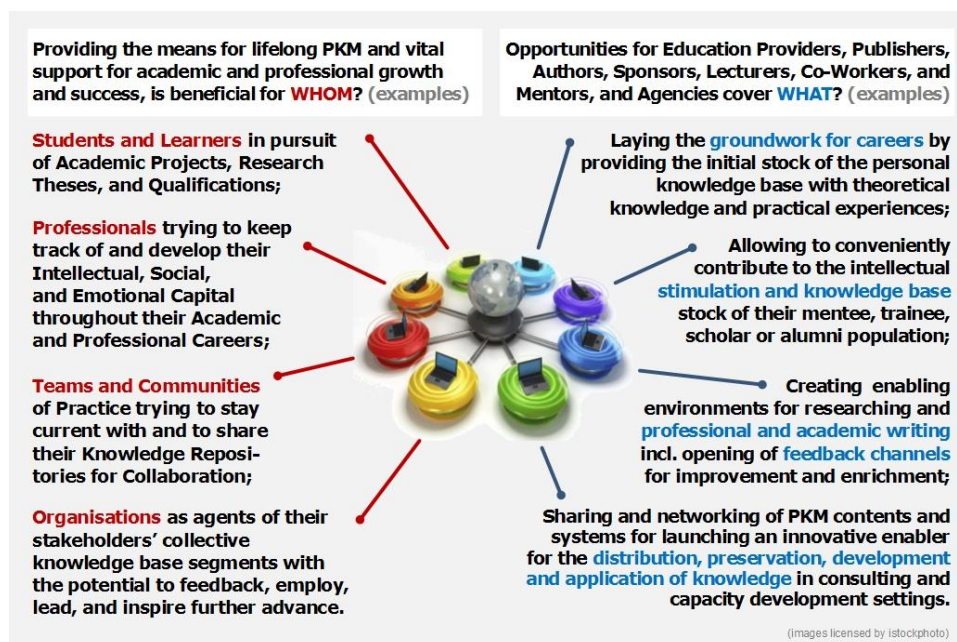


Figure 1: Exemplary Network of Autonomous Individual PKMS (Schmitt, 2013e)

Three papers have looked at the concept and workflow point of view and demonstrated a close proximity with a range of renowned models and established Organizational KM practices (Schmitt, 2014e, 2013g, 2013c). The 'Ideosphere' where these workflows and processes take place as continuous iterative learning cycles has been visualized using a three-dimensional matrix, known as an Information or I-Space¹ and presented in the papers as well as posters (Schmitt, 2013d, 2013b).

In this endeavor, the extension of the Ignorance Matrix provided a suitable base for integrating other KM methodologies and for identifying seven typical wastes in need of being addressed by PKM Systems (Schmitt, 2013e), adding to the discussion of individuals' challenges at the acquisition, preservation, collaborative, capacity development, and conceptual level (Schmitt, 2012).

As a meme-based concept, the 'Knowcations' PKMS focuses on the relevant textual, visual, audio, or video memes² a document or message contains, conserves them with

¹ Boisot's 'Information Space' model entails a three-dimensional matrix formed by the axes of codification, abstraction, and diffusion. The original model depicts the dynamic flow of knowledge assets following a 'Social Learning Cycle' through six phases: scanning, codification, abstraction, diffusion, absorption, and impacting (Boisot, 2004).

² Memes are (cognitive) information-structures that evolve over time through a Darwinian process of variation, selection and transmission. They are able to self-replicate utilizing mental storage in human hosts and to

their relevant frames of references (e.g. origins, titles, formats, licenses) and embedded in a more-dimensional classification system for subsequent easy retrieval. By digitally capturing, referencing, and visualizing these basic information units, the system allows the user to recall, edit, sequence and combine stored units with his/her own new meme creations ('nemes') for integration in any type of authoring and sharing activity he/she would like to pursue. As a result, the user obtains the means to retain and build upon knowledge acquired in order to sustain personal growth and facilitate productive contributions and collaborations between fellow learners and/or professional acquaintances. This novel meme-based approach entails a departure from current document-based knowledge management practices which has been further detailed in an 'It is a Meme's World' section of a prior paper (Schmitt, 2014e).

4 Seven Barriers inhibiting a Paradigm Shift towards innovative PKMSs

However, an enabling technological environment benefitting the novel PKM System approach has to facilitate the creative conversations between the many individuals' autonomous personal knowledge management devices. Unfortunately, such an empowering state of Extelligence¹ formation is presently facing severe constraints. Seven barriers have been identified by the author and are described below. In the context of establishing productive PKMS, they are counterproductive and annoying for wasting time and efforts of individuals, but can be eliminated by initiating sound PKM approaches, shifting paradigms, changing habits, and innovating solutions. The remedies suggested for each barrier are underpinning the notions that knowledge and skills of a knowledge worker are portable and mobile as well as concept of decentralized autonomous PKMS capacities.

influence their hosts' behaviour to promote further replication. Memes are virtual, and have no intentions of their own, they are merely pieces of information in a feedback loop which are encoded in vehicles for transmission between human hosts; this loop facilitates their continued replication as mental copies with their longevity being determined by their environment. (Dawkins, 1976; Bjarneskans, Grønnevik, & Sandberg, 1999; Collis, 2003).

¹ *Stewart and Cohen (1999) introduced the term 'Extelligence' for externally stored information; it represents the cumulative archive of human cultural experience and know-how accessible and augmentable by any individual who knows how. In their concept, Extelligence forms the external counterpart to the intelligence of the human brain/mind and deals in information whereas intelligence deals in understanding; together they are driving each other in a complicit process of accelerating interactive co-evolution.*

4.1 Barrier #1: Incompatible Formats and Structures for PKM Repositories

“To keep up and remain à-jour, we currently take copies and store them in diverse arrays of devices or make mental notes only. Over time, copies deteriorate, memories fade and with it the ability to recall the locations and contents of our fragmented personal knowledge inventories and archives. Nevertheless, we are unable to part with our accumulated hard and soft copies which slowly but steadily lapse from potential value towards dead ballast. Forgetfulness and bad memory cause our non-obsolete knowledge to deteriorate, but even if we do remember, limited access to or loss and misplacement of records might still prevent a total recall. Hence, time and effort have to be re-spent to regain the status of knowledge we once commanded” (Schmitt, 2013e).

Contents and appearance of non-digital information and artefacts can easily be recorded and digitized nowadays. The obstacle here is missing standardized formats and structures for setting up a versatile digital knowledge base for a broad range of PKM activities. Existing solutions are specialized and do not fully address PKM needs. As a result, improvised practices continue to (mis-)guide the integration of newly gathered data, information, and experiences into existing fragile frames of personal knowledge, leading to the sorry states portrayed.

Remedy: Personal contents are kept in a standardized, consistent, transparent, flexible, and secure format for easy retrieval, expansion, sharing, pooling, re-use and authoring, or migration.

4.2 Barrier #2: Bothersome Risks-of-Loss and Fragmentation of Extelligence¹

Productive PKM activities are currently compromised because any utilized digital library, e-Learning platform or other eService requires separate set-ups of individual accounts and personal or collaborative work spaces. Inevitably, replication of work and information follows and by taking advantage of the best functionalities on offer, the results created end up in disconnected external storage spaces with often severely limited opportunities for information sharing, import and export.

Unfortunately, the main stream educational and learning management systems are still focusing on centralized costly developments. With competing organizations determined to build their own and exclusive portals or social web platforms in order to capture their audience and users - often with meagre or problematic benefit for the individual – the wasteful treatment of clients’ attention and efforts is likely to continue.

Only a few years back, the OECD (2009) affirmed that ICT has not yet revolutionized teaching and learning and blamed the immaturity of e-Learning tools as well as “the cultural resistance of students and academics to use existing tools, because of some skepticism about its quality”. Although one of the authors of this study noted: “If the design of educational technology facilitates broad access and fosters personal agency and ownership, participation in adopting and evolving a new application is likely to occur” (Kahle, 2009) and other authors in the same publication also came up with suggestions of ‘personalizing’ as a potential solution, it has been mostly in the realm of add-ons to big centralized systems. The time has come for a paradigm shift towards decentralized PKM Systems.

Remedy: The added-value knowledge services of external providers have to allow for receiving relevant resources from PKM devices and the feeding back of the resulting outcomes without loss to the user’s decentralized and autonomous personal knowledge base. Consequently, digital personal and personalized knowledge (Extelligence) will always be in possession and at the personal disposal of its owner or eligible co-worker, residing on personal hardware and/or personalized cloud-databases.

4.3 Barrier #3: Disruptive Services due to Change of Personal Circumstances

This constraint is closely related to the previous one and refers to the access of centralized systems over time. The dynamics of individuals’ academic and professional lives will increase further and with it the scale of temporary associations to multiple organizations. Many of them provide dedicated digital services, but the restrictions currently imposed on users are discouraging.

Bound to location (e.g. work place, university), time (e.g. employment or study contract), technology (e.g. platform, operating system), or ownership (e.g. hardware, licenses, member status), personal engagements bear the constant risk of loss due to piecemeal version management and back-ups or sudden changes in one’s private, academic or professional life. Universities, in particular, are guilty of preventing the further exploitation of competencies learnt by simply pulling the access plug on their former staff and students and also by employing systems which are confined to education, are unaffordable by smaller enterprises or starting entrepreneurs.

Remedy: Standardized, decentralized PKM systems and interfaces ensure that information and functionalities can be continually used without disruption independent of changing one's social, educational, professional, or technological environment.

4.4 Barrier #4: Inadequate Reference Systems prevent Traceability and Vetting

Missing, broken, or pretentious web links or references are inefficient, but this also applies to the current reference and citation systems in general. Any correct reference indicates a discrete source (e.g. book, article, web site) with a page number or access date added only sometimes. It represents a granularity which might have been adequate in the stable context of paper-based worlds, but is far from sufficient in a volatile digital world where contents referenced are constantly altered or erased. It also is far too unrefined for the potential capabilities of digital Personal Knowledge Management Systems.

The problem is exaggerated by a tendency reported by Arbesman: "Too often a popular paper isn't actually read by a scientist and then cited in her own work. Sometimes scientists just look at the bibliographies of other papers and copy the citation to the paper instead. This somewhat lazy approach is unfortunately all too common, and if one scientist types it incorrectly, then suddenly there is a mutated version of the citation out in the wild." To back up this claim, he cites a study which concluded that only about twenty percent of scientists who cite an article have actually read that paper. (Arbesman, 2012)

A PKMS is expected to serve its master over a lifetime of educational and professional careers and is supposed to constantly evolve in the process. What we have to refer to and what we need to store at the same time, has to be smaller and more distinct, a basic building block of knowledge in the eyes of the beholder. Captured best in a quasi-atomic state, the information-structure should be perfectly understandable alone by itself but be able to be used at any later time in combination with other building blocks stored without piggybacking irrelevant or potentially redundant information.

Remedy: A PKMS has to support a user's cognitive capacity to identify, store, recall, and exploit atomic information-structures via reliably storing and retrieving textual, visual, audio, or video input with their relevant frames of references (e.g. origins, titles, formats, licenses), embedded in a more-dimensional classification system for easy access and as original, pre-edited, and/or already re-combined versions according to users' individual preferences and objectives.

4.5 Barrier #5: Unsuitable Concepts and Designs discourage continuous Usage

Since a PKMS embodies many entities with inherent multi-dimensional structural interdependencies, the complexity of the tasks to be handled by a user needs to be sufficiently eased by intelligible concepts and well thought-out design features. Building just a ‘better mousetrap’ is not enough to motivate PKMS users and instil in them a sustainable commitment and conviction to interact with the system on a continuous basis in order to keep it à-jour for reaping the potential benefits.

Mostert (2013) describes six levels of appreciation representing the extent to which leaders internalize learning content and examine application opportunities (from lowest to highest level): 1. Aesthetic Elegance, 2. Schematic Resonance, 3. Contextual Relevance, 4. Opportunity, 5. Responsibility, 6. Enactment.

The model can also be applied to potential PKMS users. It starts with just appreciating the idea of the proposed system (creates curiosity), followed by recognizing a close match with one’s own views (adding validity), and then with one’s own experiences and needs (adding relevance). At the fourth level, the added value towards one’s own circumstances is realized (useful to do), followed by making it a personal priority (should be done), with the final stage of successful implementation and utilization (doing). However, to keep ‘doing’, the added value generated for the user will have to significantly outstrip the user’s perceived inconveniences due to time, effort, and self-discipline invested.

The absence of an all-encompassing underlying conceptual and practical PKM model has been - in the author’s view - the main barrier hampering the successful development and deployment of potent PKM systems so far.

Remedy: The PKMS design and complex operations are based on a concept, functionalities, and interventions which are clearly understood and are painlessly applied in practice; for the system-in-progress this base consists of Dawkins’ (1976) concept of Memes and Koch’s (2002) notion of Business Genes.

4.6 Barrier #6: Better Support by Information and Knowledge Suppliers

A prior paper (Schmitt, 2013c) described how intelligent agents are handling data, information, and knowledge. If we adopt the remedy for the fourth barrier and base our decentralized PKMS on ‘atomic’ information structures (memes), the singling out, digital capturing, referencing, classification, and annotation of these memes will be the main

routine task to be performed as books, presentations, lectures, reports, images, or conversations inspire the PKMS user's mind.

Charged this way, the PKM system allows us to pursue any type of authoring and sharing activity by retaining and building upon knowledge acquired and by collaborating with fellow learners and/or professional acquaintances for mutual benefit.

These tasks could be significantly eased if the sources of interest, respectively their publishers, writers, presenters, educators, or tutors, would also supply us with their own complementing meme suggestions. In fact, rather than leaving the internalization of documents, articles, and books fully to the limited attention span of the potential user, a novel profitable market niche for open access or commercial service providers could be established to provide added value to clients in the form of document or domain specific essential meme collections or meme subscriptions. A market for similar services already exists in the form of 'Key Concept' or 'Mover & Shaker' publications or 'Executive Book Summaries Subscriptions' (e.g. SoundView, 2012) which offer speedier comprehensions via summaries of essential readings, but without the integrated meme support discussed here.

Remedy: To co-create the individual PKM Extelligence base, information suppliers are welcome to provide value-added services complementing their publications, consulting projects, or educational programs in the form of suggested meme sets or subscriptions.

4.7 Barrier #7: Constrained Horizontal and Vertical Sharing and Collaboration

Accommodating the prior six provisions opens up the opportunity to de-centrally tackle PKM by employing grass roots, bottom-up, lightweight, affordable applications rather than the top-down, heavyweight, prohibitive approaches alluded to. With an increasing adoption by members across knowledge communities, sharing and collaboration capabilities are able to facilitate horizontal networking with co-workers as well as teamwork within vertical relationships (e.g. mentee and mentor, employee and employing organization or client).

In an increasingly mobile world, PKM systems ought to partner with their organizational counterparts for pooling and feeding back records and relations for the wider benefit of stakeholders. The aim has to be to collaboratively interlink and collectively harvest prior accumulated personal knowledge subsets and also to offer

development opportunities to novices by simply leapfrogging into other knowledge domains with which they have previously not been confronted. Currently, organizational KM tools allow for privileged instant access to resource plans, progress reports, and team members' contributions for works-in-progress, but the release of the yields into the personal custodies of those contributing tends to be not part and parcel of these systems.

Remedy: Collaboration capabilities have to be mutually beneficial to facilitate consolidated team and enterprise actions that convert individual into organizational performances.

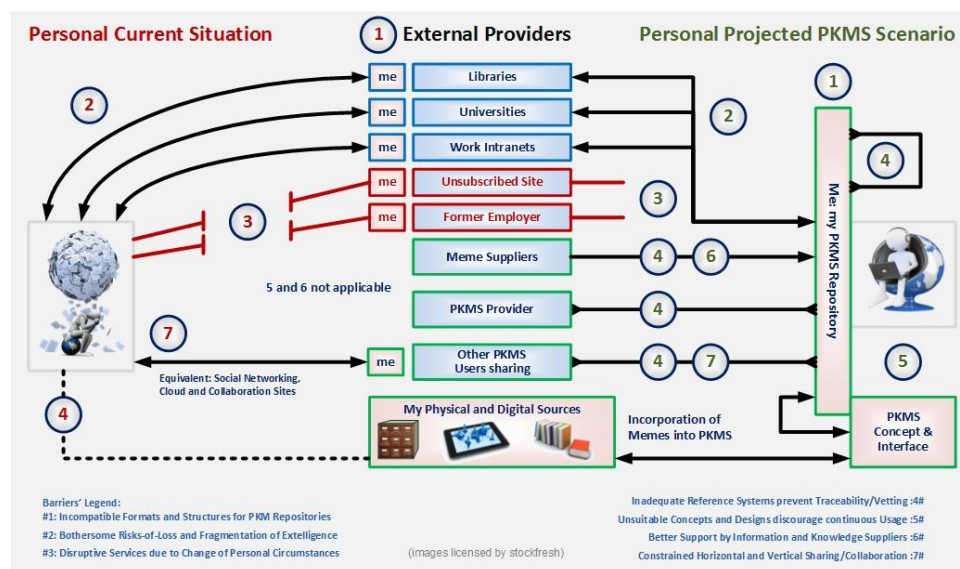


Figure 2: Current Situation (left) versus anticipated PKM Systems Scenario (right)

5 Vital Provisions for thriving Personal KM Systems and Collaborations

Figure 2 attempts to holistically visualize the implications of the barriers by comparing the current state (left) with a PKM Systems Scenario where these barriers will be eliminated (right). The remedies suggested can be summarized in form of Five Vital Provisions:

- Digital personal and personalized knowledge (Extelligence) is always in the possession and at the personal disposal of its owner or eligible co-worker, residing in personal hardware and/or personalized cloud-databases.

- Contents are kept in a standardized, consistent, transparent, flexible, and secure format for easy retrieval, expansion, sharing, pooling, re-use and authoring, or migration.
- Information and functionalities can continually be used without disruption independent of changing one's social, educational, professional, or technological environment.
- Collaboration capabilities have to be mutually beneficial to facilitate consolidated team and enterprise actions that convert individual into organizational performances.
- The PKMS design and complex operations are based on a concept, functionalities, and interventions which are clearly understood and are painlessly applied in practice.

The provisions are aiming to strengthen individual sovereignty by employing grass roots, bottoms-up, lightweight, affordable, personal applications rather than today's top-down, heavyweight, prohibitive institutional approaches and centralized developments – not at the expense of Organizational KM Systems, but rather as the means to foster a fruitful co-evolution¹.

They also agree with Levy's view of KM which "draws much more on collaborative learning networks using social media, than on the administration of central information systems controlled by experts" with their "knowledge being shut up in silos and balkanized within small closed communities" (Levy, 2011).

The provisions and the PKMS concept introduced also fit well with Johri's and Pal's (2012) call² to design ICT for development applications not only with a focus on offering effective low-cost applications (accessibility easiness), but also with adequate attention to

¹ Pasher and Ronen point out that first generation Organizational KM Systems "were about treating knowledge [merely] as an asset, recognizing how it influences strategy, and wanting to make the most of it by managing it properly." The next KM generation, they argue, needs to focus on creating new knowledge and innovation, a process which starts with the "reuse or new use of existing knowledge, adding an invention, and then creating a new product or service that exploits this invention" (Pasher and Ronen, 2011).

² Johri and Pal point out that current ICT for Development efforts "are primarily framed in the theory and practice of development and empowerment", signifying "a disproportionate emphasis [...] on fulfilling basic needs of users in low-resource environments without adequate attention to user-motivated concerns which would enrich their lives rather than merely provide access and satisfy basic needs." To overcome this gap, they advance a design framework, named capable and convivial design (CCD) and propose targeting four primary design characteristics, "if ICTD is to satisfy its purported goal of making a real difference in the lives of its intended beneficiaries - those that are significantly disadvantaged in terms of resources as well as opportunities": a. Access to Artefacts (accessibility easiness), b. Ability for Self-Expression (expressive creativity), including the ability to use personal energy creatively and to personalize the environment, c. Ability to interact and form Relationships with other People (relational interactivity), and d. Opportunity to enrich the Environment (ecological reciprocity). (Johri and Pal, 2012).

opportunities for enriching users' lives by enabling the authorship and contribution of own ideas based on one's background (expressive creativity), alone or in collaborative environments with other users/owners (relational interactivity), and with the opportunity to add productively to the world's extelligence (ecological reciprocity).

The arguments for the PKMS's potential in addressing the digital and innovation divides (Drori, 2010) are further strengthened by Gurteen's definition of the Knowledge Worker which centers around the virtue of responsibility rather than an individual's type of work (as in Florida's Creative Class¹): "Knowledge workers are those people who have taken responsibility for their work lives. They continually strive to understand the world about them and modify their work practices and behaviors to better meet their personal and organizational objectives. No one tells them what to do. They do not take 'no' for an answer. They are self-motivated". To Gurteen's mind, they "cannot be coerced, bribed, manipulated or rewarded and no amount of money or fancy technology will 'incentivize' them to do a better job. Knowledge workers see the benefits of working differently for themselves. They are not 'wage slaves' - they take responsibility for their work and drive improvement" (Gurteen, 2006).

6 PKM Considerations in the Future Digital Agendas of Governments

Thus, as enablers of personal development and people empowerment, decentralized autonomous PKMS capacities will give individuals a better chance of navigating today's abundance of information and changing career patterns. However, the even larger potential lies in the creative conversations initiated by them as well as their integration with the next generation of organizational KM expected to focus on creating new knowledge and innovation.

Collaboratively interlinking the knowledge bases available to collectively utilize and harvest accumulated knowledge subsets based on shared records and pathways rather than on redundant contents will improve the productivity of information seekers and suppliers alike. Extelligence (as the cumulative archive of human cultural experience and know-how accessible and augmentable by any individual who knows how) will flourish due to

¹ In addition to the traditional division of the workforce into an agricultural, working, and service class, Florida introduced the concept of the Creative Class as a rising and driving force of economic development. Estimated to be one third of the workforce (USA), their economic function is to create new ideas, new technology, or new creative contents as well as to engage in complex problem solving that involves a great deal of independent judgment and requires high levels of education or human capital (Florida, 2012).

more empowered individuals with better how-to-employ-and create-extelligence-skills as well as due to added knowledge memes and non-fading trails and their improved way of access.

Accordingly, commissions and governments are well advised to consider promoting PKM Technologies in their digital development frameworks. The European Commission, for example, is just undertaking a review of their Digital Agenda for Europe (DAE) to drive EU growth further digitally and to stimulate the conditions to create growth and jobs in Europe.

By responding to their InnoCentive Challenge 'The Future of ICT-Enabled Growth and Jobs in the EU: Current Barriers and How to Overcome Them' (www.innocentive.com), the author summarized the barriers and provisions presented and called for a wide-ranging political backing of autonomous Personal Knowledge Management (PKM) devices to make a crucial next difference by providing the overdue personal support tools for the problems faced today and an enabling environment for the creative conversations needed tomorrow, including liberalizing regulations for utilizing, preserving, developing, applying, and distributing PKMS's knowledge memes, directing educational and training institutions in providing better technologies and services to their staff and clients, spearheading a decentralizing KM revolution giving more power and autonomy to individuals and self-organized groups, securing the open-access availability of the knowledge memes created and shared by PKM users for the benefit of all, and appealing to the self-interest of institutional stakeholders employing knowledge management methodologies to support PKM technologies.

7 Conclusions and the Road Ahead

The critics of KM (e.g. Wilson, 2002) reason that "knowledge (i.e., what we know) can never be managed, except by the individual knower and, even then, only imperfectly". However, the distinction of Personal KM Systems, in contrast to its organizational counterparts, is to enable self-reflecting monologues of its user over life-long-learning periods of educational, professional, social and private activity and experience. In these conversations with self, the knowledge under review is biographically self-determined and presents itself as a former state of personal extelligence captured - for the time being due to the absence of brain implants - in external extensions of the individual knower's mental storage capacity. Thus, in a

personalized setting, the Utopian idea mentioned by Wilson converts into a workable scenario where individuals are indeed autonomous in the development of their expertise, and where they can determine how that expertise will be used or exchanged with people, communities, or organizations close to them.

Accordingly, the concept and prototype system ‘Knowcations’ presented in the papers facilitate establishing à-jour, well-maintained Personal Knowledge Bases and are designed to take on the role of the quartermaster and broker for sizeable portions of one's Intellectual, Social, and Emotional Capital. Above all, PKMSs should help preventing the sights encountered in the brief PKM Needs Survey depicted in figure 3 (see acknowledgements).



Figure 3: A Brief PKM Needs Survey in Flickr Images (see acknowledgements)

It is planned to transform the prototype into a commercially viable PKM software application within 18 months. The concerns to be further elaborated in future papers are the potential effects of PKMS's creative conversations on our citation-based Academic Reputation Systems and an appropriate Training and Service Concept for Personal Knowledge Management aimed at Higher Education and Professional Training.

7 Acknowledgements

All eleven pictures in figure 3 are resourced from Flickr, the online photo management and sharing application web site, according to the creative commons license

provided by the authors (CC by 2.0, CC BY-SA 2.0). The source address for each individual image is www.flickr.com/photos/<creator>. Please replace <creator> with the author's reference: from top left to bottom right /schnaars, /dullhunk, /juhansonin, /dylanramos, /sflaw, /themastershakesignal, /35188692@N00, /spine, /fwb, /blueace, and /17258892@N05.

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Creativity in waterfront renewal: A sustainable approach

Assunta Martone, Marichela Sepe *

Institute of Service Industry Research IRAT
National Research Council CNR
Via G. Sanfelice, 8 - 80134 Napoli, Italy

* *Corresponding author*

Structured Abstract

Purpose – In contemporary city the competitiveness is increasingly played on creative regeneration to achieve a more comprehensive and sustainable development. As regards, the paper aims at illustrating the case study of creative urban regeneration of Lyon Confluence. Thanks to the Confluence renewal, that will be explained focusing on history of places, urban projects implemented, sustainable socio-economic regeneration and participation policies, Lyon is part of the Creative City Network promoted by UNESCO and is reaching quite a good ranking among world cities in Quality of living. A first assessment of critical and positive factors of this process, still under development, will conclude the paper.

Design/methodology/approach – Our approach is focused on *creative cities*, which has its origin in the research into reasons why several cities gain attractiveness and competitiveness in recent decades. Such cities improve the interaction among urban regeneration, economic development and social renewal. These experiences show that their competitiveness is based on local peculiarities shaping the *city brand*. This case study is part of a broader research programme *Innovation and competitiveness in the global economy*, in development by IRAT CNR. The objectives are: creation of a methodology aimed at identifying and designing the creative and identity resources in emblematic areas of urban transformation; identification of urban regeneration best practices; identification of guidelines for sustainable urban regenerations.

Originality/value – The case study highlights, in an original way, an integrated approach to sustainable urban creative regeneration. In fact, Lyon is an emblematic case of urban regeneration among the French cities since the main project Lyon Confluence appears a singular example. It regards a particular territory with a strong identity, and its renewal seems to be able to both preserve nature and landscape, and revitalizing local economy consistent with the culture and vision of the residents. In 1995 Lyon started the renewal process aimed at launching the city at an international level, and attempted to change the Lyonnaise identity, based on silk and industrial production, redefining it on quality of life, attractiveness and creativity.

Practical implications – The study described in this paper is related to the identification of the best practices of urban regeneration in Europe, and the conducted analysis is also aimed at gather suggestions and advice for policy makers. Although the Lyon Confluence renewal project is still under development, a first assessment of critical and positive

factors of this process which will be described in the paper, could be carried out. This include the problems observed within the urban regeneration of Confluence which are essentially of physical and relational/cultural nature.

Keywords –Creative regeneration, sustainability, innovation, place identity, quality of living

1 Introduction

In recent decades, the role of culture has become a major and often driving factor for the process of urban regeneration. The focus on culture as a factor in regional transformation has been particularly extensive in response to competitiveness among cities, but also to the needs of sustainability of the cultural sector. In the same perspective of this approach, culture in its broadest sense assumes a decisive role in constructing a system of interventions where employment, tourism, social cohesion and sustainable development become the product of the integration of places, people, economies and traditions (Scott, 2000, 2006). Indeed, there exists a wide variety of visitors and corresponding demands, and cities need to provide for new types of cultural uses, suitable for tourists as well as citizens (Richards, 1996, 2009).

The operation of regeneration in contemporary city are often based on "creativity" (Sepe, 2009,2013,2014; Martone, Sepe, 2011). The creative cities are able to generate economies of innovation, culture, research and artistic production, and hence strengthen their own identity capital. It is a question not only of boosting existing culture-based economies but also producing new economies out of cultural capital, understood as an essential element of both tangible and intangible place identity — and creating a system together with other urban capital (Carta, 2007).

Florida (2002, 2005) has observed the relationship between the transformations in the capitalist mode of production – in particular those occurring at the urban scale including the clusters of high-tech firms, the dissemination of leisure activities and the urban economic networks – and the changes in identities of the actors involved in such transformations. Florida argues that the more cities are able to seem attractive to the creative class of workers and managers in the various sectors of economy such as art, design, fashion and advanced technologies, the greater are the chances that those cities

can successfully face up to the challenges of competition among cities imposed by globalization (Landry, 2000, 2008).

In this way, the creative city recognises the complexity and addresses the spatial, physical and land use conditions which help citizens and visitors to think and act with the use of imagination and live the city as a satisfying experience.

The formation of a creative district must be accompanied by the construction of lines of action to make the factors of development consistent with identity and sustainable growth of the city (Nijkamp and Perrels, 1994). Furthermore, the development of a creative district has to be considered alongside sustainable development intended in the economic, social and environmental sense (Ferilli and Pedrini, 2007), conditions which are equally important and interdependent for the sustainability of cultural resources.

Starting from these premises, this paper aims at illustrating the case of creative regeneration of Lyon focusing on: the history of places, the urban projects implemented (with particular attention to Lyon Confluence), its socio-economic regeneration (with particular attention to the increase in jobs and tourism enhancement), the participation (focusing attention to sustainability and social cohesion).

This regeneration process, combining the public space regeneration, the cultural renewal (Fête de la Lumière) with technology (LYONRESA tourism monitor, a computer-aided information management system) and environmental sustainability (Project Renaissance, WWF One Living Planet) has contributed to bringing the city of Lyon in the Creative City Network promoted by UNESCO and reaching quite a good ranking among world cities in Quality of living.

2 Lyon Confluence

2.1 The guide-idea and the new identity

Lyon is city settled between the banks of the rivers Saone and Rhone, with a commercial area located in the peninsula, with the Rue de la République and the Place des terreaux, Place Bellecour, and an old town centre, Vieux-Lyon, Fourviere, Saint Jean.

Founded by the Romans in 43 BC, it was the commercial and military capital of the “Three Gauls”, in the XVI century it became famous for printing industry and silk processing, under Napoleonic Empire it was transformed into an industrial city, with its workers neighborhoods on the Croix-Rousse slopes and tenement built against the hill

with the characteristic "traboules" (balconies, internal courtyards and passages), while it was urbanized the Rhone left bank.

The urban structure of the Presqu'île was reorganized, between 1848 and 1863, with the opening of three new straight roads with a north-south direction, 1.000 buildings were destroyed and 25.000 people moved, the Parc de la Tête d'Or, one of three largest existent, was realized.

After a stagnating period in the first half of 1900, two agencies were established: (i) in 1968 the Communauté Urbaine de Lyon (Grand Lyon, i.e. "Greater Lyon", its former acronym being COURLY) with broad responsibilities for the government of its 55 municipalities (57 in 2007), with 1.200.000 residents, a prominent actor in economic sector, in development and coordination of urban policies and in activity of promoting Grand Projet de Ville GPV; and (ii) the Syndicat mixte d'études et de programmation de l'Agglomération Lyonnaise SEPAL, with 72 municipalities and 1.300.000 inhabitants over an area of 730 sq km, since 1985 in charge of structural and strategic planning of the area. In addition, a few laws have encouraged the centralization of inter-communal associations providing centralization of services such as culture and sport (Dragotto, 2005; Palazzo A.L., 2011).

Some critical issues, related to the coexistence of these two inter-communal authorities, were solved by institutional governance belonging, for decades, to Agence d'Urbanisme (established in 1976), a focal node between technical knowledge and political decision.

In such a scenario, the urban revitalization has been strongly supported by the transport infrastructure (airport, TGV, metro opened in 1978, tunnel that crosses Fourvière hill) and the construction of the center Part-Dieu (now second Central Business District CBD in France, behind La Défense in Paris) (Boatti, 2004).

During the '60s Lyon, as the rest of France, dealt with a huge growth in the number of inhabitants and new neighborhoods in suburbs like La Duchère to accommodate returnees from Algeria were developed. The city boasts an important architectural heritage, dating back to Roman times and the Renaissance, and for this reason a part of the city (500 hectares, one of the largest areas in the world after Venice) was classified as a world heritage by (UNESCO World Heritage site) in 1998 (Russo, 2002).

The Lyon urban regeneration process started in 1995 with Mayor Raymond Barre (Demeuse et al., 2008). The singularity of Lyon's project is given by a deep integration of

all different levels in which it is structured, ranging from the metropolitan area development strategy (Schéma Directeur) to arrangement of the urban plan and plans for specific urban areas; in which each project gain a particular value as part of a larger structure. The whole city is reorganized through the design of a new framework of thematic planning systems such as the revitalization of public spaces, in both the center and periphery, creating new centers for urban and economic development, the reinterpretation of the places of mobility and the creation of a new public transport and road network, urban parks and historic sites, and the enhancement of the urban landscape. The complex structure of planning tools and strategies works thanks to the deep internal renovation of Authorities and the continuous dialogue setup with stakeholders and committees involved in each phase (Marchigiani, 2003).

The public direction of policy and Lyon urban development, important in the context of European competition among cities, was mainly based on such tools as Schema Directeur SD, Schéma de Coherence Territoriale SCOT, Grand Projet de Ville GPV Millenaire 3.

The Lyon urban development started with the arrival of TGV in the 80's and the construction of Lyon-Satolas (renamed in 2000 Lyon-Saint Exupéry) an exchange pole between iron, earth and sky (D'Ascia, 2007).

In December 1997 Millenaire 3 started, a process, conceived by Raymond Barre, for drafting the urban area project, shared and human-centered (Lusson, 2003); then urban renewal was organized according to river and its landscape, building thematic plans (relating to public spaces, lighting, water and green).

Among the GPV objectives there is the containment of the metropolis spread, thickening and redeveloping urban areas. A flagship projects within GVP is Lyon Confluence, which begins under the Mayor Raymond Barre in 1997 and the creation of mission Perrache Confluent, renamed Lyon Confluence in 1998 together with the launch of the consultation for the redevelopment, while in 1999 the société d'économie mixte SEM was created and began the first demolitions.

Millenaire 3 and Conseille de Developpement, born as implementation of a law for inter-municipal cooperation, extend the number of actors involved, the new plan aiming at combining competitiveness and social cohesion, setting five strategic areas and twenty-one priority to make Lyon open to cultures and to the world, attractive, and able to promote entrepreneurship and learning (Dragotto, 2005). The conurbation is equipped

with a comprehensive development program, integrated with sustainability principles allowing to improve its international ranking and achieve social cohesion (EDURC 2000).

The identity of Lyon, previously linked to silk production and later to industrial production, is redefined pointing at attractiveness, quality of life and creativity.

Lyon looks like an historical city, with university, hilly, with a European and international vocation which has started a process of urban regeneration, activating also an important activities of specialized international conferences (Morandi et al., 2003). The strategic vision of urban sprawl has been identified also thanks to the reflection process Millénaire 3, animated with the involvement of Grand Lyon stakeholders through open debates, conducted over several meetings, where the idea emerged of placing man at the heart of the debate on urban design, a distinctive sign of Lyon's identity.

The shared project is aimed at develop a metropolis open to world cultures, which enriches itself by differences, which is integrated, internationally recognized, accessible and welcoming and also able to develop events and leisure activities. To communicate, and represent, effectively the dynamism of the Lyon area, twelve major economic agglomeration partners have designed a new banner, Only Lyon, addressing decision makers and the major European capitals, but also residents, so that they can, through the embedding of the "signature", express their pride and identity and become the best ambassadors for their city (D'Ascia, 2007; www.grandlyon.com/).

2.2 The urban project

The Schéma Directeur Lyon 2010 clearly stated its objectives, consistent with a medium to long-term vision, it was focused at transforming the Lyon area into an international metropolis, through the development of additional functions alongside the traditional manufacturing ones.

In SD the accomodation of public spaces, both in the city center as in adjacent municipalities, is associated with the reorganization of accessibility and the introduction of new economic and commercial activities in order to shape a balanced set that preserves and strengthens the identitarian characters of the individual areas. The importance attributed to the redevelopment of public spaces, highlights the social value of living places quality, to respond to the needs and aspirations of the inhabitants, while the strategic vision of SD sees the structure of landscape and environment as a mean to give

order to the development of the conurbation (Marchigiani, 2003). The SD was therefore an important tool for converting of the traditional economy of Lyon towards activities aimed at ICT, consolidating the transport network and enhancing the tourism potential.

The task of ensuring the implementation of SD until the approval of the Schéma de Coherence Territoriale SCOT, of handling the processing of the SCOT and monitoring and evaluating the implementation has been attributed to the Syndicat mixte d'études et de programmation de l'agglomération lyonnaise (SEPAL), technical body composed of specialists from different areas, who have collaborated to implement the plan in close coordination with State and Region Chamber of Commerce.

In 2001 Gerard Collomb was elected new President of Grand Lyon; he developed his mandate keeping the prospect of his predecessor Barre, the Millénaire 3 approach, and with the update of the reflection on the city future. Thus the ideas of development, elaborated by Lyon 2010, were reviewed through the Vision Métropolitaine Lyon 2020 (Une métropole compétitive et responsable, creuset d'une nouvelle urbanité).

This revision, caused also by the changes in social policies and by the presence of new territories, has the objectives to promote a better understanding of the territory, of "genius loci", which establishes the identity of the conurbation and of the wider region Lyon, reinforces the sense of belonging to the metropolis and its international visibility. Another objective was to involve the strategic levers available to the city in different sectors of urban policies - housing, economy, etc. - to assess their consistency and ability to meet future challenges, with the aim of creating a competitive and responsible city.

In continuity with the SD, the SCOT 2030 imagined for Lyon a balanced economic and population growth, environmentally friendly, with social equity and territorial solidarity, following principles peculiar for the area, such as multipolarity, i.e. urban development organized around a dozen living spaces, not concentrated in the heart of the city, so reducing travel; accessibility, by offering to residents of individual areas all the functions of daily life: home, work, shops and services ("mixed" city on model of the "city of short distances "); the attractiveness, promoting a denser urban development, without compromising the quality of life for residents, helping to preserve natural areas; respect of the balance between nature and the city (50/50); the presence of vegetation in urban forms a "green frame" important both for the quality of urban life as for its economic wealth and attractiveness, while the Réseau Bleu formed by the rivers is an

important component of a new living space toward the water, and also represents an alternative to the carriage of goods by road.

As explained above, the Millenaire 3 permanent program-laboratory was set up to facilitate understanding and elaboration of new development ideas, and identified a mission for the city center, initially called Perrache Confluent, then renamed as Lyon Confluence (Cioce, 2007; Demeuse, Marek, Veithen, 2008). Lyon Confluence is also the name of the main Grand Projet de Ville GPV, focused on revitalization and development of the territory and the landscape between the river banks of Saone and Rhone.

The old quarter of Perrache, known as Confluence, is an industrial suburb enclosed in the historic city center. The area, urbanized during the industrial revolution with installations of railways, a port, industrial and working class neighborhoods, began to isolate themselves from the rest of the city at North. The marginalization culminates in the 60s with the construction of the highway, and Confluence became the district of the slaughterhouse, of prisons, of the Rembaud port, while in the 70s the manufacture is displaced to areas more easily accessible and the facilities are disused. With post-industrial crisis a recovery started, on a large scale, to boost the city's image through an extensive urban planning. The re-conversion of the neighborhood Perrache is inserted into a larger urban project, which has a highly experimental character and is managed mostly by artists and landscape architects (Palazzo E, 2010).

Actions on public spaces and creation of new poles of research and attraction are linked to projects based on large relational connections, such as the reorganization of public transport lines, the road system and the protection of green spaces that reach the city center.

In fact, high-speed connections of various parts of the city, which are a constant feature of all the interventions of urban renewal in Lyon, together with great care for the public open space (Place de la Bourse, Place de la Republique and Place de Celestins, Place de Bellecour, urban parks) make the urban unit clearly perceptible (Scaramuzzi, 2005; Ferrari, 2004).

In particular, the scheme of accomodation of the central and suburban public spaces built a common language of the new identity of Lyon, a common vocabulary for urban equipment, for historic squares as well as for the suburbs. Considering the public spaces such as a structuring plot of the new image of Lyon requested the search for unitary answers to different themes such as the layout of space, physical and functional, and the

vehicular and pedestrian accessibility. These principles, contained in Lyon 2010, considers the urban landscape as one of the elements of the strategic plan, supported by different thematic plans in which the enormous commitment to innovation are represented in accordance with the history and landscape of Lyon: the Plan Lumière rearranges the light of the historical center, the Plan Vert rearranges parks, green spaces and gardens, the Plan Bleu for arrangement of the riverfront, etc. So moving from the search for the identity of places (Fourviere, Croix-Rousse, Presqu'île, Rhone and Saone) to the launch of a new vision of the city (Parc de Gerland, Cité International, Cité Scolaire International and Lyon Confluence) (Boatti, 2004; Marchigiani, 2003; Morandi et al, 2004).

The territory that, although at first sight does not have a specific vocation, has a strategic location and a large number of brownfield sites, and the re-conversion of the area provides space for commercial and port service activities. There the pôle de loisirs, the Confluence Museum, and residential areas are scheduled with the ultimate goal of strengthening the role of Lyon as a city of innovation and scientific research (Carta, 2004; Scaramuzzi,2005)

2.3 The socio-economic regeneration

In Lyon the layering, physical, economic, environmental and social of interventions done is clearly apparent. From a geographical point of view Lyon is dominated by hills in the North West who see the location of schools; in the South East wide natural spaces, green areas of quality (50% of the territory) and the wide plains, with technology poles and university town; located to the East are the large infrastructures (TGV, motorway and airport), while the downright urban structure includes the central area (Confluence), the historic center (Croix Rouse), the management center (Part Dieu) (Morandi M., 2004).

Regarding the road system one points out the International Interchange node of Lyon (highway, TGV, 3 stations) to Catalonia, Piedmont, Baden-Wuttemberg, Paris, Geneva; the establishment of a North-South axis along the Rhone, alternative to that of Milan, Zurich, Frankfurt and London; the great weight of inland waterways (planned connection Rhine-Rhone); the inclusion in the European network of high-speed trains (in Lyon three TGV stations, intercontinental airport Satolas with TGV station inside); the strengthening of iron and rubber exchange, with Grenoble, St. Etienne and Geneva (regional triangle) (Pollini, 1996).

The Confluence Project had evolutions referable in stages and articulated into two periods of fifteen years each: in the first phase, begun in 1998 and defined in 2003, the first studies were launched, the Société Anonyme d'Economie Mixte Locale SAEML Lyon Confluence to bring the project up and running was set up, consisting of Grand Lyon, Conseil General du Rhone, Voies navigables de France, Caisse des dépôts et consignations, Chamber of Commerce and Industry of Lyon, and some banks.

In 2003 SAEML became officially the project manager on behalf of Grand Lyon and signed an agreement for the public development of 150 ha; the ZAC Lyon Confluence 1a phase was created; and finally in 2008, SAEML was transformed in Société Publique Locale d'Aménagement SPLA for the study and implementation of the second phase.

In fact, Grand Lyon assigns to Société Economie Mixte SAEML the project implementation, with the establishment of the Zone d'Aménagement Concerté ZAC, an area in which the local authority decides to implement infrastructure works and major projects entrusted to a mixed enterprise; the works on tramway begins, and the tram enters in service in 2005 along the course Charlemagne, the main street of Confluence.

The first phase is developed on the areas previously freed from port activities along the Saône to the west, with the creation of an urban park along the river, a new square, the extension of the tramway. The development schedule provides a total of 340.000 square meters of which 130.000 sqm residential; business, services, leisure and hotels 120.000 sqm; 70 sqm service sector; museums 20.000 square meters.

Planned investments for the first phase of the project for about a billion euros are allocated to: City of Lyon 3%, 4% Sytral, Rhone Department 13%, 15% Grand Lyon. Private 65% (Demeuse et al., 2008). The public involvement program has a protocol that provides fairly accurate series of meetings organized (timing, participants, objectives in stages), exhibitions and other activities, an Urban Center.

In 2006 work began on the future Place Nautique, with the reorganization of the new docks. Currently the first phase is almost completed while the second phase, which began recently, will redraw the district by 2020 with a further improvement of public transport, even in light of the significant increase in mobility in France which increased from 5 km/day/person in 1960 to current 45 km/day/person (Zoltán Gábor Virányi, 2010).

The second phase began with the launch of the consultation in February 2007, the selection of the design team in July, while in September the concertation was launched, at first "professional and restricted" and in 2008 opened to public with Bilan de la

Concertation, then spaces of the Marché d'Interet National (MIN) were released. Between the years 2009-2010 ZAC Lyon Confluence phase 2 was created.

This phase will also benefit from the European program Concerto, with a budget of approximately 3.9 million euro; the project Renaissance aims at promoting in Lyon the development of a sustainable district model, with energy efficiency and renewable energy. The district consists of 21 buildings (660 dwellings and 15.000 sq.m. of office) shared in 3 blocks of buildings which have strict requirements in terms of energy efficiency, renewable energy use and social diversity, in addition a careful monitoring of energy consumption should allow a better understand of green buildings behaviours.

Perrache area consists roughly in Sainte-Blandine working-class area, in the industrial area of Port Rambaud and in the Market area, while the new Place Nautique will be the heart of the Presqu'île.

The demographic evolution of Confluence shows a loss of about 100.000 inhabitants between the '70s and the '80s; from the '90 to 2007 the increase of about 62.000 inhabitants demonstrates a good recovery in conjunction with the activities of urban renewal.

1962	1968	1975	1982	1990	1999	2005	2007
519.854	527.800	456.716	413.095	415.487	445.452	467.400	473.657

(Demeuse et al., 2008)

Currently in the area about 7,000 people live in the area, expected to reach 10,500 by the end of the project first phase and 25,000 at the end of the second phase; the three central blocks of buildings will contain a wide range of accommodation, about 44% of dwellings luxury, 33% standard and 23% of popular housing. The construction of new offices will increase the number of jobs from the current 7.000 to 11.000, and then at the end of the second phase to 22.000 (Demeuse et al., 2008; Virányi-Fontan, 2010).

Lyon Confluence also benefits from strengthened collaboration between research and business, through the creation of modern poles of competitiveness as the technology incubator CREALYS, CANCEROPOLE, etc., as well as work enhancement of scientific research; the dissemination of innovation in traditional companies putting them in network with new centers; the expansion of the international attractiveness of Lyon University.

Finally Lyon in recent years has heavily invested in developing the fields of culture and the digital, on the birth of new image industries, video games, electronic music and

new opportunities to access the knowledge offered by digital media. For the cultural portal, online since April 2007, Lyon has invested a budget of 80.000 € and boasts 30 - 40.000 users / month; it is the first cultural portal created by a French city with new services (e-ticketing, etc.).

2.4 The listening process

In December 1997 the development of an urban human-centred project, to identify challenges for the third millennium and the risks and obstacles to overcome in order to gain an international position, began in Lyon. This participatory process has aroused considerable interest and membership, thanks to the numerous meetings of working groups with the aim to identify challenges and develop appropriate proposals.

The listening process has seen the partnership of all the groups representing the diversity of the urban area: public institutions, economic institutions, universities, associations, and agents of Grand Lyon. More than 1500 people have contributed to collective reflection.

The collective, and shared, dimension of the process is reinforced by the conversations, which have gathered the opinions of the main institutional decision makers of the agglomeration on the proposed response strategy, allowing to formally associate the process with significant partners such as State, the Regional Council, the General Council, the University, consular chambers, the patronage, trade unions, cultural and religious worlds.

Among the tools to communicate and share there is the "lettre Millénaire 3", that has provided constant support, distributed to more than 7,000 addresses, to expose the progress of the process which remains open to experiences, projects and similar initiatives conducted in other places by other bodies or other individuals; the "dossier Millénaire 3" has provided a common base of knowledge on the major issues explored, and were means of sharing information and expression of points of view; a website, since September 1998, provides a citizen forum.

One of the five great challenges identified by Millénaire 3, namely "Strengthening citizenship and promote a local government system", has been implemented thanks to the contribution of Gerard Claisse, Councillor for Consultation and Participation of Grand Lyon since 2001, and of the Charte de la participation GrandLyon. The Charte, product of

a co-processing and approved in May 2003, is a political contract agreed between elected (politicians), services and civil society.

The Charte is supported by 2 goals and 3 principles and identifies 4 levels of public action. The two goals are: encouraging the participation of citizens through information, exhibitions, opening several urban centres (maison du projet), listening, encouraging expression of ideas, questionnaires, and training; and stimulate public opinion through meetings, workshops concertation and mediations. The three principles are: the consideration of a continuously evolving process; the application of the concept of subsidiarity for 55 municipalities; the adaptability, i.e. trying not to use a single model, adapting to the context.

The Public action is developed over four levels: strategies and prospects of agglomeration; public policy; projects of management and development, with the 6 GPV including Lyon Confluence; urban public services with the Charte de Qualité Publique (a development of the Charte de la participation).

Among the positive effects one can include the better readability of the public action, more effective in responding to expectations and encourage creativity; better "planning" of technical solutions, more socially acceptable; greater legitimacy of the elected (politicians) (Dragotto, 2005).

The phase one of Lyon Confluence was interested by four public meetings in order to consult residents, while six themed workshops were held in order to consult residents about the project - on transport, public spaces, housing, etc... - during phase two. Furthermore, there is a www.laconfluenceonendiscute.fr web page, resulted in over 2,000 written contributions, as reported by the official Lyon Confluence website, and the exhibition trail "Ma ville demain"/"My city tomorrow".

The Maison de la Confluence is the information and consultation centre for Lyon Confluence, where exhibitions on the ongoing project and different kinds of materials are present in order to show and explain the transformation project. The last exhibitions Traits d'union, La Confluence au coeur de Lyon, started on November 2011. During this event: inside the house, walls, large illustrations of real and virtual life-size outline of Confluence; before them, explanations of key projects are available on trees that blend images and short texts; in the video, the designers explain their actions; a 3D models, gives an idea of the future face of the neighbourhood; in the courtyard the environmental qualities of the project are compared with current standards. In addition to the visit, there

are two newspapers of 24 pages each deepening project in detail, one is dedicated to part of the Rhone and the other to Saone.

Finally, SPLA, in July 2011, launched a consultation to redesign the Lyon Confluence web site with the aim to join the three web site (lyon-confluence.fr official site of urban project; laconfluence.fr website of the territory and laconfluenceonendiscute.fr dedicated to planning the second phase) without losing interactivity and quality of information. The new website is online since spring 2012, and there is also a newsletter Lyon Confluence info’.

3 Conclusion

The problems observed within the urban regeneration of Confluence are essentially of physical and relational/cultural nature.

From a physical point of view, the main problem of the area is that Confluence appears as a triangle closed on two sides by the rivers and on the third side by railways and motorways, which form a kind of barrier to the access, rather than an attraction to people, so the main goal of regeneration, namely to extend the city center, will not be achieved until these barriers persist.

Since the center of Lyon, for about 300 years, has been represented by Place Bellecour, which is still isolated from Confluence, the only way to extend the center of Lyon to the south would be to “move” the highway outside the peninsula, but this project is almost impossible or at least extremely expensive. Therefore as long as there are such barriers, it seems Lyon cannot be equipped with a single, extended, urban center, but will be characterized by two centers in competition with each other (Virányi-Fontan, 2010).

In addition, the pressure on land that would result from the regeneration project is likely to exclude the low-income population now living in the north since the actual size of the new social housing is still unclear; further, there is no sufficient attention on ties between the city center and the right bank of the Saone (which is part of another municipality) (Demeuse et al, 2008).

An example is given by the consequences of the opening of the mall (Lyon Confluence first phase), which has already created traffic problems; so moving within Confluence with the bicycle and tram can take 25 minutes, but there are long queues at tram stops and trains are crowded, while it takes 53 minutes to go from Place de la Comédie to the mall by car.

Now, with the start of the second phase and the Marché Gare on the tip of the peninsula, the need for transport is likely to rise without an increase of the transport supply.

The cultural/relational issues concern the limits and difficulties of the transition from “participation” to “action” and from the “action” to the “cultural change” of politicians and residents.

The consultation and participation are likely to give rise to purely formal consensus, detached from the “actual” agreement on the words and their meanings. Since cultural changes are not achieved by decree, it takes time to change the culture of: (i) the elect (from the centrality of the decision to the centrality of the process), (ii) the services (from a pedantic organization to an organization capable of learning), (iii) civil society (by the defense of private interests or category to the formulation of public interests); all this requires new methods of conducting shared projects, and adequate competences (Gerard Claisse).

A good example is the Renaissance project which tries to redefine the Confluence district in an ecological way, following the principles of WWF’s (World Wildlife Fund) One Planet Living, but since the innovation of transportation is not very well planned yet, it is very difficult for people to change their habits using bicycles instead of cars (Demeuse et al, 2008).

Lyon has invested heavily in improving relationship among culture, urban space and local identity, finding a balance between past and future through innovative projects included in the tradition of economic and technological initiatives.

The first phase of Lyon Confluence is almost completed while the second phase will redraw the district by 2020 with a further improvement of public transport. Currently about 7.000 people live in the area, with almost the same number of jobs, they are expected to reach 25.000 people and 22.000 jobs when Lyon Confluence will be completed.

Even though the market laws are changing some aspects of the Lyon Confluence project and the process of sharing of the urban choices is not always privileged in this process of transformation, Confluence is part of a more general strategy devoted to the Lyon metropolitan area in which each single project assumes a role and involves interests that go beyond the revitalization of this specific area.

The investments have redefined and strengthened cultural identity, giving stimulus to participation and positive implications in terms of improving the cultural image of the city and its attractiveness for residents, tourists and investors. The regeneration of the cultural sector has been focused primarily at increasing the quality of urban life, with investment in tangible and intangible assets, such as the improvement of networks and encouragement to creativity (La Rocca R.A., 2008).

Interesting the use of festivals and events to increase the attractiveness. Here are a few examples. In fact, Lyon has also used the light as an element of urban regeneration and redevelopment, the urbanisme lumière to create the perception of a city which at night shows other faces, and the Fête de la Lumière, held in December since 1999 and known worldwide, originated from the religious traditions.

Lyon uses, in a creative way, also electronic and digital culture, including the visual creation; the festival Nuits Sonores, held since 2003 in May, in 2012 hosted about 250 artists, half from the international scene, with tens of thousands visitors, and always sold out events. Unlike the other great festivals that take place in parks outside the city, Nuit Sonores takes place in 60 locations in Lyon, using unusual places like the Charlemagne ice rink and the roof of the station Perrache.

It is also to be noted LYONRESA tourism monitor, a computer-aided information management system provided by Lyon Tourism and Conventions; it is a booking centre aimed at the general public which offers accommodation, leisure activities and holiday/tourism packages.

As detailed above, according with the environmental sustainability, present in every project of Lyon, Grand Lyon signed cooperation with WWF in order to develop the Confluence district.

All this cultural, creative, environmental and technological implementation contributed to bringing the city of Lyon in the Creative City Network promoted by UNESCO and reaching a quite good ranking among world cities in Quality of living.

Forasmuch as the media arts have been part of the Lyon's life for nearly a decade and many public events celebrating media arts in the city are becoming more and more famous, Lyon in June 2008, was appointed as the first UNESCO City of Media Arts.

Further, Lyon ranked in *Mercer quality of living survey*, 37th in 2005-2006, 36th in 2007-2008, 38th in 2010; in 2011 Paris and Lyon ranked respectively at 30th and 39th place.

For innovation economy the “2thinknow Innovation Cities Top 100 world cities rank” includes Lyon in 2009 at 10th position, in 2010 at 9th, while in 2011 the city ranked 10th globally and 2nd in France for innovation.

Since it is easier to attract “creative class” increasing cultural industries and their production, the media communication cluster in Confluence confirms this, being targeted to attract and retain students in the city, young graduates, the future creative class.

Finally, Lyon Agence d’urbanisme, aimed to make Lyon enter the Top 15 of the most competitive European Cities, set up a survey in 2006 to measure the manager perception of Lyon; the survey confirms that Lyon symbols are Economical information technologies and textile, Communication network (rail, road, river); Geographical Front door to the south of France, Geographical situation and “well-sized” equipments, Urban area dynamism, Sufficient critical mass for an international influence, Second French city and Cultural Culture and gastronomy, Ville lumière, Urban quality (Opale).

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Designing Cross-Disciplinary Innovation – How to program customized Creativity in Teamwork systematically

Anja Jannack *, Jörg Rainer Noennig

Juniorprofessorship for Knowledge Architecture
Department of Architecture
TU Dresden (Dresden University of Technology),
Germany

** Corresponding author*

Structured Abstract

Purpose – The paper reports on the impact of designing a creativity workshop schedule in terms of successful cooperation and project generation. It is based on a series of creativity workshops designed and conducted by researchers of Knowledge Architecture, a new scientific field at TU Dresden. Knowledge architecture utilizes architectural processes and tools in order to develop conceptions of non-architectural items, as organizational design, product development, innovation- or knowledge management. Whereas groups and teams of divergent scientific fields and professions are focused.

Background – These days scientific research and industrial development are getting more and more complex. To find appropriate and problem-oriented solutions, different disciplines have to cooperate and collaborate closely.

Design/methodology/approach – In order to focus on the interplay of the design of the workshop and the success of the interdisciplinary teamwork a systematic framework is derived from several case studies. These workshops were documented and analysed systematically. Creative techniques were developed and successfully implemented into workshop practice.

Originality / Value / Practical implications – From the observations so far, a number of findings can be stated. Generally, the implementation of architectural methods was quite successful, and appears to be a way to increase variety, creativity, and innovations. But not only the creative techniques themselves are influencing the workshop results, moreover the design of the procedure and the arrangement of different tools, methods and sequences evolved as a key driver of successful interdisciplinary cooperation. Interdisciplinary cooperation has to be taught, learned and practiced in a long-term. Therefore a theory of creative for collectives is needed. This may be facilitated by discussed systematic and customized program of workshop design and methods of Knowledge Architecture to foster Creativity in Teamwork to design cross-disciplinary innovation.

Keywords – Creativity, Innovation, Cross-disciplinary Groups, Management, Method-Transfer

Paper type – Project Report

1 Introduction / Situation/ Background & Problem description

Creativity is one of the key skills to surviving today's world complexity. No longer is this feature held by individuals like painters, musicians or other artists only. Yet, creativity is a primary source of technological change and economic growth. As it is the base of innovative ideas it drives both academic and economic world. For those organizations it is outlined as an important attribute towards their potential of innovation, their competitiveness, and their progress (Taggar 2002; Miron et al. 2004).

The continuously increasing demand of creativity is illustrated by various amounts of literature and studies in scientific areas, and on the other hand by an overflowing offer of innovation and creativity trainings on market side; for individuals and for whole companies for each kind of industry. These days' scientific research and industrial development are getting more and more complex. To find proper answers to scientific and economic tasks different disciplines have to cooperate and collaborate closely. Now very specific knowledge is to be integrated and a common communicate-language has to be installed in order to support cross-disciplinary teamwork with its various forms. But without a systematic approach and apt methods, these groups can hardly work successfully together. A strong need for creativity and innovation is apparent not only in the scientific and industrial fields but for communities and the society too.

Since 2011, researchers of Knowledge Architecture were asked to conceive and conduct about 25 creativity workshops for different stakeholders, such as scientists, teachers, administrators or innovation- and knowledge-managers. As most of the members of Knowledge Architecture are trained architects, they are used to develop unique answers for complex tasks by using architectural means. By these workshop activities, a variety of creative techniques were developed, which are mostly based on modeling techniques and visualization tools, on design thinking and spatial representation. As one of its core endeavors, Knowledge Architecture seeks to apply architectural thinking and methods to un-architectural tasks as product development or strategically organizational design. The analysis of the workshop participant's behavior and workshop results indicated that methods of Knowledge Architecture may increase the probability of Innovation.

Besides the support via transferring of methods from one to another discipline, a problem-oriented and custom-tailored workshop design was identified as a key feature of successful interplay and to enhance the knowledge exchange of workers within, and in-between different fields. But to plan and manage a cross-disciplinary cooperation successfully and to coop within divergent teams is not an easy task. Moreover the development of single methods and creative techniques a more systematic approach is needed. This paper is going to report on the related systematic we use to design custom-oriented workshops for divergent stakeholders and settings.

2 Theoretical background

Before detailing the developed toolset and the systematic programming of the creative workshops we are going to deliver a short overview on existing theoretical backgrounds according to innovation. In the scope of this paper we focus on the following theories:

- Innovation funnel.

The model “Innovation Funnel” by Steven M. Dunphy, Professor at Illinois University, Chicago, is outlining that there have to be many ideas at the beginning in order to gain a single innovation implement on the market at the end. This one idea has passed through different filtering steps. The path to technological innovation is made up of a number of identifiable macro and micro level discriminators (Dunphy et al. 1996).

Usually innovative ideas are provided by the in-house Research & Development division of the firm- the paradigm of closed Innovation – the notion that the only good idea comes from within, a strategy of vertical integration and exclusive control. For most of the twentieth century this paradigm worked, and worked well. “If you want something done right, you’ve got to do it yourself (Chesbrough 2003).

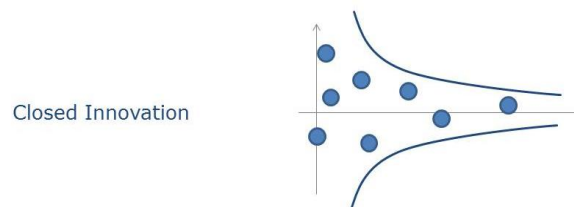


Figure 1: Funnel Innovation

- Open Innovation

Henry W. Chesbrough, professor at Berkely University, California; argued “that companies need to look beyond their walls to thrive. Gone are the days when in-house research and development (R&D) muscle alone could dominate markets. The future’s giants will get the best bang for their research buck by bringing external ideas in and let internal ideas out” (Interview in Nature Reviews 2013). Open Innovation, already under way in variety of industries, show how forward-thinking companies leveraging the power of external ideas. Ideas bubble up in organizations of all kinds and sizes, not just in large research labs. And knowledge workers are ever more mobile, willing to take their ideas and talent to whatever firm will develop them (Chesbrough 2003).

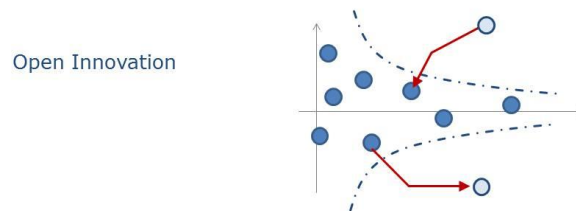


Figure 2: Open Innovation

- Disruptive Innovation, (breakthrough, discontinuous, radical innovation)

Clayton Christensen, economist and founder of Innosight, defined “disruptive innovation” as an “innovation that makes it so much simpler and so much more affordable to own and use a product that a whole new population of people can now have one – people who, historically, didn’t have the money or skills to be in the market” (Interview in Research Technology Management 2011). He describes it as something new to the world, and a departure from existing technologies or methods; as something that creates a even new market by applying a different set of values, which ultimately (and unexpectedly) overtakes an existing market. Christensen observed that a disruptive technology initially underperforms the dominant one on dimensions the mainstream market demands, but with steady improvements it meets or exceeds those demands (Christensen 1997).

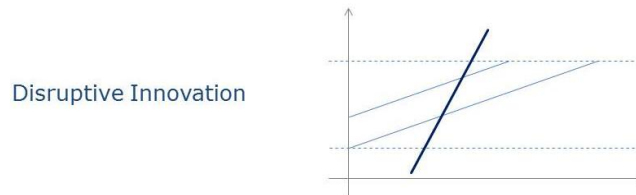


Figure 3: Disruptive Innovation

- Double Diamond

In 1990 Michael Porter's "Diamond Model" suggests some important determinants for a nation's global competitiveness. This model was extended to a Double Diamond Model in order to generalize the model and do incorporate multinational activities too (Rugman 1993, Moon 1995). This model suggests that managers built upon a domestic and a foreign diamond to become globally competitive in order to their survival and growth.

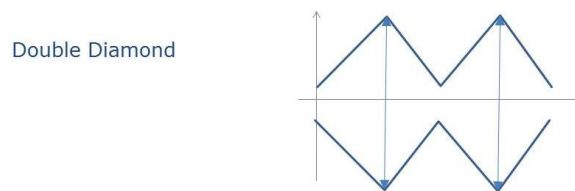


Figure 4: The Double Diamond

- Creative flow

If it comes to creativity the Flow Model of Mihály Csikszentmihály, a Hungarian American Psychologist, is essentially. He depicts that the flow is characterized by a complete absorption in what one is doing. The flow is representing a balance between over- and under-challenge. The Flow theory postulates three conditions that have to be met to achieve a flow state: 1) One must be involved in an activity with a clear set of goals and progress, 2) The task at hand must have clear and immediate feedback, and 3) One must have a good balance between the perceived challenges of the task at hand and his or her own perceived skills.

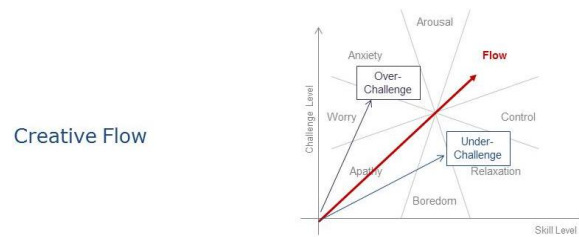


Figure 5: The Creative Flow

Idea Peristalsis – Silkworm

The mentioned theories explain some patterns of innovation from more or less an economic point of view. But for complex tasks and for creating innovation within very dynamic markets e.g. with shifting targets creativity is needed not only in the beginning – at the “Ideation process” (Knoll and Horton 2011, Husserl 1950, 1962).

On The base of our workshop experiences and structures analysis of the workshops, the participant’s behavior and resulting outcomes we formulated the following model of the “Idea-Silkworm” (figure 6). During the “invention”, the “making”, and the “re-thinking” we discovered the need of different modes of creativity in the different phases of the Ideation- and Innovation-process. This process can be described as alternate series of spread-out-generating and closing-selective creativity actions. That means that firstly modes of creativity are needed to create a large span over a wide range of ideas, themes, or problems. In a second step this variety has to be narrowed down to the focus of the given customized task and also specific competences and knowledge of the workshop participants.

Depending on the complexity and the included sequences of each different workshop the selection criteria’s are essential: Not only for finding and developing a successful result output but moreover to enhance the probability of “keep-on-working” on the result after workshop is finished (Figure 19). Hence, criteria finding is of absolute importance and has to be done as group activity discussion vise. For defining common and useful criteria creativity and creative tools are still to be developed and practiced in a more systematical way.

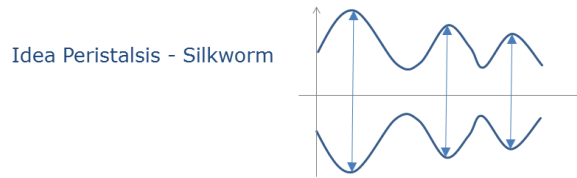


Figure 6: Idea Peristalsis – The Silkworm

3 Programming Creativity as a Black-Box-Model

In order to explain the systematic approach of designing a workshop, we introduce the “Black-Box” model (figure 7). To provide the customer with a fitting program, a most defined description of the target: the expected and needed resulting output is crucial. Boundary conditions as thematically contents, nature of participants, how many people take part, room dimensions and quality, or the equipment have to be taken into account. Both Customer and workshop creator have to develop a clear and common understanding of the in- and output. We hold, the assessment of customers need is the first thing to do before starting to program workshop activities. It is the foundation of a successful working program. The Black-Box itself can be described as a system which contains a various number of (creative) elements – what we call the Toolbox (Table 1; figure 8).



Figure 7: The Black-Box Model

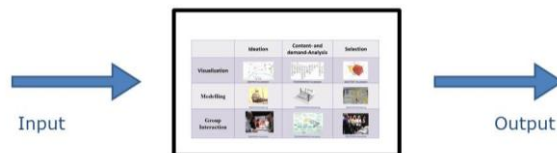


Figure 8: Toolbox insight of the Black-Box

According to the complexity of the different targets it is possible that an outer Black-Box contains a varying number of inner Black-Boxes (figure 10). A sequence can get that composite that it is an independent Black-Box. A single sequence often have alternate followings of “being-creative”-tools – in order to open up variety - followed by narrowing down through selection tools. We state, that having a big amount of (starting) ideas is not only important in the beginning, but in the later (developing) steps as well, because a wide range raises probability of good results to evolve innovation in the end (Idea Peristalsis - figure 6). The question is how to funnel creativity target wards?



Figure 9: the Black-Box inside of a Black-Box

The design task of the workshop creator is: to find the best fitting sequences of elements and a suitable linked connection them according to the customer’s needs. So the Black-Box System is interlinked and regulated with inside. Due to its inner structure it takes the risk of being very high tact sensitivity; especially if the composed elements are successive and the results of each sequence is one after the other. According to the nature of customer-oriented output and the boundary conditions each workshop schedule has its own diagram of combined elements and programed sequences. We hold, this designed uniqueness is an important success factor.

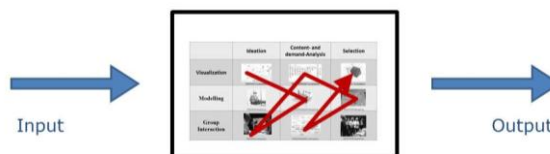


Figure 10: Black-Box interlinked Sequences

To create a successful program two dimensions are of great interest: 1) atmosphere as well as what we call the “creative-fun-factor”-effect, 2) a certain time pressure, and 3) a (concrete) clearly explained tasks to the audience, and 4) a well moderated procedure. The Magic of being creative within a group and outside of your daily (work-)

environment usually seems to work as an easy win within a fun generating and joyful atmosphere. But to provide a certain level of output quality, each workshop group has to identify and discuss their specific criteria (Figure 19) They are extremely relevant for the selection process of focusing and narrowing down (Silkworm Figure 6). The criteria ranking is different due to the customers target and industrial or scientific sectors.

In order to get customer-fitting results one has to deliver the optimal time – in-between to less and not too much time. To be efficient it is necessary to do each step or sequence in shortest possible time within a balance of time and result-quality. Usually people find out that for the first step of idea-generation in general they don't need as much time they expected. So under conducted and moderated conditions and within an enriched atmosphere people create many (good) ideas in a very short time.

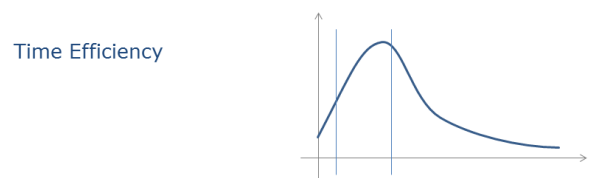


Figure 11: Time Efficiency relation

4 A closer look into the Black-Box -the (methodological) Toolbox

The main objective of the Black-Box is to offer a customized outcome. So the design task is to interconnect the different means in the best fitting and most efficient way. Therefore we developed a broad toolbox step by step. The toolbox supports the workshop creator with more or less complex tools to funnel creativity of different modes in order to ensure the output. To meet clients' needs and demands there is no standardized workshop schedule existing. Each case is supported via a unique structure though the used elements are basically same. The usefulness of most tools is proven through practical experiences. Though they always have to be adapted and modified to each new, tasks specific context.

For a more detailed expression of the toolbox elements please see authors article "Programming Creativity: Methods for Empowering Innovation in Interdisciplinary Teams (IFKAD proceedings 2013). For the scope of this paper we shortly want to sum up and add the new elements developed during the last year:










	Ideation	Content- and demand-Analysis	Selection
Visualization	 IDEATION Visualization	 PROGRAMMING Visualization	 SELECTION Visualization
Modelling	 IDEATION Modelling	 PROGRAMMING Modelling	 SELECTION Modelling
Group Interaction	 IDEATION Interaction	 PROGRAMMING Interaction	 SELECTION Interaction

Table 1: Matrix table of types of creative modules

IDEATION Visualization:

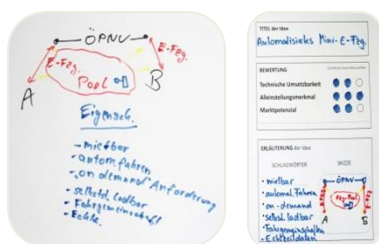
Visual protocols are widely used to capture input or keynote speeches, discussions as well as idea talks in real-time. During a talk, keywords and symbols are quickly mapped onto paper and graphically enhanced. Connections by lines, arrows etc. and extensive wording clarify the relation of the topics.



Figure 12: Visual Protocol, Key Note Speech Example 5.3

IDEATION Visualization:

Idea-sheet with evaluation form is used to catch and visualize ideas and themes e.g. during a “Speed Dating” or a small group discussion. The participants have to evaluate their generated ideas with a short evaluation form. In the example on the left the criteria were: technological realization, Unique Selling Point and



13: Idea-Sheet, Example 5.1

figure

PROGRAMMING Visualization:

Technology Roadmap is a mean to structure a defined problem-oriented solution. Therefore the different steps have to be ordered and linked according to technological dimensions and needs as partners, knowledge or skills. It is to describe the process from idea to market implication visually.

market-potentials. The Idea has to be named and explained via keywords and sketches.

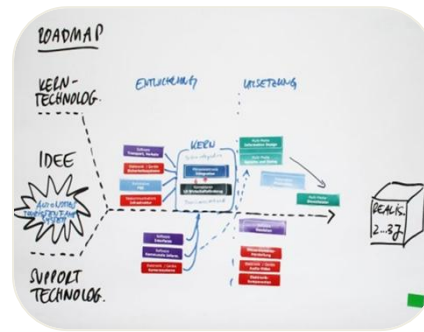


Figure 14: Technology Roadmap, Example 5.1

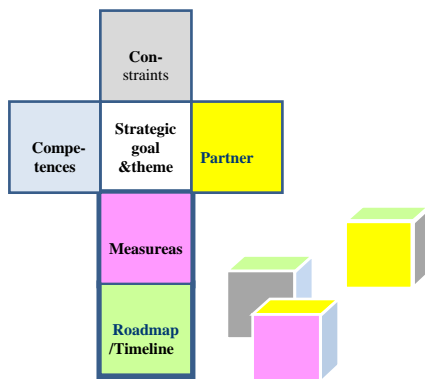


Figure 15: Strategic Cube, Example 5.2

PROGRAMMING Modelling

Strategy Cube is used to discuss the different dimensions (Constraints, Competences, Strategic goal and themes, Partners, Measures, and Roadmap/ Timeline) of a successful idea and its processing development towards an implemented innovation. As the Cube is three-dimensional it offers the opportunity of systematic “playing”. If there exists a certain amount of cubes they can be rearranged via their 6 faces – so different rankings are embody able.

PROGRAMMING *Visualization*:

Business Model Canvas is a common mean for Entrepreneurs and Developers. We apt this method to a very early stage of Idea- and Project-generation to focus group discussion on different perspectives in order to compare and rank different Ideas in a more differentiated way it a very sufficient tool. Things still to do are made visible.

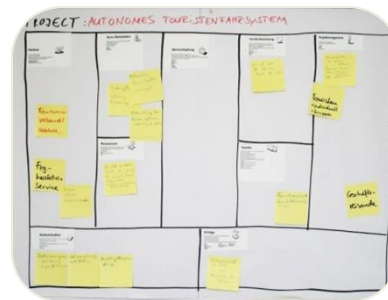


Figure 16: Business Model Canvas, Example 5.1



Figure 17: Map of Competences, Example 5.3



Figure 18 (Reworked) Map of Competences, Example 5.3

PROGRAMMING *Visualization*

Criteria finding is a mean to capture a group discussion or vote on the importance and ranking of definite criteria belonging to the different tasks and contexts. It is the fundamental base of the evaluation and selection processes.

PROGRAMMING *Visualization*

Map of competences is used to enrich the workshop environment. The Participants are asked to stick their yellow “Namecard ++” into their field of competences. Each participant has several white “Namecards ++” to stick it to field of interests.

After **reworking** this information a visual representation of competencies is deliverable. Within a closer look good matching partners - competences of one person may fit to the needs of another one – are visible. A second clue is the identification of lacks – unfilled part of the matrix – to be investigated in.

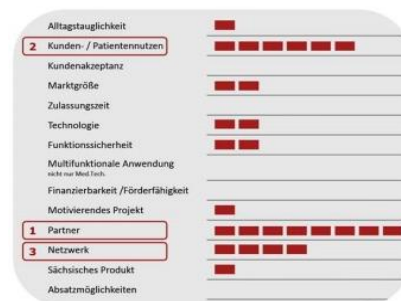


Figure 19: Criteria findings, Example 5.3

SKILLS Methoden und Werkzeuge			
	Personen / Team	Inhalte und Konzepte	Projektgestaltung
PROJECT Life Cycle	Anbahnung 	<ul style="list-style-type: none"> • Science Speed Dating • World Café • Competence-Matching 	<ul style="list-style-type: none"> • Theme Mapping • Demand Analysis • Programming
	Durchführung 	<ul style="list-style-type: none"> • Scrum (Agile PM) • Design Kitchen • Netgraphing 	<ul style="list-style-type: none"> • TRIZ • Innovation Games • Ideagramming
	Transfer 	<ul style="list-style-type: none"> • Continuous Delivery • Multi-Stakeholder PEP 	<ul style="list-style-type: none"> • Business Model Canvas • Micro Stories • Potential Screening

Table 2: Matrix of creative modules according to ideas level of readiness

5 Practical Sample Cases

To enhance the systematic design-work of create a concrete schedule we shortly introduce 3 sample cases of divergent workshop activities. They differ in topics, subjects, size, customer-goals and participants character.

5.1 Silicon Saxony Day 2013

Embedded in the annual meeting of the silicon cluster of Saxony, Germany, members of Knowledge Architecture conducted three parallel running workshop sessions according to the following topics: Mobility & Transport, Knowledge & Work, and Health & Demography. Round about 20 participants took part in each workshop session lasting three hours – so 60 persons in total. Each group followed the same schedule (Figure 20).

First step was to create as many ideas as possible within one hour. Than the group members depicts 3 best ideas and developed two different technology-roadmaps for each. At last step they selected 3 roadmaps and sketched a Business-Model-Canvas for this product/ project case. The customer's goal was to use the knowledge capacity of the annual company meeting and to link this with university and research competencies. They wanted to identify (minimum) one proposing project-idea of each topic to be developed locally and with-in 2-3years.

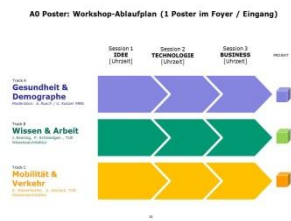


Figure 20:
Three parallel WS-Sessions

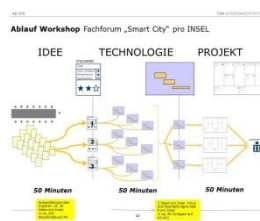


Figure 21
Roadmap of each WS-Session

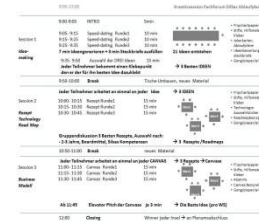


Figure 22:
precise time schedule

Customer	Silicon Saxony Commercial Cluster organization
goal	Concrete Project-Ideas (to develop microelectronic sector in Saxony)
Time	Three hours
WS	three parallel Sessions
Participants	60 in total, 20 in each session Managers, R&D
Results	
Ideas	12 in each session, 36 in total
Technology Roadmaps	6 in each session, 18 in total
Business Model Canvas	3 in each session, 9 in total

5.2 Saxony Economic Development Corporation

The second example is of different nature hereby a workshop was programmed for the inner strategic orientation of an administrative “company” belonging to ministry of Economy, Work and Transportation of Saxony. Therefore two separate workshops (figure 23) were conducted in order to discuss the emerging topics and tasks for all the different industrial sectors the corporation is dealing with. Beside the identification of the “Hot-Topics”, the main focus was to enhance the inter-action and inter-communication of the people working in three separate divisions of the company.

As a first step the members of the different divisions explained shortly the topics of the last year and plans for the next focus – in a very short oral presentation. This was followed by a moderated discussion on the different topics and working plans in order to find overlapping common points of interest for the whole company. This phase was closed by the participants voting of the most virulent topic.

After this decision the participants worked in small groups on the four most important topics of common interest. To address the discussion on strategy we developed a “Strategy Cube” (Figure 15). To a real physical model (15x15x15 cm) the notes of the discussion were stuck. Each group was hosted by a member of Knowledge Architecture in order to discuss and protocol the following 6 fields of activities: 1) Strategy theme, 2) Competences, 3) Cooperation-partners, 4) constraints, 5) measures, and 6) roadmap.

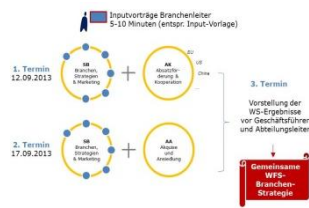


Figure 23:
General flowchart

09:00 - 09:15	Start	Vorbereitung, Ziele und Ablauf der Veranstaltung
09:15 - 09:45	1. Inputvorträge	Einzelvorträge (Branchenleiter) 5-10 min + 5 min Nachfragen, kurze Diskussion der Branchenthemen, Feedback zu Vorträgen Themen- und Zeitvorgaben vorher mitteilen!
09:45 - 11:05	2. Diskussion	Wiederholte Diskussion / Vorträge & Diskussionen werden strukturiert in einer Gruppenarbeit / Präsentation
11:05 - 11:45	3. Vertiefung	Gruppenarbeit / Präsentation der Vertiefungsarbeiten, Identifikation thematischer Schwerpunkte / Zusammenfassung
11:45 - 14:30	4. Mittagspause	Strukturierung der Schwerpunktergebnisse, Entwicklung von Strategien / Maßnahmen
14:30 - 15:00	5. Strategische Handlung	Strukturierung, Identifikation, Bewertung, Priorisierung, Umsetzung
15:00 - 16:00	Präsentation Feedback	Zusammenfassung, Diskussion, Präsentation Vertiefungsarbeiten, Zusammenfassung

Figure 24:
precise time schedule



Figure 26:
Strategy Cube

Customer	Saxony Economic Development Corporation
goal	Identify Strategic Topics Enhance interaction and inter-communication
Time	Two times 8 hours
WS	Two separate Sessions
Participants	36 in total, 18 in each session administrators
Results	
Discussion notes	252 note cards (programming visualization)
Ideas	33 Strategic cubes

5.3 Biosaxony

The third example again is a cluster network but of a totally different nature than first one. Researchers of Knowledge Architecture were asked to conduct two separate events for biosaxony, the cluster of biotechnology and life science industries in Saxony concerning the emerging topic of medical device technology.

The first event was a public-oriented one (presentation modus) and the second one was closed to interested potential partners to discuss and interact more detailed (productive modus). Customer’s goal was to identify the important key players of this

topic in Saxony and the most virulent question interlinked. Therefore key speakers were invited to give short insights to the state of art in research and industry. This was followed by a moderated discussion in order to define criteria of successful ideation, product-development and implementation to this specific context. Presentation and discussion were documented via “visual protocol” (Toolbox: figure 12). Within the breaks people were asked to fill the map of competences (Figure 17).

During the second event all participants were enriched with 14 very short intro speeches in order to provide a common level of knowledge for the following Ideation session. During break the audience was marking their main success criteria out of a given list (Figure 19). The part was done by a “speed-dating” to gain interesting topic in-between the participants. Than the participants worked on the tree winner ideas of a blind voting to develop a concrete Project-Profile containing 1) Idea description sketch, 2) relevance of the topic, 3) Partner (research, companies, etc.), 4) core competence, 5) needs (partners, competence), and 6) Roadmap and time schedule (figure .

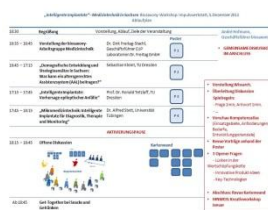


Figure 25:
precise time schedule event 1

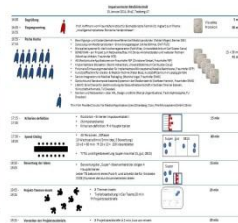


Figure 26:
precise time schedule event 2



Figure 27
Project-Profile

Customer	Biosaxony Commercial and Scientific Cluster organization
goal	Identify themes linked to medical device technology
Time	Two times 3,5 hours
WS	Two separate Sessions
Participants	65 First event 45 Second event 75 in total, (overlapping participants) Researchers, R&D, administrators
Results First event	
Discussion notes	30 note cards (programming visualization)

Presentation	3 Posters
Results Second event	
Input speeches	14 posters
Ideas	20 Idea-Sheets
Project-Profiles	3 Project-Profiles-Sheets

6 What kind of Creativity is needed: “programed creativity” vs. “real creativity”?

We cannot pursue an in-detail discussion of all creative elements and possible combinations and sequences here. However, it is an essential issue to clarify how the procedures are lined up, what consecution is to be followed, and what purpose, or direction such a combination is to follow. The main risk of the linked sequences is the dependence of each step towards final produced result. That means that the result of a first sequence is going to be used as the input of the following one. If there are too many sequences or Black-boxes in a line a slight un-preciseness at the beginning can increase to a big misfit in the end. Conductors can hardly regulate this process during operation. That’s why a carefully programmed schedule is required. To enhance the workshop creators with more evidence, further investigation is needed. The influencing parameters have to be described and analyzed concerning their limitations of well-working.

So fare we can assume that the amount of people and the available time – in total as well as for each sequence – have extraordinary influence to the procedures of the workshop and its outcome. If there are many people less sequences are to be integrated. If there is less time few sequences are to be selected and designed carefully.

Using systematics and clear defined outcomes for creating workshop schedules facilitate a funneled and programmed creativity. The analysis of the workshops made clear, that this system is operating adequately to reach demanded outputs with and within divergent groups in an efficient time. It is corresponding to cybernetic systems with circles of regulation and integrated loops of feedbacks. With both models – the Silkworm and the Black-Box – we introduced practicable abilities to gain momentum in terms of cooperation and collaboration of divergent groups notably regarding aspects a creative environment and an inspiring atmosphere. The fun-factor characterizing these kinds of creativity is to be used productively to encourage goal-oriented idea-generation as well as

to enhance the capability of long-lasting and trustful (working-) relationship. Though this programmed creativity is goal-oriented and funneled it differs from “real” creativity where the out coming results are not regulated or controlled. They evolve by using modes of escalation and out-of control principles. The creational process is neither bordered nor restricted, and the shape of the findings is not predictable. It can either be genius or is going to fail.

Yet, we can state that with a programmed creativity systematic customized products, ideas and project proposal can be delivered. But until now we found no indicators that it is possible to program or to mandate any kind of radical innovation by this means. Probably because those innovations need “real” creativity, uncontrolled environments and are hardly plan- or conduct able. Within the system a systematic error occurs: escalations are not possible due to systems (self-) regulation and feedback, although escalation seem to be a necessity for the origin of radical innovation. Moreover there is a lack of scientific examination on demands and the special (spatial) conditions as well as o the influencing factors of this formation. These insights are necessary to develop strategies to raise the probability of these innovations systematically.

7 Summary

However, we outlined a systematic toolset for innovation engineering. Although the workshop schedule we plan a very precise, a certain amount of risk and unexpected contingencies still exist. Because working with people in a – for them – unconventional and unfamiliar way is risky, of course. So why do we need an accurate plan – if real situation may differ? It is mandatory not in terms of a strict accomplishment but in order to ensure conductors awareness of the goals and the single steps needed to reach the goals. If the conductor is using it as the best working framework he is free to act very agile during workshop operation. The plan enables him to take care of the needs and competences of the in real involved participants and same time not to lose orientation in creative production in order to develop best possible results.

Due to the increasing complexity of future knowledge work, the different stakeholders have not only to be supported in spatial, technical and monetary terms but also be encouraged with transferable methodological support. Future cross-disciplinary knowledge worker have to be supported and trained right now. Interdisciplinary cooperation has to be taught, learned and practiced in a long-term. Therefore a theory of

creative for collectives is still in need. This may be facilitated by discussed systematic and customized program of workshop design and methods of Knowledge Architecture to foster Creativity in Teamwork to design cross-disciplinary innovation.

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A new Intellectual capital framework in the No Profit sector

Graziella Sicoli*, Giovanni Bronzetti, Maurizio Rija, Franco Ernesto Rubino, Paolo Tenuta

Department of Business Science and Law
University of Calabria
Ponte P. Bucci 87036 Arcavacata Rende CS (Italy)

Eugenio Vite

University of Calabria
Ponte P. Bucci 87036 Arcavacata Rende CS (Italy)

* *Corresponding author*

Structured Abstract

Intellectual capital (IC) is a key driver in value creation. According with the above more and more companies, for profit as well as no profit organizations (NPOs), direct their attention to new tools able to communicate to the stakeholders their intangible assets as value creator driver.

IC in for-profit companies, but especially in NPOs is positively correlated with the performance. For this reason, during the last years the interest in the importance of IC in NPOs is increased.

IC report becomes a fundamental tool in the disclosure of the NPOs' activities. Nowadays is necessary to use a correct frame work to represent the IC in terms of knowledge, skill, procedures and relationship spread into the organization.

The aim of the paper is to propose an original framework for IC report addressed to NPOs.

To reach paper's aim the work is developed as follow: first of all is examined existing literature on NPOs and IC in order to identify relevant features of IC in NPOs, and are focused relevant aspects to be measured by IC indicators and disclosed by IC report in the above context.

Then are outlined extant frameworks for IC report in order to verify if they fit the aspects qualified as relevant in NPOs and point out what they lack with reference to NPOs context.

On these basis the work proposes an original framework, with a new set of indicators inside, that would better fit to NPOs features.

Finally the proposed framework is tested in an Italian NPO.

The result is to disclose new aspects of the activity carried on by NPOs on the side of knowledge, skill and relationship with the surrounding community.

Purpose – The research is focused to build an original IC framework through a set of indicators able to disclose IC in the NPOs context.

Design/methodology/approach – After a review of existing literature and of IC in order to identify relevant features of IC in NPOs, and are focused relevant aspects to be measured by IC indicators and disclosed by IC framework in the above context. Then the model is tested on an existing Italian NPO

Originality/value – An original IC framework and a new set of indicators for IC in the NPOs, tested an Italian NPO, offer a new disclosure of the activity carried on by the organization on the side of knowledge, skills and relationship with the surrounding .

Practical implications – The findings appear to suggest an innovative model of IC framework for NPOs with a significative set of indicators. The work is tested only on an Italian NPO which can be extended in the future to other NPOs both Italian and non Italian.

Keywords – No profit organizations, IC framework, IC indicators

Paper type – Academic Research Paper

This work is fruit of joint reflection and collaboration. For academic reasons section 1 is attributed to Franco Ernesto Rubino, section 2 and section 4 are attributed to Giovanni Bronzetti, section 3 and section 5.5.2 are attributed to Paolo Tenuta, section 4.1, section 5.3, section 5.5 and section 5.5.3 are attributed to Rija Maurizio, section 5.1 and 5.2 are attribute to Eugenio Vite, section 5.4, 5.5.1 and 6 are attributed to Graziella Sicoli.

1 Introduction

Intangible assets are considered, worldwide, very important because are resources difficult to imitate and socially complex, able to create value for organizations. The importance of intangibles and among this of the intellectual capital (since now IC) in non profit sector (since now NPOs), generates the need to measure its role in the value creation process. In fact, in contrast with what happens in the for profit sectors, where everything is measured quantitatively, in the non-profit sector the importance of communicating and demonstrating to stakeholders the quality of services provided (Stewart, 1997) respect of other public or private subject, is determinant to generate social value.

The NPOs includes the new model of Welfare State based on public service but increasingly characterized by important private initiatives.

The NPOs is the sum of private, voluntary, and non profit organizations and associations. It describes a set of organizations and activities next to the institutional complexes of government, state, or public sector on the one hand, and the for profit or business sector on the other. The “third sector,” is a sector that has gained more

prominence in recent years—in the fields of welfare provision, education, community development, international relations, the environment, or arts and culture. The NPOs or third sector has also become more frequently the topic of teaching and research, it has become a major economic and social force.

The reference frame is therefore very broad and diverse and it is characterized, at least in part, by a fragmented legal framework whose only common denominator is the absence of the profit motive as a driving force (Cohen, 2007).

NPOs are today commonly operating in a highly competitive environment that is characterised by increasing demand of services from the community, IC enables NPOs to enhance their performance by providing meaningful information to organisational stakeholders.

NPOs in many developed countries thus have been operating in new public management environments, facing performance challenges and therefore expressing a need for new management tools in the same way as private companies.

From this point of view IC, measurement and reporting originally a private sector oriented metaphor, is increasingly viewed as a new conceptual framework for non profit setting (Kong and Thomas, 2006).

Recent study (Kong and Prior, 2008) indicates that the role of IC in the NPOs is more critical than in the private sector due to the fact that intangibility is even more present than in the case of private organizations in terms of their goals production processes, focused on human capital and output (Ramirez, 2010).

Intellectual capital (IC) is one of the key determinants of companies' business performance (Schiama et al., 2007). In service organizations and therefore in the NPOs the role of IC is crucial because the outcome of activities is heavily based on, e.g. the efforts of skilled personnel, fluent processes and other intangible factors, while the role of tangible resources such as machines is not as important (Kujansivu and Lonnqvist, 2009).

In the NPOs, the intangible aspects of operations are further emphasized: for those organizations improving the wellbeing of clients or other stakeholder groups is more important than financial success.

Several studies indicate that unique or scarce resources impact firm performance (Barney, 1991; Castrogiovanni, 1991; Grant, 1991; Mahoney, 1995; Nahapiet and Ghoshal, 1998; Pfeffer and Salancik, 1978; Tsai and Ghoshal, 1998). For instance, Barney (Barney, 1991) suggests that NPOs have a competitive advantage when their

assets, capabilities or processes possess specific attributes. That is, when assets, capabilities or processes are rare, valuable, difficult to imitate, and have few substitutes, they represent a critical source for competitive advantage.

In this context are IC studies proposed as a novel managerial approach in NPOs (Kong, 2007a; Kong, 2009; Kong and Prior, 2008). In companies the significance of IC is acknowledged and several frameworks for managing and developing IC have been introduced (e.g. Kujansivu, 2008). However, the issue is relatively new to NPOs (Kong, 2008). Thus there are many open questions. There is also a lack of empirical research in the topic because only a few empirical studies have been carried out (Fletcher et al., 2003; Kong, 2007b). This paper builds on the few studies conducted so far and examines how IC could be taken into account in NPOs.

After a brief review of national and international literature on IC, suggesting that IC can be utilised as a competent strategic management conceptual framework in NPOs. IC is an important resource that NPOs need to develop in order to gain sustained strategic advantages.

The research is focused to build an original IC framework through a set of indicators able to disclose IC in the NPOs context. After a study of existing literature and of IC in order to identify relevant features of IC in NPOs, and are focused relevant aspects to be measured by IC indicators and disclosed by IC framework in the above context. Then the model is tested on an existing Italian NPOs, offer a new disclosure of the activity carried on by the organization on the side of knowledge, skills and relationship with the surrounding community. The findings appear to suggest an innovative model of IC framework for NPOs with a significative set of indicators.

2 The third sector: evolution of the phenomenon

According to the International classification of Non Profit Organizations include 12 different groups:

- culture and recreation
- education and research
- health
- social services
- environment
- development and housing

- law, advocacy, politics
- philanthropic intermediaries and voluntarism promotion
- International
- Religion
- business and professional associations and unions
- organization not elsewhere classified

The third sector includes a variety of different organizations and associations, is active in many areas of economy ranging from healthcare, social services, employment and culture to environment (OECD, 2003). Compared with private companies the characteristics of NPOs include the following:

- are value-driven, instead of profit-driven;
- stress the local dimension in their activities;
- provide and develop services based on needs which are often not recognized by public authorities;
- offer not only services for clients but also often do community work and/or advocacy work;
- train and engage volunteers as part of the service staff;
- may have a special approach in their work, e.g. social goal, value goals,
- empowerment or religious approach. (Borzaga and Santuari, 2003).

NPOs are increasingly involved in welfare, health care, education reform, and public-private partnerships and rural and urban planners use nonprofit and community organizations for local development and regeneration.

All these developments suggest that NPOs are part of the transformation of societies from industrial to post-industrial, and from a world of nation-states to one of transnational, even global, economies and societies, where the local level nonetheless achieves greater relevance and independence. The full recognition of the immensely elevated position and role of NPOs at the beginning of the twenty-first century is the main difference to the latter part of the previous century, when nonprofits were “(re)discovered” as providers of human services in a welfare state context. NPOs are now seen as a part of the wider civil society and welfare systems of modern societies.

The phenomenon of non-profit has grown not only because of the crisis of the Welfare State, but also because of a variety of factors, among which we can include:

- economic development as well as rising incomes, has led to an increase in activity as a result of voluntary and charitable;
- the emergence of new needs and the different and specific services;
- increasing employment and economic in this sector.

This situation has been favored by the spontaneity and good will of many citizens, who have joined together in groups (associations, cooperatives etc.) in order to provide answers to serious social problems. (Chaminade & Catusus, 2007).

According with last Italian census of 2011 NPOs active in Italy are about 301.191 with a disomogenea distribution on the territory. 55,2% NPOs is in the north Italy, 21,5% in the Centre and 16.6% in the South. The rate per person is is 38,4% every 10.000 people. The indicator per resident indicates that in Italy are active 38,4% NPO's every 10.000 people.

Today, NPOs regularly find themselves sharing the same territory with for-profit organizations, sometimes as collaborators, but probably more often as competitors (Ryan, 1999). NPOs are now expected to adopt for-profit competitive strategy approaches (Weerawardena and Sullivan-Mort, 2001). A NPOs gains competitive advantage when it consistently outperforms its competitors,

Although this performance is not measured in the same way as it is in for-profit organisations.

Today, as physical assets and financial capital are no longer the primary resources that facilitate competitive advantage but intangible and IC resource ensure competitive advantage (Kaplan and Norton, 2001; Wall et al., 2004)

Nowadays, the role and contribution of NPOs are more important and strategic. Various circumstances place NPOs activities in competitive environment and require a complex management. This makes the demand of NPOs management should conducted in a more professional, modern, and use the concepts of strategic management. In fact, the performance measurement models that have been developed are tend to profit-oriented organizations, while performance measurement model according to the characteristics of NPOs is still relatively limited. The lack of this limitation, is inadequacy the stage of identify and determine the aspects of NPOs interaction with internal and external parties that demands of higher levels of capabilities (the need for the level of the knowledge based organization). While the difficulties to develop a mechanism of quantify intangible

assets elements, is the intangibility of the leading indicators that expected to perform quantitative value of organizational performance achievement. This constructive research is to develop a performance measurement model according to the characteristics of NPOs based on the intellectual capital.

The fundamental difference between *NPOs* and for Profit Organization is focused on the main reason of the establishment of the organization. Simply is possible to say that main purpose of Profit Organizations is to create financial advantages for its shareholders through profits from the goods/services traded. On the other side the main purpose of the *NPOs* is to meet the social needs of a community or of its members. In return, the *NPOs* not only provide services that are owned but also need to consider all the consequences arising from the services they have. Therefore there is a difference between the groups perspective Profit Organization *NPOs*. Here are the general differences between Profit Organization and Non-Profit Organization.

3 Intellectual capital: literature Review

Intellectual capital was focused as the new concept of wealth of an organization. From this perspective the definition of IC has been the object of discussion by both academics and men of business¹. In general, all major author share the idea that intellectual capital, from a qualitative point of view, can be divided into three categories: human capital, structural capital and relational capital, as defined by the model of Bontis (Bontis, 1998). Although the labels used to identify categories in which intellectual capital can be classified are different for different authors, the content of these categories is more or less similar (Bontis, 2000).

According to Bontis (2002), Daum (2003), Vaškeliėnė (2003), Hitchner (2006), Sáez et al. (2007), Fitz-enz (2009), and Dubra (2010), *human capital* is perceived as the entirety of knowledge, skills, education, experience, talent, innovativeness, competence, motivation, loyalty, creativity, ability to perform a task and deal with arising issues, leadership, business skills, management and ideas leading to new products of the staff of an enterprise. It also covers the value, culture, and philosophy of the enterprise. This capital is denoted by its inability to belong to the enterprise. Claims are produced that this capital is one of the core and most influential resources of the enterprise in competitive

¹ *Beyond lexical distinctions, for a brief summary of the major classifications of intellectual capital see Hunter – Webster – Wyatt, 2005; Pike – Roos, 2005; Marr - Adams, 2004; Edvinsson e Malone, 1997, Sveiby, 1997).*

fight as the ability of the enterprise to compete in the market depends on the knowledge and skills amassed by its staff, i.e. on the efficiency of the human capital.

According to Bontis (2002), Daum (2003), Vaškeliënė (2003), Hitchner (2006), and Sáez et al. (2007), *organizational capital* is perceived as the organizational and financial structure of an enterprise, its strategic processes, technologies, procedures, process documentation, risk assessment methodology, technical equipment, software, systems, the use of information technologies, databases (e.g., the ones covering information on the market and clients), patents, trademarks, methods of sales management, communication systems and all other organizational capabilities supporting the productivity of the personnel and facilitating their productive cooperation. A claim may be produced that it covers the technologies, methodologies and processes that enable the functioning of the enterprise. In other words, it remains “inside” the enterprise after the completion of a work day when the staff has left. Differently from human capital, this type of capital may belong to the enterprise, and the enterprise may thus handle it. This capital is considered the second most important capital of an enterprise after human capital.

According to Bontis (2002), Daum (2003), Vaškeliënė (2003), Sáez et al. (2007), and Fitz-enz (2009), *relational capital* is conceived as the awareness of the enterprise, its trademarks, brands, image, external networks and complete orders, its supply streams, long-term contracts, license and franchise agreements and relations with external individuals founding the marketing and commercial capabilities of the enterprise. In this context, external individuals include not only clients / consumers, but also business partners, suppliers, and regulatory institutions.

According to Maditinos et al. (Maditinos et al.,2012), only by nurturing intellectual capital organizations will be able to remain competitive, fight against the severe competition (both domestic and foreign), and create sustainable competitive advantages. That is why organizations need to evaluate their intellectual capital and its components, and monitor their development and performance.

Also the Meritum report validad the three-way division of IC into: human capital, structural capital and relational capital

1. *human capital*: skills, experience, competence and innovation ability of personnel who work within the company. This is a knowledge that is not owned by anyone except the person who owns it. Therefore, the company to secure a

sustainable competitive advantage over time, recognize that resource and hold it within the organization;

2. *Structural capital*: organizational processes and systems, software and databases and business processes. All the elements that compose the structural capital constitute assets on which it is appropriate to invest because they are property of the company;

3. *Relational capital or customer capital*: all resources linked to the external relationships of the firm with stakeholders, such as, customers, creditors, investors, suppliers, etc.¹.

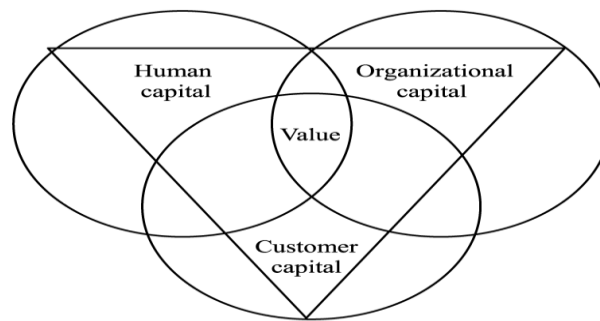
The reference structure of and IC report, according to the Meritum project must include three parts: the firm's vision, which is a narrative of firms strategic aims and critical intangibles, a brief summary of intangibles resources and intangible activities, visualized under the three IC categories, which must developed to reach strategic aims and a system of indicators to allow the reader to judge whether the firm's behaviour is coherent with strategic aims (Veltri, 2007).

In this model IC are positioned with respect to two dimension: the four types of knowledge resources (employees, customers processes and technologies) and the three evaluation criteria (effects, activities and resources).

The Austrian Research model incorporates the IC frame work validated by Meritum project with the process logic of organizational research processes proposed within the innovation and research evaluation literature.

The three components, human capital, structural and relational, are not independent, but complementary and are not intended to interfere with the economic objectives, but to instill an ethical content to the financial decisions, which contributes to the protection of the environment and a better society.

¹ The term "intellectual capital" is used synonymously with "intangibles": both are non-physical sources of future economic benefits that may or may not appear in corporate financial reports (Meritum, 2002).



Source: Petrash (1996)

Figure n. 1 The value platform IC

The key challenge for both researchers is understanding how to measure and manage knowledge assets dynamics, their interaction at the basis of organizational value creation capacity bearing in mind that measures are required but they should derive from the organizations knowledge strategy and should integrate the story of how IC is mobilized via knowledge narratives.

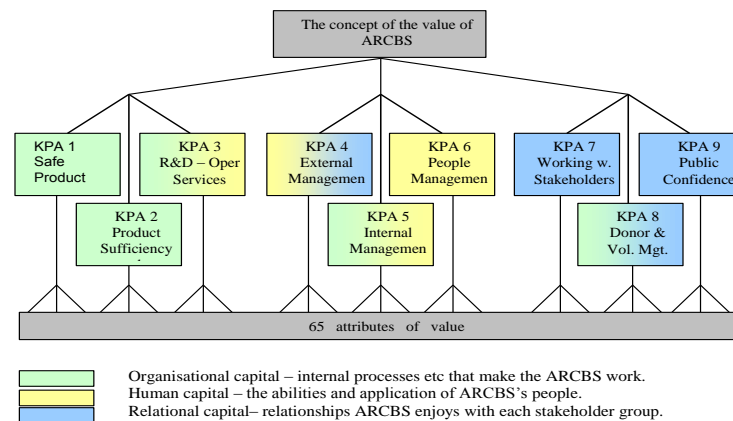
Typically, IC have been study through the lens of private sector but this fact does not render the concept of IC or the importance of IC reporting less valuable for nonprofit sector settings

The strategic importance of the IC, the NPOs have developed new forms of reporting both in the interest of communicating to stakeholders the commitment to the reconciliation of their instances, and the need for tools to support the management in respect of the stakeholder view (Baur, Fenn, 1972; Mathewes, 1993; Gray, 1996).

4 IC and NPOs

An area that has not attracted studies addressed to the implementation of IC report is the NPOs (Guthrie et al., 2009). This is surprising considering the importance of IC in service provision that is both illustrated (Fletcher et al., 2003) and claimed (Steane, 1999) by third sector organizations themselves, which consider intangible resources as the differentiating features of the sector. Among the few studies on ICR in the NPOs, we must cite the research of Fletcher et al. (Fletcher et al, 2003), focused on the intellectual capital of the Australian Red Cross Blood Service (ARCBS), a complex non-profit organization providing specialized services in the health industry, which belongs to this kind of study. The main research aim was to understand better the value that ARCBS

holds for its different stakeholder groups. The value is represented in a comprehensive value hierarchy, which reports stakeholder perceptions of the relative importance of the Key Performance Areas (KPA) of the value hierarchy and their constituent attributes (Chatzkel, 2002; Pike et al., 2002) (fig. 1).



Source: Guthrie (2002)

Figure 2. The ARCBS value hierarchy

As a result of the study, ARCBS is better able to visualize the value creation path and may better align performance measures and strategy to achieve greater value creation.

In 2009, Guthrie et al. came back to analyze the ICRs of ARCBS in the 2002-2005 three-year period to provide an assessment of ICR in a NPOs through the content analysis methodology (Guthrie et al., 2004). It was found that, unlike prior studies on corporate ICR, the amount of IC reporting at ARCBS is generally high, especially for certain IC elements (the reference is to the high incidence of innovation and R&D). Summarizing, ARCBS is an organization that has focused on and expended considerable effort on developing a stakeholder oriented IC report, but the IC reports do not trace the process of value creation through R&D or, more generally, through IC (Guthrie et al., 2009).

Intellectual capital provides an overview of potential future NPOs its ability to compete in the market, highlighting the strengths and weaknesses to be maintained to be corrected to avoid crisis situations.

IC helps to shift NPOs strategic focus to intellectual resources including knowledge, skills and experience. This is important to NPOs because strategic activities and changes

that are brought to the organisations will be mainly driven by internal initiatives by paid employees and volunteers rather than external forces such as government agencies

Mouritsen et al. (2005) emphasise that IC is related to questions about identity, such as 'who you are, and what you want to be' and thus, IC is not merely an objective in relation to intellectual resources, but is an identity crafted around ability and knowledge of what an organisation can do (Mouritsen et al., 2005; Roos et al., 1997). As a result, the IC approach forces non-profit leaders to rethink their mission and their social *raison d'être*. IC becomes important to NPOs not only because it helps the organisations to avoid goal displacement and resource diffusion, but it assists them to refocus their objectives on the social dimensions, which are sometimes distorted by operating in commercial contract environments under the public sector reform movement.

The representation intellectual capital has been widely tested in the world of private enterprise, a field in which you can find numerous studies, but is poorly implemented at the NPOs. Nevertheless, the reasons for that postulate the management in these companies are similar to those of companies: user involvement in the processes of production / service delivery, high professionalism of the operators, direct contact between the applicant's performance and who the supplies, etc.

4.1 Characterize of CSV in the NPOs

The components that characterize the intellectual capital in the NPOs can be classified into three categories:

1. Human Capital consists of the knowledge, skills, knowledge, experience, skills that are embedded in the human system of NPOs. It is a capital that cannot be owned by anyone outside of the person who owns it. Therefore, to maintain some success for each NPOs is necessary for the to take action to motivate and involve volunteers to enforce their involvement with the NPO on which operate. The ability to attract and retain competent and motivated people, more efficiently than the organization for profit, represent the principal source of competitive advantage. (Mauritsen and Larsen 2005). As far as possible is important to convert human capital into structural capital through the sharing of expertise and experience

2. Organizational Capital, expressive of knowledge possessed by the structured and shared (database, procedures, software, manuals, etc..) from which springs the corporate

culture and with whom it describes the modus operandi of the NPOs, consists of all those elements, tangible and intangible, that support volunteers in their job.

In particular, the organizational structure and operating procedures represent the reference frame for the proper functioning of a company, since they define the subdivision of activities and the exact methodology to be used in the work performance (Joia, 2000).

3. Relational Capital, represented by the set of relationships that develop between the NPOs and the local community of reference (individuals, associations, businesses and other stakeholders that will work with the agency. From these reports resulted in a number of different intangible. Consider, for example, reputation, credibility, the social consensus and so on.

A NPOs creates a competitive advantage when it focuses on creating value for the user, that is to say the ability to produce wealth for the user itself (Cavenago, 2004). In the NPOs, relational capital covers, among other aspects, the communication system, client satisfaction, feedback and the corporate image (Andriesson, 2008). The communication system is important because the NPOs must have a deep understanding of the user's needs and, therefore, must create a relational and communication system that is able to perceive in real time the changes in demand; if it does this successfully it will be able to create an effective service and build up client loyalty and goodwill.

It needs to manage all three components of intellectual capital in the world only unit so it triggers a virtuous cycle that leads to an increase in the knowledge that, in turn, is a source of value creation for every NPOs.

Peppard and Rylander (Peppard and Rylander, 2001b) argue that IC resources can be utilised simultaneously by many users in different locations at the same time and thereby, are non-competitive in an economic sense. The non-competitive characteristic of IC is important to NPOs because IC may encourage resource sharing rather than resource competition

5 Methodology

5.1 Introduction of CSV

The CSV - Centro Servizi per il Volontariato (Voluntary service centre) – it is a NPO created on the indication supplied by the law on volunteers organization (L.266/91) and it is managed by Volontà Solidale, which is an association of no profit association that has the role to sustain, promote and develop voluntary activity in Italy. In 2010, the shareholders were 9.409, with an average of 121 shareholders for CSV. In Calabria, there are 481 shareholders, with an average of 96 for each centre.

5.2 Historical reasons for the CSV

Cosenza CSV, financed from **Special fund for Volunteers**, works since 2003 with basic principle “help” and “empowerment” to promote an active role of citizens in building an equal society and to guarantee the common wealth. It gives value to volunteers and enable people of Cosenza area to be volunteers. In march 2014 is operating with 16 workers. During 2013 were recorded to Cosenza area CSV 608 *NPOs*. The board is formed from 21 members which meet 7 every year.

Can use and receive services CSV the following subjects:

1. Volunteers NPOs which work in the area and single volunteers who works in NPOs' as well;
2. Volunteers network;
3. Single persons who want to establish a volunteer's NPO;
4. aspiring volunteers;
5. Citizens who want to be involved in the promotion of a culture of solidarity;
6. Subjects of the Third Sector and public bodies who can provide information and guidance on issues relating to volunteerism.

It is clear, therefore, that the CSV supports the practical world of Volunteering through the provision of a number of different services; from basic services, promotion, advice and professional assistance, services, training, documentation, communication and social planning. (table 3).

Table n. 1 – CSV main services

Hearing/Orienteering:	Advice:	Logistic
Citizen	Social meeting	Advertising
Association	Associations' meeting advice	Rent instrumental assets
Hearing	General advice	

Source: our elaboration

CSV at 31/12/2012 filed 1.300 NPOs' in Cosenza area; among these

- 584 are related to law 266/91 (Volunteers' NPOs);
- 432 Volunteers' NPOs which work with CSV;
- 311 recorded in the regional volunteers NPOs register;
- 250 work with CSV among the recorded in the regional volunteers NPOs register.

5.3 Research Framework

The research is in two parts: first is theoretical on NPOs' characteristics and analyses organizations and dimension using most recent national census Istat; then IC is applied to NPOs' world. Second part is empirical: it analyze a case study and elaborate a new IC framework (Cfr. Attach n. 1)

The second part has two steps. First of all, is made a quantitative analysis on IC report available on line for NPOs and particularly for Volunteers' NPOs. From on line data clearly results a very little number of NPOs which disclose intangible report in general and IC report in particular. IC management is almost unknown among Italian NPOs: according to the literature, in Italy there have reported only been two cases of NPOs which have assessed their IC (Bronzetti and Veltri, 2007). For this reason we read IC report of for profit organization as well which indicators can be estrapolated and implemented to represent and improve *NPOs* communication. On these basis we have built a new IC framework with indicators of the three IC areas: Human capital, structural capital and relation capital still divided in growing indicators, efficiency and stability indicators. CSV of Cosenza province was chosen as case study as was necessary to get objective information on service supplied and social impact on the NPO examined. CSV is a benchmark for all NPOs operating in the area; to implement a new IC framework in CSV of Cosenza provincia could facilitate the adoption of the instrument in the area. The

new IC framework is set on the basis of the Sveiby *Intangible Assets Monitor*, already adopted in other structures.

Table n. 2 – IC Indicators

	HUMAN CAPITAL	STRUCTURAL CAPITAL	RELATIONAL CAPITAL
GROWTH AND RENEWAL SKILLS	Availability of the personnel to enhance their skills and from CSV to supply resources for he growth	CSV skill to generate new services	CSV skill to keep its users and to get new ones
EFFICIENCY	Skill to create new value	Innovation skill with the minimum number of resources	Customer satisfaction
STABILITY	Measure personnel loyalty and membership to CVS	Trust of the internal personnel in the structure	Measure the retention of old users

Source: our elaboration

5.4 Scope of the research

A new framework to be used from all NPOs. The new IC framework represent main tool for *NPOs* to aid strategic planning of the knowledge, internal and external, communication with stakeholders about services offered and resources available. Past studies on *NPOs* showed the awareness and the perceptions of non profit sector regarding IC is not diffuse (Schneider and Samkin, 2008; Guthrie et al., 2009).

The non profit sector records a delay in the awareness on the strategic relevance of IC to create and manage knowledge to enhance organizational value and the lack of specific IC management models tailored on non profit organizations.

Until now, researches and studies on IC have been mainly developed and used by for-profit organizations. Fewer were focused on non-profit organizations (NPOs), in spite of the fact that since the early 1990s NPOs stand out as crucial actors in politics, economics and welfare systems (Salamon et al., 2003). Kong (2007a, 2008) suggests that IC can be applied as a conceptual framework for effective strategic management of NPOs, since it does not have an economic nature and shifts strategic focus to intangible resources.

5.5 Hypotheses testing

IC can be an effective tool for NPOs and, for CSV best suits its resources and products because it addresses intangible assets, which are the most important resources for NPOs. We hypothesize that Italian CSV (as most NPOs) do not use IC, but they might highly benefit from using it to address their management challenges. In particular, the following questions are examined:

- (1) Which intangible resources are highlighted in the operations del CSV ?
- (2) What are the existing practices regarding the managing of IC factors da parte del CSV?
- (3) What are the IC needs of management in these organizations?

The aim was to gain from the informants a more concrete and detailed understanding of the role of IC in these organizations and the needs to manage IC. Follows an exam of the most important.

5.5.1 Human capital (HU)

HC in CSV is the most important and strategic asset of the organization. The set of persons with their skills is steady in the years analyzed.

Referring with availability growth and innovation indicator there are 13 workers. Their profile is young, dynamic and with a good culture (graduated 11). There are more women than men with a good instruction. An important indicator shows the training days and it is constant in the two year examined. In front of the training provided it was not considered necessary to develop new roles or introduce training programs for new hires. The organizational roles may be considered consolidated. In addition, in 2013, there was a growth trend in the training courses organized in the area and a large presence of volunteers involved and interested in it. These indicators are a practical reaction to the needs of the territory and NPOs in the light of ongoing changes.

With reference to the efficiency indicator it can be highlighted an involvement of employees in the various fields of activity of the CSV and also a good network capability that helps to build a positive image of the organization which contributes to the achievement of a high level of satisfaction of the parties that are addressed to it.

With reference to the stability indicator the average age both of the Board and the staff present a trend very young. The presence of staff is most prevalent in the agency and in the communication than other areas. Positive results have emerged on the level of customer satisfaction of staff in relation to their working conditions. The analysis

conducted can be deduced also a high sense of belonging and a strong personal identification with the CSV. This ensures stability in time. The indicator shows the strengthening of the capacity of CSV to foster a positive climate that encourages business development both in the design phase and service delivery. An associative favorable climate provides more guarantees in terms of fidelity and correct behavior by individual members.

Table n.3 - Human Capital indicators

	Year 2012	Year 2013
Employees	13	13
Part-time	13	13
Growth and renewal capability		
With degree	11	11
High school instruction	2	2
Master	1	1
PHD		
Literature studies	1	1
Scientific studies	12	12
Software knowledges	1	1
Languages		
Female gender	10	10
Woman with important roles	2	2
Number of training days	2	2
Average age	40	40
Efficiency		
Coordinators	1	1
Administratives	1	1
Number front office workers	4	4
Number of specialized workers	7	7
Personnel with multiple role	12	12
Personnel with single role	1	1
<i>(scala 1/5)</i>		
Network between personnel	4	4
Leadership	4	4
Problem solving	4	4
Skills	5	5
Stability		
Average age	40	40
Average age in top position	50	50
Permanence in the work	100%	100%
CSV experience	8	8
<i>(scala 1/5)</i>		
Customer satisfaction	5	5
NPO loyalty	5	5

5.5.2 Structural Capital

The Structural capital represents the set of tools and skills, technology innovation that enable the CSV to optimize organizational processes. It includes all the features that go beyond the individual and are placed at the service of each of the CSV and professionalism that it is aimed to obtain quality services.

With reference to the growth and renewal availability indicator it can be report a decrease in 2013 of meetings held; attendance at meetings, however, the attendance has been constant especially by members. With reference to the efficiency indicators, there has been an increasing trend with an average of the services provided to the urban area higher than the other territories under its jurisdiction. There is also an increase in revenue from the Special Fund for Voluntary Service (See table 8) for grants handed out by public bodies to be zero in 2013. Indicator of the shares is embedded expression economic quantification in line with the trend of n. of the member organizations and allows us to highlight the sustainability quality of the services rendered by CSV. The value of units underwent a slight decline.

The indicator growth and availability to renewal there is a decrease of the meetings even if attending at the meeting is constant from shareholders. Efficiency indicators there is an increase of the urban area.

Table n.4 – Structural Capital Indicators

	Year 2013	Year 2012
Growth and availability to renewal		
Number of hardware equipment	19	19
Number of meetings	10	13
Number of Shareholders' meeting	2	3
Number of board's meeting	7	6
Efficiency		
Number of vehicles	1	1
Structures rented	1	1
Structure freely used	3	3
Services	4178	5078
Projects	39	88
Stability		
(1=Yes; 2=No)		
Social report	1	1
Mission report	1	1
Service card	1	1
Guidelines	1	1

5.5.3 Relational Capital

Relational capital represents the heritage of CSV made outside of relations established inside and outside the structure. It expresses the result created by the use of intangible assets relating to both the structural capital to human capital. The analysis of the indicators of relational capital shows the ability and aptitude of the CSV to produce positive results.

For the indicator growth and availability to renewal there a steady increase in the various urban area. The number of services provided is in remarkable growth and shows an increase in services provided through personal contacts. It should be noted , moreover, in the course of 2013 a number of access to the site with a very high increase of contacts on social networks. This demonstrates the willingness of the CSV to engage and cultivate the interest of various age groups especially the younger ones . These indicators (increased telephone contacts managed in detail and contacts via the web) confirm the continued efforts of the CSV oriented to the improvement of communication (even more targeted and personalize) with the aim to achieve a constant level of sharing of experiences and knowledge. The indicator is significantly stable and with the growth trend .

To underline the highest number of seminars in 2013 compared to 2012 with a high participation of volunteers. It is clear , moreover, a number of issues in the media constantly growing. This confirms the ability of the CSV to approach the issues close to the collective with the aim of raising public awareness. These indicators give greater visibility to CSV and its commitment to the territory.

With regard to the indicator efficiency , many positive judgments (internal and external) that have an impact on the company image . There is also a growing trend with regard to the collection through the 5 per thousand. Finally, with reference to the indicators of stability suggests a spatial distribution that correlated with the number of residents expressed a degree of attraction of the CSV similar in different geographical areas . This is the manifestation of vitality and stability of the CSV fact that although different even between the same purpose . The indicator in question confirms in terms of miles the increased need of the community and the continued demand of services by the whole territory.

Table n.5- Relational Capital Indicators

	Year 2013	Year 2012
Growth and availability to renewal		
Services users	729	746
Services offered	4817	3719
Web site access	65925	41541
Newsletter reader subscribers	3449	3270
Number of times on information media	132	110
Facebook contacts	1890	
Number of seminars	32	12
Efficiency		
Average reply time	2	2
Number of collaborations	11	11
Support of 5 per mille charity offer	210	190
Interna/external Image	4	4
Stability		
Organizations Pollino area	121	
Organizations Tirreno area	284	
Organizations Ionio area	156	
Organizations urban area	190	

6 Results of Hypothesis testing and limits of research : a concluding summary

The NPOs vary across countries and the sector has profoundly changed in recent year.

The IC approach seems well-suited as a managerial framework that can capture the intangible aspects of operations of NPOs. However, more research and practical application experience are needed at this stage nowadays in Italy as most european countries NPOs have equally important economic as well as social dimensions and it happens especially in the welfare services social sevicees and health care. the future scenario is for a further increasing of the sector. (Borzaga C., Fazzi L., 2011).

The new IC framework proposed contained the argument that Human Capital, Structural Capital and Relation Capital are all resources and, as such, each offers a potential avenue for competitive advantage. The suggestion of a conceptual new IC framework such as the one in this paper represents a significant addition to our understanding importance IC within the context of NPOs. The framework of this IC

report is proposed as a method of more fairly, objectively and transparently identifying the hidden value of the CSV and also all NPOs.

The new IC framework compiled by CSV in the province of Cosenza is a tool that can bridge the information gap and anchor the strategic objectives of the CSV to the objectives of the individual NPOs to it in turn. Through the new IC framework CSV has been able to: Identification and mapping of the intangible asset;

- Increase understanding of how the interrelationship of people knowledge can create;
- Improve workers' personal perception of the organization which leads to increased motivation to work;
- Create a culture of performance improvement oriented;
- Better understand the flow of knowledge within the organization.

The new IC framework is intended by CSV of Cosenza as a management tool that allows you to monitor the evolution of relations between the CSV and the community ; increases the diffusion of knowledge within and outside if properly used and allows a transparent communication with all stakeholders of the performance and organizational skills. The new IC framework is seen as a means of fund raising, raising of financial resources and people raising, recruitment of new volunteers , but also as a tool to create greater involvement of people already in contact with the CSV and the consolidation of the reasons in the founders and the members. Therefore , report through the new IC framework of intellectual capital CSV is a strategic factor for design along with NPOs that are addressed to it in the future and broaden the base of resources, both human and financial .

The continued commitment to the development of the IC, the sharing of Knowledge CSV through the use of media, training initiatives allow a constant involvement of citizens and volunteers with the growth of their skills they acquire a greater awareness in the social . The knowledge acquired over time both allow a reduction in the social cost borne by the community and is an increase in the level of safety of the users in contact with the CSV .

Through the new IC CSV framework aims to standardize the display mode of the intangible resources through their grouping into the three dimensions of IC (human capital , structural capital , capital relation) and subdivided into indicators of growth and renewal , performance indicators and indicators of stability.

IC is an important resource that CSV need to develop in order to gain sustained strategic advantages. This work helps to build a nascent body of literature suggesting that IC can be utilised as a competent strategic management conceptual framework in all NPOs. The increased awareness of the IC concept in NPOs, as a result of this paper, likely generates further research

Unlike many other for-profit strategy concepts, IC stresses qualitative, non-financial indicators for future strategic prospects and may be harnessed to co-ordinate with the unique environment in which NPOs operate. IC contributes the CSV strategic positioning by providing enhanced understanding of the allocation of organisational resources. Simultaneously, IC enables to CSV to enhance their performance by providing meaningful information to organisational stakeholders. In these ways, IC aids the organisations in their attempts to reconcile their social and commercial objectives

IC framework helps to shift the focus towards strategic CSV intellectual resources including knowledge, skills and experience through their constant monitoring. The sharing of knowledge management tools and knowledge allows the improvement of the effectiveness and efficiency of the services provided and improved organizational stability CSV to guarantee the new challenge for the development of strategic knowledge.

The IC framework requires little interpretation , when used and disseminated within and outside the CSV encourages the sharing of resources rather than competing for resources . This is because due to a change in behaviour and values of the people of what is good and what is bad for the organization of what is right and what is wrong to do .

The results of the empirical study are limited only by the CSV object of IC implementation of the new framework. Therefore Although the work Reaches concrete results, the presence of a single CSV object of analysis reduced and limits Their significance.

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Attach n.1- The new IC Framework CSV Cosenza

HUMAN CAPITAL		YEAR 2013	YEAR 2012	
Growth and renewal availability	N° of personnell		13	13
		Women	10	10
		Men	3	3
	N° of personal with high school		2	2
		Women	2	2
		Men		
	N° of Graduated personnell		11	11
		Women	8	8
		Men	3	3
	N° of personnell with Master			
		Women	1	1
		Men		

N° of personell with PhD			
	Women		
	Men		
cultural Background	N° of personell with humanistic studies	1	1
	N° of personell with scientific studies	12	12
	N° of personell with professional instruction		
N° of personell with certified skills	Software/hardware knowledge (ECDL)	1	1
	English language		
N° of volunteers			
	Women		
	Men		
N° of employees		13	13
	Women	10	10
	Men	3	3
N° of employees part-time		13	13
	Women	10	10
	Men	3	3
N° of employees full time			
	Women		
	Men		
turn over employees			
(entered at 1/1 - stopped 31/12)			

turn over volunteers			
Women in role with responsibility		2	2
Training expenses in personnell			
	Investment for person		
N° of training days for personnell		2	2
	N° hours (minutes)	960	960
	N° participants	13	13
N° of seminars for personnell		4	4
	N° of hours (minutes)	720	720
	N° participants	13	13
N° of participants to the course "Communication target"			
	N° ODV participants		50
	N° of volunteers		100
	N° of employees		8
	N° of independent contractors		
	H of lessons (in minutes)		2.280
	N° of certification		88
N° of participants at "Fund Raising" course			

	N° ODV participants		51
	N° of volunteers		86
	N° of employees		4
	N° of independent contractors		
	hours of lessons (in minutes)		1.440
	N° of certificates		77
N° of participants at "People Raising" course			
	N° ODV participants		25
	N° of volunteers		55
	N° of employees		4
	N° of independent contractors		
	hours of lessons (in minutes)		1.440
	N° of certifications		45
N° of participants "Project Europa" course			
	N° ODV participants		55
	N° of volunteers		107
	N° of employees		4

	N° of independent contractors		
	hours of lessons (in minutes)		1.440
	N° of certifications		100
N° of participants human rights courses			
	N° ODV participants		
	N° of volunteers		
	N° of employees		
	N° of independent contractors		
	hours of lessons (in minutes)		
	N° of certifications		
N° of participants anticorruption course			
	N° ODV participants		
	N° of volunteers		
	N° of employees		
	N° of independent contractors		
	hours of lessons (in minutes)		
	N° of certifications		
EFFICIENCY	N° of coordinators	1	1

N° of administrative employers		1	1
N° of persons at front office		4	4
N° of skilled persons in the service		7	7
Internal Network	low		
	medio	x	x
	high		
Skilled people	low		
	media		
	high	x	x
Skills in multiple role	Personnel with single role	1	1
	Personnel with two roles	12	12
	Personnel with more than two roles		
Problem solving ability	Low		
	Media	X	x
	High		
Leadership capabilities	Low		
	Media	X	x

		High		
STABILITY	Average age of the personnel		40	40
	Average age of the Board		50	50
	personnel breakdown per CSV activity area			
		Coordination	1	1
		Agencies	5	5
		Advice	1	1
		Training	1	1
		Information, communication	4	4
		Documentation	1	1
	N° of personnel under 30			
	<i>employees</i>	Women		
		Men		
	<i>independent contractors</i>	Women		
		Men		
	<i>volunteers</i>	Women		
		Men		
	N° of personnel over 50			
	<i>employees</i>	Women		

	Men		
<i>independent contractors</i>	Women		
	Men		
<i>volunteers</i>	Women		
	Men		
Years of experience media of the personnel in CSV activities		8	8
Personnel with less than 2 years experience			
Average presence of personnel along years		100%	100%
N° of personnel with no expire date contract		13	13
	Women	10	10
	Men	3	3
Internal Customer satisfaction	Unsatisfied		
	Low satisfied		
	satisfied	x	x
	Very satisfied		
Loyalty to the company	low		
	medio	x	x
	high		

STRUCTURAL CAPITAL		2013	2012	
GROWTH AND RENEWAL CAPABILITY	N° of Computer	19	19	
	Expenses for instruments			
	Expenses material purchase			
	General Expenses			
	Investment in IT			
	N° projects			
		new		
		n° of people involved		
	N° innovation projects			
	N° of internal meetings	10	13	
	N° of external meetings			
	N° of Shareholders meetings	2	3	
		N° of participants		
		N° of shareholders	223	219
		N° of OdV	186	180
		(media) N° of non OdV	37	39
	N° Board's meeting	7	6	
		Average attending	75%	75%

N° of executive board				
	Average attending			
N° of improving activities				
	N° advices			
	Hours of web navigation (in minuti)			
	N° of data			
	N° base data			
	N° new base data			
	Banca Dati	N° update base data		
EFFICIENCY	Training credits			
	Absence for worker			
	Lost days for sick			
	N. of vehicles			
		owned	1	1
		rented		
	N° of structures			
		owned	0	0
		rented	1	1
		Freely rented	3	3

N° service		4.718	5.078
area	Pollino	556	675
	Ionica	788	804
	Tirrenica	502	538
	Urban	2.894	2.996
	Mobile	77	65
Reimbursement			
	Volunteers Special fund	786165,68	705711,32
	Membership fee of Volontà Solidale		3270
	Public Contribution		562,24
Income	Other revenues	45,83	42,51
	Area Consulting	94186,85	61776,63
	Area Training	35324,53	165472,08
	Area Marketing	57234,69	98235,63
Expenses	Area Information and communication	33606,10	25691,62

	Area research	54707,85	82655,18
	Area Animation territory	34731,89	24999,22
	Territory offices	83525,97	94073,87
	Purchase	18661,91	0
Mission's cost		434113,88	585865,67
	uscite per il personnel dipendente e independent contractors	298016,53	286498,02
<i>Exit for activity</i>	uscite per lo svolgimento delle attività	136097,35	299367,65
Costs		104541,73	122058,51
	costs of the structure	102636,71	117932,35
	interests	1905,02	4126,16
N° successful project		39	88
STABILITY	Social report	x	
	Mission report	x	
	IC report		
	Service card	X	x
	Guidelines	X	x

	Internal imagine	Unsatisfied		
		Low satisfied		
		satisfied	X	x
		Very satisfied		
	Management involvement	low		
		medio	X	x
		high		
	Skills exchange among workers	low		
		media		
		high	X	X
	Target perception from top management	low		
		media		
high		X	X	

RELATION CAPITAL		2013	2012		
GROWTH AND RENEWAL CAPABILITY	N° di utenti	729	746		
		new	77	70	
		cittadini	205	220	
		volunteers			
		future volunteers	22	6	
		Local community	4	23	
		OdV recorded in Provincial register	252	248	
		OdV not recorded in Provincial register	194	184	
		Other association	52	65	
		N° area of Pollino	97	105	
			new	8	10
		N° of users Ionica area	115	121	
			new	5	8
		N° users Tirrenica area	103	112	
			new	11	8
		N° Urban-Hinterland area users	414	402	

	new	53	44
N° services required		4.817	4.760 (5075 con map)
	hearing/orienteering	834	1052
	advice	1024	738
	logistic	937	755
N° of services offered		4.817	3719
	directly	2661	2010
	By mobile office	22	0
	by telephone	1452	1235
	Green number		
	via fax	7	
	Web site	27	15
	via e-mail	670	459
N° web site visits		65925	41541
	N° direct visits	33252	21383
Hours of navigation (in minutes)		2,5	2,5
N° ofdownload			
N° newsletter subscribers		3449	3270
N° CSV marketing meeting		36	18
attended	N° OdV	247	160

	N° volunteers	500	300
	N° future volunteers	200	150
	N° of schools	35	7
	N° university students		
Quality of CSV	low		
	media	x	x
	high		
Press		34	30
	N° of exits for week	3	2
	N° initiatives	3	1
N° of exit on media		132	110
	articles	45	32
	Tv exit	16	12
N° of meetings		3	5
N° di conferences		1	1
N° newspapers			
N° of brochures		2000	1000
N° papers			
N° marketing paper		2000	1000
social network	N° of contacts on facebook	1890	

	N° di contacts on twitter		
	N° OdV training days	1	12
	N° of volunteers	55	247
	N° of future volunteers		
	N° of OdV	27	131
	N° of seminars	32	12
	N° of volunteers	340	100
	N° of future volunteers		
	N° of OdV	151	50
	N. of members	230	
	Training on web		
	N° of downloads on training materials		
	Average time of reply	2 day	2 day
EFFICIENCY	N° claims		

N° collaboration with public and private entities		6	5
N° collaboration with other CSV		5	5
N. membership fees		139	272
Income from Fondo speciale volontariato		786165,68	705711,32
Contribution from public entities			562,24
Contribution from employees			
Contribution from independent contractors			
Contribution from volunteers			
Contributi dai privati			
Contribution from others			
5 per mille charity		210	190
	bad		
	medium		
	good	x	x
External Imagine	Very good		
Company Imagine in university	bad		
	medium		
	good		
	Very good		
Imagine in contributors	bad		
	medium		

		good	x	x
		Very good		
	Customer satisfaction:	Unsatisfied		
		Low satisfied		
		satisfied	x	x
		Very satisfied		
STABILITY	N° shareholders		223	219
		OdV filed in regional register	138	135
		OdV not filed in regional register	56	55
		Associations	29	29
		Foundation		
		Other volunteers entities		
		New		
		Ceased		
		OdV Pollino area	121	
		filed		
		Ask to be filed		
		OdV Tirreno area	284	
		filed		

	Ask to be filed		
OdV Ionio area		156	
	filed		
	Ask to be filed		
OdV urban-Hinterland area		190	
	filed		
	Ask to be filed		

R&D collaboration and co-patenting: which strategy in the automotive industry?

Lara Agostini*

Department of Management and Engineering (DTG)
University of Padua
Stradella San Nicola, 3 - 36100 Vicenza (Italy)

Federico Caviggioli

Department of Management and Production Engineering (DIGEP)
Politecnico di Torino
Corso Duca degli Abruzzi, 24 - 10129 Torino (Italy)

* *Corresponding author*

Structured Abstract

Purpose – In the last years, researchers have shown that innovation processes are veering towards an “open innovation” approach whereby innovating firms rely increasingly on contributions by external partners (Chesbrough, 2003). In particular, the automobile manufacturing industry is a typically complex technical environment where the cooperation in knowledge creation is very extensive (Lin and Cao, 2012). On these basis, this paper aims to analyze if and to what extent, innovation output in terms of patent quantity and value differs depending on whether an automaker engages in a (certain type of) collaboration for its R&D activities.

Design/methodology/approach – To reach our aims, we selected a quali-quantitative approach based on the collection of two datasets about four among the world largest automakers: the former contains a total of around 4,400 relationship pairs of automakers and suppliers, allied companies and subsidiaries; the latter includes the automakers’ EPO patent portfolios, and related information, since 2004 which provide the names of the co-assignees. Matching the company names of the two data sources allowed us to obtain the final dataset used to carry out the extensive descriptive analysis and regression analysis.

Originality/value – The paper contributes to the scientific literature by investigating the presence of differences across the patenting activities of a selection of automakers and their supplier, allied and subsidiary firms. Moreover, the issue related to patent value represents an emerging area of interest in the field of collaborations for innovation. Also the methodology constitutes a novelty in this field, since the examined database is generated by matching two different sources. Furthermore, the process for cleaning and standardizing the company names (“name game”) combined an automated algorithm with a double manual check, by searching the company websites and querying the corporate tree.

Practical implications – The outcomes of the study show that the four selected automakers adopt different strategies regarding co-patenting with their R&D partners. On this basis, a framework including four main strategies -contingent, purposive, watchful and advanced- have been identified and lays the foundation for further research in this field. In addition, the present study reveals that co-patented inventions with suppliers and subsidiaries seem to be more valuable than with allies. Evidences emerging from our paper may support firms in making aware choice regarding the management of knowledge collaborative activities and co-patenting.

Keywords – Co-patenting, R&D collaboration, Suppliers, Alliances, Automotive

Paper type – Academic Research Paper

1 Introduction

In contexts characterized by increasing competition, constant innovation is a primary source of sustainable advantage (Chesbrough, 2003). Importantly, innovation has become a collaborative activity and firms rely extensively on their environment to exploit much of their innovation advantage (Fawcett *et al.*, 2012).

On these grounds, the issue of how to manage the knowledge flow in and out of a company has become a major corporate concern (Choi *et al.*, 2004) and R&D collaboration has been given increasing attention by researchers (Lin *et al.*, 2011). In this field, the literature has mainly focused on ‘why to cooperate’ and ‘with whom’ (Schwartz, 2012), as well as on the impact of (different types of) R&D collaboration on firm performance (Hottenrott and Lopes-Bento, 2012), both in terms of innovation output and economic output. Within this context, where it is widely recognized that patents are among the most important outcomes of R&D (Laursen and Salter, 2006) and intellectual property (IP) management issue becomes central in order for firms to protect their competitive position (Reitzig 2004), patents could be exploited as data source for the investigation of co-patenting strategies and the value of R&D collaboration output.

Based on these evidences, this paper aims to analyse if and to what extent innovation output, in terms of patent quantity and value, differs depending on whether a firm engages in a (certain type of) relationship with its R&D partners in the automotive industry which is a typically complex technical environment where the cooperation in knowledge creation is noteworthy (Lin and Cao, 2012). On this basis we mean to identify possible co-patenting strategies between automakers and their R&D partners. In particular, this study investigates the phenomenon of co-patenting from the perspective of the type of

relationship existing between the focal firm and its R&D partners, that are suppliers, allies and subsidiaries.

To reach our aim, we opted for a quali-quantitative approach. Four global-scale automakers were selected and for each of them we identified both the portfolio of relationships with supplier, allied and subsidiary companies and the portfolio of patented inventions co-owned with other firms.

Results show that the selected companies seem to have different co-patenting strategies not only in terms of propensity to co-patenting but also in terms of relatively most frequent type of partners and of level of concentration of the co-owned patented inventions with them. We argue that co-patenting strategies can be thus distinguished along the categories *contingent*, *purposive*, *watchful* and *advanced* according to the co-patenting propensity and the presence of a preferred co-patenting relationship type, i.e. suppliers, subsidiaries or allies.

Moreover, the co-owned innovations are on average more complex, are associated to a wider technological scope and cover technological fields which are more often different from the core activities of the examined firms than the single-owned inventions. Finally, the technological relevance of the patented inventions is higher when the co-assignee is either a supplier or a subsidiary. The results seem associated to the fact that firms might be more able to generate valuable innovations collaborating with partners with a tighter relationship correspondent either to the direct ownership or the existence of a solid supply contract, while co-patented inventions deriving from alliances, that is the R&D collaboration output, may be required by the alliance agreement.

The remainder of the paper is divided in four sections: firstly, a literature overview on R&D collaborations and involved partners is outlined in order to contextualize the research questions; secondly, the methodology is described in deep details; thirdly, data analysis and results are divided into two parts, among which the former provides a thorough descriptive analysis and the latter a statistical analysis; lastly, results are discussed in order to draw the conclusions and open new paths for future research.

2 Theoretical background

2.1 R&D collaboration and co-patenting

Technological innovation has been the driving force for evolution in many industries. The success or failure of a firm's R&D activities often has serious implications for its overall performance (Teng, 2007), hence firms have allocated increasing resources to R&D to speed up the pace of innovation and diversify their technological capabilities (Miotti and Sachwald, 2003). One of the most successful and widely employed approaches has been a cooperative strategy. Within this context, Chesbrough (2003) suggests that many innovative firms have shifted to an 'open innovation' model, using a wide range of external actors and sources to help them achieve and sustain innovation. This concept redefines the boundary between the firm and its surrounding environment, making the firm more porous and embedded in loosely coupled networks of different actors, collectively and individually working toward commercializing new knowledge (Laursen and Salter, 2006). In particular, joint R&D is one of the most significant driver towards collaboration in medium and high-tech industries.

Tether (2002) illustrates that R&D collaborations have a long history and they received considerable theoretical and empirical attention during the 1980s and 1990s when authors started to talk about strategic technology alliances, collaborative arrangements for R&D, and innovation networks.

Scientific literature on the theme of R&D collaborations has developed along two main streams of research: the first concerns the various motives that spur firms to collaborate on R&D (e.g. Fritsch and Lukas, 2001; Tether, 2002; Belderbos *et al.*, 2004a) and the second studies the effects of (different types of) R&D cooperation on firm performance (e.g. Belderbos *et al.*, 2004a,b; Gnyawali and Park, 2011).

In particular, a variety of reasons are given in the literature for the apparent growth in innovation and technology alliances: to overcome firm individual limitations in R&D capabilities and enhancement of their R&D success rate, as well as to jointly endorse R&D outputs, which creates a network externality effect that increases the innovations' chance for market acceptance (Teng, 2007), and reduce the risks associated with innovation, including the risk of technological spillovers (Tether, 2002).

Concerning the second stream of literature, firm performance may refer to the generation of new innovation or to the associated economic returns. The latter are measured in terms of sales, employment growth and firms labor productivity (e.g. Klomp

and van Leeuwen, 2001; Lööf and Heshmati, 2002; Faems *et al.*, 2005). The former is related to the increase of firm capabilities in terms of new product development, R&D project performance, technological advances and patent productivity (e.g. Brouwer and Kleinknecht, 1999; Gnyawali and Park, 2011; Sampson, 2005). Reminding that there is a well-established relationship between R&D and patents (see Griliches, 1998), and patents are among the most important outcomes of R&D (Laursen and Salter, 2006), we expect an association between the joint R&D efforts of firms and joint patenting.

A co-patent is a patent owned by two or more assignees, hence co-patenting implies the joint ownership of collaborative outcomes (Belderbos *et al.*, 2013). Co-patenting started to become a more diffused practice towards the end of the twentieth century when jointly owned patents tripled within a period of only ten years (Hagedoorn, 2003). From an economic perspective the joint ownership of patents creates, depending on the number of proprietors, a form of duopoly or tight oligopoly that appears at first somewhat similar to a restrictive licensing agreement (Hagedoorn, 2003). Despite studies (e.g. Reitzig and Wagner, 2010) stress the disadvantages of co-patenting, Belderbos *et al.* (2013) noted that co-ownership of intellectual property (IP) remains an empirically relevant strategy for companies developing technology jointly. Moreover, Hagedoorn *et al.* (2003) provided evidence that firms engaged in co-patenting activities in the past are more likely to adopt co-patenting with subsequent collaborative activities, which suggests that the learning experience of effectively arranging and managing co-patents makes firms more likely to employ them in subsequent collaborative efforts (Belderbos *et al.*, 2013). The type of partners involved in co-patenting seem to be one of the focus of co-patenting. In particular, previous literature (e.g. Tether, 2002; Miotti and Sachwald, 2003; Belderbos *et al.*, 2013) focus on four main categories of partners: suppliers, customers, competitors and universities or research institutes.

Assuming a different perspective, in this study we aim to investigate the differences in the co-patenting activities of a set of automakers, which represent our focal firms, according to the type of relationship with the co-assignee. Indeed, the choice of the governance mechanisms –from arm’s length market transaction to strategic partnerships– appears to be key in order for automakers to access external specialized knowledge while avoiding issues of partner’s opportunism, knowledge leakage, and appropriability (Trombini and Zirpoli, 2013). The whole study is integrated in the automotive industry which is a typically complex technical environment where the cooperation in knowledge

creation is very extensive (Lin and Cao, 2012). In particular, large automakers proved to be among the most active in co-patenting (Hagedoorn, 2003). More generally speaking, the automotive is a technology-driven sector which makes high use of patents in order to prevent imitation by competitors. Furthermore, due to the enlargement of the car's technological components (e.g. electronics components) and the rise of new technological trajectories (e.g. the «electrification» trend), automakers have been increasingly needing to master a wide variety of technological fields in order to stay at the forefront of technological developments (Trombini and Zirpoli, 2013). Due to the distinctive features of the context of analysis, which are detailed in the Methodology section, as anticipated this paper offers an alternative perspective which takes into account the type of relationship a firm has established with partners it collaborates for innovation with. In particular, we focus on collaborative R&D between the focal firm and their suppliers, allies and subsidiaries.

2.2 R&D with suppliers, allies and subsidiaries

Collaboration with suppliers is highly important in the automotive industry, to the point that the success of Japanese automakers has been attributed, amongst other factors, to their close supplier relations, with suppliers being closely involved in the innovation process (Harhoff *et al.* 2012). For example, Toyota has developed a number of practices that facilitate knowledge transfer to and among suppliers with whom it has developed its innovations. However, the fact that vertical co-operation is supposed to impact more on the introduction of new products to the market than on patenting (Miotti and Sachwald, 2003) suggests that further analyses are required.

The second relationship type for R&D collaborations deals with a firm's alliance partners which are, in many cases, the most important source of new ideas and information that result in performance-enhancing technology and innovations (Dyer and Singh, 1998). Indeed, partners may bring distinctive resources to the alliance, which, when combined with the resources of the partner, results in a synergistic effect whereby the combined resource endowments are more valuable, rare, and difficult to imitate than they have been before they were combined (Dyer and Singh, 1998). Thus, alliance partners can generate rents by developing superior inter-firm knowledge-sharing routines, where inter-firm knowledge-sharing routine is defined as a regular pattern of inter-firm interactions that permits the transfer, recombination, or creation of specialized knowledge

(Grant, 1996). Joint R&D is one of the most popular reasons for forming alliances in many so-called high-tech industries and emerging technical areas (Hagedoorn *et al.*, 2003). Based on the fact that an alliance is defined as voluntary agreements between two or more organizations that unite to pursue a set of agreed-upon goals remain independent subsequent to the formation of the alliance (Rangan and Yoshino, 1996), the choice to share property rights may be seen as an important landmark signifying the successful completion of inter-firm cooperative R&D and a milestone suggesting future collaboration as the discovery is moved toward commercial success (Hagedoorn *et al.*, 2003). Moreover, seeing the benefits of a long-term partnership is crucial for entrepreneurial companies before engaging in risk-taking behavior such as the disclosure of sensitive knowledge. Hence, we argue that R&D alliances offer a fertile soil for patenting.

Lastly, firms consider that co-operation within groups involving subsidiaries does indeed constitute co-operation which needs to be considered as a separate case (Miotti and Sachwald, 2003). Indeed, in this case competitive risks are *a priori* much lower, which may for example be an incentive to co-operate also for relatively small firms and to patent. Despite these indications, previous literature in this field (e.g. Tether, 2002;) has mainly focused on the propensity of ‘group firms’ versus independent firms to have co-operative arrangements for innovation with external partners, rather than on patent sharing between the focal firm and its subsidiaries.

Within this context, to the best of our knowledge, there is no study investigating patterns of co-owned patented inventions depending on the type of relationship between the focal firm and its patent co-owners/R&D partners. On this basis, the first research question emerges.

RQ1: How does the co-patenting strategy of automakers differs according to the type of relationship with the R&D partners?

Previous empirical studies found evidence for a positive effect of R&D collaboration on innovation output, often measured in terms of the number of patents, while the characteristics and the value or technological relevance of these patents has not been studied to the same extent. Only a few authors have expanded on this topic, finding that joint R&D may provide incentives to file patents that are indeed aimed at protecting

valuable inventions from imitation by others, while exchange alliances drive ‘portfolio patenting’ which has been shown to result in fewer citations for the individual patent (Hottenrott and Lopes-Bento, 2012) and, in any case, the challenge to appropriate value from sharing IP ownership depends on the type of partner involved, with particular emphasis on intra-industry vs inter-industry dynamics (Belderbos *et al.*, 2013).

The literature offers a variety of indicators based on patent bibliometrics to estimate the characteristics of the underlying inventions such as the complexity, the technological and geographical scope of the protected inventions (e.g. van Zeebroeck and van Pottelsberghe, 2011). In particular, the technological importance of the patented invention can be assessed through the number of citations received from subsequent patent filings (forward citations). The issue related to patent value has received increasing attention since it has been recognized that the economic value of patents is skewed and only a small percentage of patents is truly valuable (Scherer and Harhoff, 2000).

Based on these considerations, the second research question is formulated.

RQ2: How do the co-assigned patented inventions differ from single-owned ones and which are the most valuable when considering co-patenting between an automaker and its suppliers, allies and subsidiaries?

We refer to the output of joint R&D in terms of patents assigned to more than one company as “co-owned/-assigned patented invention” since our unit of analysis is the invention underlying the patent documents: the next section provides details on such issue.

3 Methodology

Our study is made up of two parts; the first has an exploratory nature aimed to investigate patterns of co-patenting between automakers and suppliers, allies and subsidiaries; whereas the second is explanatory and aims to determine which are the characteristics of the examined co-patents in terms of technological scope, complexity and technological relevance. As a consequence a multi-method approach has been selected. In particular, the first research question is addressed through a qualitative analysis based on multiple case study, while the second research question is addressed

through a quantitative analysis based on econometric regressions comparing pairs of single-owned and co-assigned patented inventions.

3.1 Case selection

Cases were selected based on the following criteria. Firstly, automakers had to be parent companies because this allowed to build their corporate tree which was needed in order to identify subsidiaries. Secondly, the top countries in terms of motor vehicle production were considered, namely U.S., Japan and Germany¹. In these countries, the top performers are General Motors, Toyota and Volkswagen. However, since General Motors could not be included in the sample², we opted for the second US automaker which is Ford. Due to the smaller size of Ford, we considered more appropriate to include in the sample another smaller, though relevant, automaker, which then revealed interesting since it contributed to diversify the co-patenting strategies. We opted for the second German automaker, which is BMW, so as to have two European and two non-European companies. Table 1 shows the main features of the selected cases.

Table 1 Main features of the selected cases (data from CIQ)

<i>Automaker</i>	<i>Acronym</i>	<i>Year of foundation</i>	<i>HQ Country</i>	<i>Total revenues 2012 [M€]</i>
Bayerische Motoren Werke AG	BMW	1916	Germany	76.848
Ford Motor Co.	FRD	1903	United States	101.823
Toyota Motor Co.	TTA	1933	Japan	192.295
Volkswagen AG	VLW	1937	Germany	192.676

3.2 Data collection

We collected two sets of data for the four selected automakers from two proprietary databases, Capital IQ (CIQ) and Thomson Innovation (TI)³. We then matched the collected information by exploiting the fact that focussing on a relatively small sample of companies allows a more detailed check of the data, in particular on firm names.

¹ China is one of the most relevant countries concerning the automotive industries, however, information on names of Chinese companies, in terms of corporate structure and patent assignments with the company names, are not complete and clear, thus we deliberately decided not to consider it.

² In 2009 General Motors went through the Chapter 11 re-organization which could have caused problems in the process of identifying subsidiaries before and after that year, as well as in the matching with assignee names (see Data collection for further details about this issue).

³ All data were accessed in October 2013.

From the first dataset, CIQ, we retrieved the inter-firm relationships in the groups of supplier, allied and subsidiary companies, for a total of around 4,400 relationship pairs⁴.

From TI, we derived the automakers' patent portfolios at the European Patent Office (EPO) and the names of the co-assignees. The focus on the EPO is motivated by reasons of data uniformity, integrity and reliability, as suggested also by Belderbos *et al.*, 2013. Moreover the EPO is a regional office so it should suffer less from the domestic effect of applicants filing their invention more often in the country of their headquarters (Criscuolo, 2006). We collected all the EPO filings with earliest priority year from 2004. The choice of the priority date as reference is consistent with the analysis based on inventions rather than patents since it is the closest to the invention date. The process generated a total of 13,576 patent documents.

With the aim to avoid the double-counting of the patent protected inventions and to consider the invention described in the application document and in all the corresponding subsequent published patent documents (e.g. search report, grant, potential amendments...) as a single unit of analysis, the retrieved documents were collapsed on the application number itself, operatively by grouping the records on the publication number and excluding the publication kind code. Such procedure determined the measurement of the inventive activity with a more accurate proxy than the count of patent documents.

The final collected records correspond to 8,041 inventions and the total share of co-assigned patented inventions is 17.5%: Table 2 provides details for each automaker.

Table 2: Descriptive statistics regarding patents

<i>Automakers</i>	<i>EPO patents (priority year >= 2004)</i>	<i>Patented inventions</i>	<i>Number of single-owned patented inventions</i>	<i>Percentage of co-owned patented inventions</i>
BMW	2,116	1,248	1,012	18.9%
FRD	1,459	912	821	10.0%
TTA	8,808	5,131	4,174	18.7%
VLW	1,193	751	627	16.5%

⁴ Some of the identified partner firms are listed with two of the three or with all the three statuses at the same time. Additional information on the data collection process are available on request.

The process of matching the two different data sources started from the standardization of the company names, in order to keep note of spelling mistakes, of historical brand changes and of mergers and acquisitions whenever possible. Such task was accomplished by analysing all the names of the identified patent co-assignees (about 2,000) at first by applying an automated algorithm for grouping similar names which served to overcome spelling variations and department specificities mainly. Secondly, we manually checked the results by comparing and, when needed, integrating them with internet searches on the official company websites and with companies' corporate tree available in CIQ. The procedure ended up with 529 different assignee names⁵.

The final procedural step is constituted by the matching between the standardized assignee names from TI and the company names retrieved from CIQ as supplier, subsidiary and allied firms of the selected automakers. A total of 121 assignee names (23% of the standardized company assignee names) were matched to CIQ lists.

3.3 *Statistical model*

The second set of analyses consists of two types of econometric models aiming at exploring the differences and commonalities across the automakers' portfolios of co-owned patented inventions output of collaborative researches: i) a set of probit models on the co-assignment likelihood to highlight the presence of differences between single owned inventions and those output of R&D collaboration; ii) a set of maximum likelihood treatment-effects models to ascertain the technological relevance level, measured by patent citations, of the inventions generated collaborating with suppliers, allies and subsidiaries.

The first group of econometric tests investigates the patent-level characteristics of the co-assigned inventions through a probit model on the co-assignment likelihood. The dependent variable of the probit model is a dummy for the co-assignment, equal to 1 when the invention is owned by more than one firm. It describes the differences between single-owned and co-assigned R&D output at the level of invention characteristics. In line with existing literature (van Zeebroeck and van Pottelsberghe, 2011), we employed the available patent bibliometric indicators as independent variables which serve as proxies for: complexity (number of backward patent citations and of inventors) and technological

⁵ Individual assignees were excluded from the standardization process and the analyses.

scope (number of diverse International Patent Classification codes at four digit level or IPC subclasses). In addition to the latter indicator which provides information on how many different technical fields the invention is associated with, we computed a dummy variable equal to 1 when the patented invention reports specific IPC codes related to the main technology fields of activity of the corresponding automaker. To do so, we identified the core technologies in each automaker from the analysis of the most representative IPC classes associated to the single-owned inventions in each company's portfolio⁶. As a robustness check, we controlled for automakers and years dummies.

The second group builds upon the findings of the correlation from the previous probit model to estimate, through a treatment-effects model, the presence of differences in the technological value of the co-assigned patented inventions according to the type of relationships with the R&D partner. The maximum likelihood treatment-effects model (Wooldridge, 2002) considers the effect of an endogenously chosen binary treatment, in this case the invention co-assignment rather than being a single owner, on another endogenous continuous variable, the technological relevance of the invention, conditional on two sets of independent variables. The technological importance is proxied by the number of forward citations, weighted in order to keep consideration of the filing age. The treatment equation replicates the previous probit model while the second stage equation includes the dummies for the relationship types with the co-assignees (i.e. supplier, ally and subsidiary firms).

4 Data analysis and results

The presentation of the data analysis and results develops around the two key themes which make reference to the two research questions: the former concerns the type of relationship between an automaker and its R&D partners and its influence on the co-patenting strategy, while the latter regards the value of patented inventions co-owned by the automaker and its R&D partners. Next paragraphs deal with them separately. In the presentation of the results, for the first issue we make use of a combination of illustrative examples and tables describing the data from which inferences were drawn (Miles and

⁶ *The 3 digit IPC codes which are considered core technology fields are those singularly associated to at least the 10% of the portfolio of single-owned inventions. In aggregate they represent from 75 to 83% of the total invention portfolio. They are listed in Table 7 in the appendix.*

Huberman, 1994); instead, for the second we base our considerations on the statistical analysis.

4.1 Co-patenting strategies between an automaker and its R&D partners

In order to understand the different patterns of co-patenting among the four considered automakers, we compared data regarding the selected automakers both at a firm- and patent-level. The differences in size of the four selected automakers are mirrored by their invention portfolios. Indeed, TTA counts a number of inventions which is four times the number of inventions of BMW. Similarly, the four automakers present differences in terms of number of co-assignees involved in the patenting activities and in the share of co-assigned inventions on the total portfolio, which point in the direction of different levels of innovation openness. Table 3 shows that TTA has a number of co-assignees definitely higher than other automakers, indicating a higher likelihood of co-patenting with many different partners. However, the average number of inventions per co-assignee is in line with FRD which has the lowest number of different co-assignees. This suggests that TTA does not concentrate many co-owned patented inventions with the same co-assignee, which is supported by the value of the Herfindahl–Hirschman Index (HHI) of patents describing the concentration of co-owned patented inventions with single co-assignees. The indicator CR4, a more direct measure of concentration, shows the share of co-assigned inventions owned by the first four co-assignees in terms of co-owned inventions, on total co-assigned patented inventions: the first four co-assignees of BMW own the 73% of all the co-owned patented inventions in BMW's portfolio, while in the case of TTA, the top four own the 36% of co-assigned inventions; FRD and VLW report lower values, between 51 and 59%.

Table 3 Descriptive statistics on co-assignments and concentration of co-patenting activities

Automakers	Number of different co-assignees	Average number of inventions per coassignee	Concentration of co-patenting activities	
			[HHI]	[CR4]
BMW	91	2.59	0.17	73%
FRD	25	3.64	0.16	59%
TTA	243	3.94	0.04	36%
VLW	46	2.70	0.13	51%

Figure 1 shows the distribution of the patented invention assignments in each automaker's portfolio distinguishing by the single-owned and the co-assigned inventions; co-assigned inventions can be, in turn, divided into those co-assigned with a company identified as one among the relationship types of supplier, allied or subsidiary and those co-assigned with other partners with no identified relationships, including non-formalized R&D partnerships.

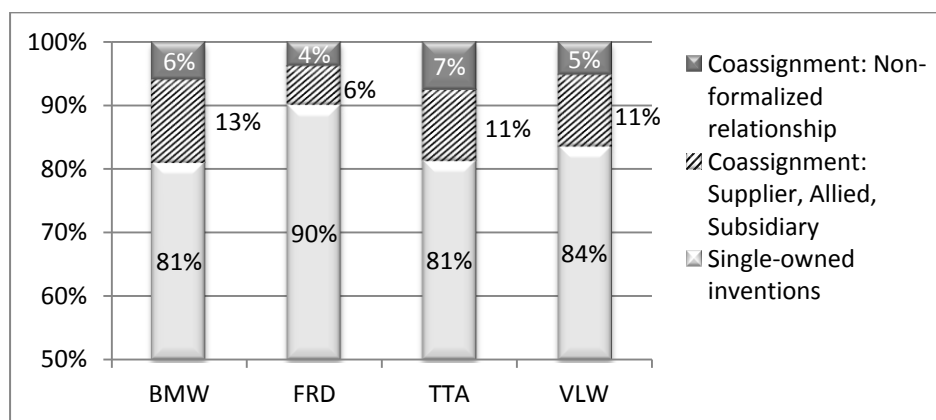


Figure 1 Share of inventions owned by each automaker alone, co-assigned with a partner identified through one of the relationship types (supplier, ally, subsidiary) or with non-formalized relationship

The data suggest a certain heterogeneity across the examined automakers. The propensity to co-patenting is high both in terms of diverse involved partners and of share of co-assigned patented inventions on total portfolio for BMW and TTA, but the former seems to focus on a small group of partners, which absorb the largest part of the co-

assigned inventions, and still reports a long tail of occasional collaborations. On the contrary the figures for TTA show that co-assignments are relatively less concentrated and involve a higher number of partners. Values of propensity to co-patenting for VLW are similar to BMW and TTA at the invention-level, but the number of partners is much lower; however the concentration indexes suggest a middle position for VLW between the situation of BMW and the one of TTA. Quite different is the case of FRD: it shows a low propensity to co-patenting both in terms of number of partners and of share of co-assigned inventions and middle concentration levels.

Table 4 reports the main statistics on the co-patenting activities of the selected automakers by distinguishing on firm- and invention-level analyses, respectively in terms of percentage on total co-assignees and on total co-assigned inventions. In order to understand the shown values, it is necessary to note that not only a company might be considered a supplier, an allied and a subsidiary at the same time in CIQ, but also an invention might be co-owned by several firms in any of the three identified types. As a consequence, we took into consideration also the overlapping among categories (i.e., allies, subsidiaries and suppliers): the sum of the items 2.a 2.b and 2.c might exceed the corresponding aggregate value in item 2.

Focusing on the firm-level analysis related to the percentage of allies, subsidiaries and suppliers as co-owners on total co-assignees in Table 4, we can appreciate that, despite a common tendency towards co-patenting with suppliers, automakers follow different patterns in co-patenting with other R&D partners. Particularly, BMW registers the highest values for allies as co-assignees, whilst the lowest for subsidiaries. In contrast, FRD shows an opposite approach, favouring suppliers as R&D partners with whom to co-own patents rather than allies.

Table 4 Co-patenting by type of relationship (non-formalized, formalized and details on supplier, allied and subsidiaries co-assignees)

<i>Automakers</i>	<i>Relationship type</i>	<i>% on total co-assignees</i>	<i>% on total co-assigned inventions</i>
BMW	1.Non-formalized	70,4%	31,4%
	2.Any formalized relationship	29,6%	68,6%
	2.a Allied	15,4%	59,3%
	2.b Subsidiaries	1,1%	0,4%
	2.c Suppliers	19,8%	14,8%
FRD	1.Non-formalized	64,0%	38,5%
	2.Any formalized relationship	36,0%	61,5%
	2.a Allied	4,0%	36,3%
	2.b Subsidiaries	12,0%	9,9%
	2.c Suppliers	20,0%	15,4%
TTA	1.Non-formalized	81,9%	40,1%
	2.Any formalized relationship	18,1%	59,9%
	2.a Allied	6,2%	35,1%
	2.b Subsidiaries	4,5%	25,7%
	2.c Suppliers	12,3%	42,8%
VLW	1.Non-formalized	65,2%	31,5%
	2.Any formalized relationship	32,6%	67,7%
	2.a Allied	8,7%	8,1%
	2.b Subsidiaries	10,9%	45,2%
	2.c Suppliers	26,1%	66,9%

The invention-level analysis, that is the percentage on total co-assigned inventions in Table 4, shows different dynamics. For BMW and FRD, the share of patents co-owned with subsidiaries is very limited, preferring allies rather than suppliers. On the contrary, VLW co-own patents firstly with suppliers and then with subsidiaries, while co-assigned inventions with allies are not a relevant part of co-assignees inventions. Similarly, TTA privilege co-assignments with suppliers, but then the share of co-assignments with allies exceeds those with subsidiaries.

Comparing the shares of co-patenting on firm- and invention-level, the first general evidence is that on average only about one third of the automakers' co-assignees are among those with a formalized relationship, but they are responsible for around two thirds of the total co-assigned inventions. The data suggest that the latter represent occasional

collaborations, supporting the fitness of the identified relationships as representative of the co-patenting activities.

Concerning the analysis of the formalized relationship types, the four automakers seem to follow different strategies. The pattern for BMW shows that the co-assignees are mainly allied and suppliers but most of the co-assigned patented inventions are with the former; subsidiaries are not involved in the co-patenting activities of BMW. The case of FRD, characterized by a relatively small pool of co-assignees, is similar to the previous but the role of allied firms is more relevant because one of them is responsible for almost one third of the co-patenting activity. The figures of TTA reflect the tight relations with the Japanese company's suppliers, which are often also subsidiary or partners in formalized alliances, and the propensity to invest in co-patenting activities also through non-formalized relationships; hence, on the one side the share of inventions co-assigned with non-formalized partners is the highest (40%) among the four automakers and on the other side all the co-assignees with any relationship type have a significant share of joint inventions (in particular a small number of allies is responsible for circa one third of the co-patenting activities and around 43% of the inventions are co-assigned with suppliers which is the most frequent type of relationship). VW seems to differ from all the previous cases by involving allied companies in a more limited way: moreover, the only allies which co-own patents with VW are also suppliers and/or subsidiaries; the largest share (42%) of co-inventions is with two companies that are both suppliers and subsidiaries.

4.2 *The characteristics and value of patents co-owned by an automaker and its R&D partners*

The first step of the following analyses aims to understand the presence of differences in the R&D collaboration output with respect to single-owned inventions. We applied a probit model on the patented invention portfolios of the selected automakers having the co-assignment event as the dependent dummy variable, a set of patent bibliometrics as the independent ones and controlling for automakers and years dummies. Table 5 shows the ex-ante variables characterizing the filed inventions; on average, the co-assigned inventions are associated to a higher number of backward citations (BWDCIT), of inventors (INVENTORS) and of IPC subclasses, proxy of the technological scope (TECHSCOPE); co-owned inventions are also associated more often to IPC classes out of the company core technologies (CORETECH) than single-owned ones.

Table 5 Probit model on co-assignment event with robust standard errors (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.10$)

VARIABLES	(1) model	(2) model	(3) Model
BWDCIT	0.087*** (0.020)	0.049** (0.022)	0.076*** (0.023)
INVENTORS	0.893*** (0.029)	0.913*** (0.030)	0.923*** (0.031)
TECHSCOPE	0.134*** (0.037)	0.108*** (0.037)	0.080** (0.037)
CORETECH	-0.290*** (0.041)	-0.301*** (0.041)	-0.293*** (0.042)
Year dummies		Yes	Yes
Automakers dummies			Yes
Constant	-1.780*** (0.051)	-2.053*** (0.339)	-2.212*** (0.348)
Observations	8,041	8,041	8,041
PseudoR2	0.152	0.169	0.176
Loglikelihood	-3161.827	-3100.003	-3072.973
Chi2	1021.653	1082.012	1059.542

The second econometric model investigates the role of the different types of relationship on the patented invention technological value, proxied by the forward citations (FWDCIT). The treatment effect model is computed on the subset of inventions until 2009 in order to limit the censorship effect connected to the forward citations variable for a total of 6,229 observations. Table 6 shows the coefficients and the standard errors of the equation for treatment effects in column (2), where the dummy for being a co-assigned invention is the dependent variable, and the general model in column (1) where the regression on the dependent variable “FWDCIT” takes into account the “treatment”, i.e. the co-assignment⁷.

The results in column (2) are consistent with the previous probit model on the full sample with no time limits, as expected. Focussing on the main equation in column (1) and on the relationship types dummies, the presence of a subsidiary or supplier company as assignee is significantly and positively associated to the number of received citations, while the presence of an allied firm among the co-assignees has no significant (but negative) coefficient. Also the presence of a co-assignee with non-formalized partnership is positively related to the proxy of technological relevance. The other variables

⁷ Equation (1) does not include the variables “CORETECH” and the “Automakers dummies” because, *ex ante*, there is no reason to expect that the technological importance of an invention should be related to one owner rather than another and to the centrality of a company technology portfolio.

describing the patented invention characteristics through bibliometrics (i.e., BWDCIT, INVENTORS and TECHSCOPE) have significant positive coefficients.

Table 6 Treatment effect model on weighted forward citations. Equation for treatment effects in column (2) with “Co-assigned invention” dummy as treatment; sample of inventions limited from 2004 to 2009; standard robust errors in brackets

VARIABLES	(1) FWDCIT	(2) Co-assigned invention
Allied dummy	-0.055 (0.055)	
Subsidiary dummy	0.161*** (0.061)	
Supplier dummy	0.173*** (0.048)	
Non-formaliz. dummy	0.179*** (0.069)	
BWDCIT	0.138*** (0.010)	0.064** (0.025)
INVENTOR	0.055*** (0.014)	0.923*** (0.035)
TECHSCOPE	0.131*** (0.017)	0.090** (0.041)
CORETECH		-0.292*** (0.048)
Year dummies	Yes	Yes
Automakers dummies		Yes
Constant	0.061** (0.025)	-2.031*** (0.103)
athrho	0.153*** (0.049)	
Insigma	-0.433*** (0.009)	
Observations	6,229	6,229
Loglikelihood	-8567.947	
Chi2	347.638	

5 Discussion and conclusions

Relying on both descriptive and econometric analysis, this paper explores the patterns of co-patenting between an automaker and its allies, subsidiaries and suppliers, trying to unveil different strategies among the selected companies and to understand whether patented inventions co-owned with R&D partners having different relationships with the focal firm may be more or less valuable. Our findings provide a better understanding of the strategic decisions concerning IP ownership in open innovation activities such as collaborative R&D in the automotive industry.

First, we show that there seem to be different co-patenting strategies connected to the company propensity to resort to co-assignments as output of R&D collaborations and in terms of preferences on one relationship type (subsidiaries, allies or suppliers). According to the analyses, we define four main strategies, named *contingent*, *purposive*, *watchful*, *advanced*, which are also represented in *Figure 2*, where the arrow traces a possible evolution regarding the co-patenting strategy.

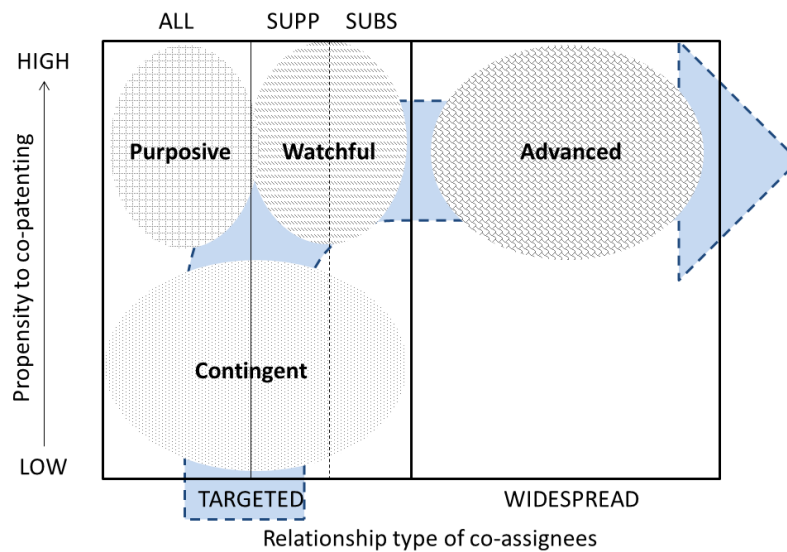


Figure 2 Scheme of categories for co-patenting strategies according to the most frequent relationship types with the co-assignees

Contingent strategy is associated to automakers with relatively low co-patenting propensity and with a preference for one relationship type which absorb the largest part of the co-assigned inventions. It is case of the establishment of a specific R&D collaboration in response to an emerging need which the company might find particularly difficult to satisfy with its internal competences: the R&D collaboration output concentrated on a very small number of partners might be considered as an exception to the usual occasional approach. Among the cases we analysed, FRD seems to adopt a contingent strategy. The American automaker shows the lowest propensity to co-patenting among the examined automakers, which may be determined to the specific regime governing co-patenting in the US where the co-assigned patent can be used or licensed by both assignees without approval from the other. The largest part of FRD's co-patented

inventions are jointly assignments with the allied company Daimler AG, regarding the R&D collaboration on the fuel cell technology which was also supported by the creation of the joint venture “Automotive Fuel Cell Cooperation”.

Purposive and *watchful* strategies identify automakers with a relatively high propensity to co-patenting. They are characterized by non-negligible amounts of co-assigned inventions with all the three types of partners but some of them clearly absorb the largest share of the co-patenting activities. We distinguish between the focus on allied co-assignees for the *purposive* approach and on subsidiaries and suppliers for the *watchful* one. We argue that the relationships with the two latter groups should suffer less from the risks of unintended knowledge leakage or undesired licensing agreements since, in addition to the intellectual property rights of the co-owned invention, the focal firm may exerts its controlling role and the threat of changes in the supply contract, nonetheless operating in a more familiar environment. Similar to the *contingent* strategy, the *purposive* one shows a preference for co-patenting with a relatively small group of allies. Overall the normal R&D collaboration rates inherent the supplier and subsidiary firms, the focal firm share the patent ownership of a high number of inventions with few allied partners on specific cutting-edge research projects. This is the pattern of BMW which, among the other R&D collaborations, was particularly involved in the development of a number of inventions with General Motors, Chrysler and Daimler on a set of hybrid vehicle technologies in the so called “Global Hybrid Cooperation” from 2005 (Dawid *et al.*, 2013). The *watchful* strategy of automakers with a relatively high propensity to co-patenting activities is focused on co-assignments with suppliers and subsidiaries, suggesting a more cautious approach in the choice of partnerships when disclosing competences and in the appropriation regimes when developing new technologies. The data analysis exhibits that, despite being the automaker with the smallest patent portfolio, VW shows a high co-patenting level; the two largest co-assignees of VW are Audi AG and Hella KG Hueck, respectively key subsidiary and supplier, assuring to maintain in-house technological and engineering capabilities.

The *advanced* strategy is associated to automakers with a significant propensity to co-patenting, that is to open innovation practices. The category is characterized by a large number of co-assignees distributed across all the relationship types. TTA seem to be the automakers having the most mature co-patenting strategy: it exceeds the other firms with respect not only to the share of co-patenting in their portfolio, but also in the variety of

R&D partners it co-owns patented inventions with. Anyway, suppliers play the predominant role in line with the general approach of TTA towards them, that is closely involved in the innovation process (Harhoff *et al.* 2012) and with the characteristics typical of the Japanese *keiretsu* group structure. The environment in which TTA operates and collaborates is protected also by a particular overlapping of relationship types with the co-assignees, suggesting that TTA is attentive to safeguard itself with additional clauses. By way of example, the largest R&D partners of TTA in terms of co-assigned inventions are Denso Corp. Aisin and Toyota Industries Corp which are direct suppliers and companies with direct or indirect ownership ties with the Toyota Group.

The differences across the relationship types emerge when performing analyses on the invention level. We first carried out a probit model to estimate the differences between the single-owned and co-assigned inventions. As expected the number of inventors is significantly larger (the simple mean values are 4.4 and 2.5 respectively for co-assigned and single-owned inventions) which is likely to be associated to the involvement of one team of researchers from each of the involved co-assignee. Also the other proxies of complexity, the number of backward citations and the technological scope, although with a small average marginal effect (around 2% each), are higher for the co-assigned inventions. Moreover the co-assigned inventions are more often in technological fields which are not the common ones covered by the focal firm. From the evidence, we argue that the automakers generally co-develop inventions which are more complex and in technological domains where the focal firm has less expertise.

The results from the second econometric model suggest that the technological relevance is not the same across the co-assigned inventions when distinguishing by the type of relationship with the R&D partner: the results point to a higher value of patented inventions for subsidiaries and suppliers while a collaboration with allies is not associated to an improvement in the average technological relevance. This evidence indicates that firms are more able to generate valuable innovations collaborating with partners with a tighter relationship correspondent either to the direct ownership or the existence of a solid supply contract, that is driven by the lower *a priori* risk of disclosing technologies and revealing competences. The examined firms might have found difficulties in the R&D collaboration process with allied partners, ending up with a lower-than-average invention. An additional explanation might concern the fact that the co-owned patent may represent an important landmark in the R&D alliance (Hagedoorn *et al.*, 2003) and signifies its

successful completion or even a specific contract milestone included to ease the technology management as a whole. In other circumstances, sole ownership of the co-developed knowledge might not be feasible since the partner may well be unwilling to relinquish control, forcing partners to co-own the technology; hence, collaboration and IP sharing may be the only route to successful invention (Belderbos et al., 2013). In these situations, the companies might file patent applications with no interest in their actual value.

These findings confirm that the choice of the governance mechanisms appears to be key in order for automakers to access external specialized knowledge while avoiding issues of partner's opportunism, knowledge leakage, and appropriability (Trombini and Zirpoli, 2013).

5.1 Theoretical and managerial implications

The present study reveals useful insights both for the academic community and managers. As far as the theoretical implications are concerned, our study has made several contributions to the study of R&D collaborations and co-patenting literatures. First, it presents an alternative approach for investigating co-patenting with partners having different types of relationships, providing a more fine-grained distinction among different types of partner. Compared with some similar studies (e.g., Belderbos *et al.*, 2013) which mainly analyse the cooperation with suppliers, customers and competitors and universities, our findings examine the co-patenting strategies between automakers and its allies, subsidiaries and suppliers, since the initial contractual design of technology partnerships can have important value-creation implications (e.g., Sampson, 2004; Faems *et al.*, 2005). Second, the study explores the value of co-owned patented inventions depending on the type of relationships the focal firm has with its R&D partners, thus responding to an explicit call for research investigating if, and to which extent, R&D policies such as direct subsidies for R&D collaboration, for instance, play a role in driving either kind of collaborative activity as well as the effects on patenting both in terms of quality and quantity (Hottenrott and Lopes-Bento, 2012). Third, the combination of two different databases which allow to integrate patent data with information about the governance mechanism is particularly valuable from a methodological point of view, as well as the use of inventions instead of patents. Last, since the propensity to co-patenting provides an indication of the propensity to R&D collaboration and, thus, to open

innovation, this paper contributed to the enlargement of the literature regarding open innovation which continues to be innovation has become one of the hottest topics in innovation management (Huizingh, 2011).

In addition, our findings provide some important implications for managers concerned with IP ownership. In particular, it offers useful insights concerning the different strategies a firm may pursue in order to share IP with its R&D partners, as well as a possible trajectory in order to improve their co-patenting strategy. In addition, we argue that the preference towards subsidiaries and suppliers rather than allies might be connected to firm risk aversion, as the econometric invention-level analyses demonstrate. Hence, managers need to take into account that *ex-ante* negotiations on co-patenting arrangements may have a beneficial impact on the value-creation dynamics in collaborative R&D, overall with allies. Moreover, results related to the technological relevance of co-owned patented inventions suggest that focal firms co-develop inventions which are more complex and in technological domains where the focal firm has less expertise, which could be used commercially in order to enhance their reputation.

5.2 *Limitations and opportunities for future research*

We acknowledge that our study has several limitations. One of which is that the empirical results are derived from four automakers which have been considered as exemplars of different strategies concerning the appropriation of the results of co-innovation. Future studies could investigate this issue for more cases in the automotive sector, as well as in different industries, in order to extend the generalization of the findings and test the taxonomy proposed for co-patenting strategies. Moreover, this is an exploratory study based only on secondary data. For this reason, primary data collected directly from companies, but always related to co-patents as the output of collaboration with external partners for innovation, could reveal significant supporting insights. Further, we did not discriminate among the different alliance forms, which could represent another possible extension of our study. In addition, some more interesting issues such as the consequences, for example from a financial and economic perspective, of the adoption of different co-patenting strategies could be explored in future research.

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Appendix

Table 7 Most frequent IPC classes in the portfolio of single-owned inventions

Automaker	IPC Class	Description	Share
BMW	B60	vehicles in general	39,8%
	B62	land vehicles for travelling otherwise than on rails	16,4%
	F02	combustion engines; hot-gas or combustion-product engine plants	12,9%
	F16	engineering elements or units; general measures for producing and maintaining effective functioning of machines or installations; thermal insulation in general	12,5%
	F01	machines or engines in general; engine plants in general; steam engines	10,3%
FRD	B60	vehicles in general	36,3%
	F02	combustion engines; hot-gas or combustion-product engine plants	29,4%
	F01	machines or engines in general; engine plants in general; steam engines	18,1%
	B62	land vehicles for travelling otherwise than on rails	10,7%
	F16	engineering elements or units; general measures for producing and maintaining effective functioning of machines or installations; thermal insulation in general	10,6%
TTA	B60	vehicles in general	31,2%
	F02	combustion engines; hot-gas or combustion-product engine plants	30,4%
	F01	machines or engines in general; engine plants in general; steam engines	18,2%
	H01	basic electric elements	14,4%
VLW	B60	vehicles in general	50,9%
	F02	combustion engines; hot-gas or combustion-product engine plants	15,8%
	G06	computing; calculating; counting	12,8%
	F16	engineering elements or units; general measures for producing and maintaining effective functioning of machines or installations; thermal insulation in general	11,2%

The Management of Intangibles for Sustainable Growth. Is there a link with the Dow Jones Sustainability Index (DJSI)?

Paola Demartini *, Mauro Paoloni, Cristiana Bernardi

Department of Business studies
University of Rome TRE
Via S.D'Amico 77 -00145 Rome, Italy

** Corresponding author*

Structured Abstract

Purpose – The present contribution addresses the implementation of an Integrated Management Control System which aims to combine the company's intangible resources, known in literature as Intellectual Capital (IC), with long-term sustainability factors. The study concerns a company operating within the Aerospace and Defence field which has developed an Intellectual Capital report in order to manage sustainability projects and meet the stringent criteria required for inclusion in the Dow Jones Sustainability Index (DJSI).

Design/methodology/approach – The qualitative research approach underlying the investigation is Interpretivism; more specifically, the study was conducted in the light of "action research" (Dumay, 2010). Data were gathered from in-depth interviews with managers as well as from group discussions. A framework aiming at fostering a sustainable management strategy was elaborated and successfully applied to a series of specific corporate initiatives..

Originality/value – The paper contributes to the extant literature by questioning whether it is possible to link IC and sustainability initiatives in order to have a positive impact on the assessment process companies are subject to for inclusion in the DJSI. As per today, in fact, no research paper has addressed this topic.

Practical implications – The outcomes of the research suggest that the adoption of an integrated management control system, providing a link between intangible assets and capabilities that create value within a sustainability framework, not only provides an effective support to general management but it could be reasonably assumed to have a positive impact on the assessment process companies are subject to for inclusion in the Index.

Keywords – Intellectual Capital, Corporate Sustainability, Dow Jones Sustainability Index, Integrated Management Control System.

Paper type – Academic Research Paper

1. Introduction

Over recent years, the phenomenon of Socially Responsible Investment has grown significantly: in response to the recent corporate scandals that have marred the international financial scenario, there has been an increased pressure on enterprises to integrate the three pillars of sustainability into general business management. According to *Artiach et al.* (2010), corporate sustainability performance “measures the extent to which a firm embraces economic, environmental, social, and governance factors into its operations, and ultimately the impact they exert on the firm and society”.

As a consequence, a considerable number of companies has strengthened its commitment to corporate sustainability by providing external stakeholders - such as providers of funds, customers, suppliers, employees, local communities and government - with supplementary non-financial statements, along with traditional accounting ones. The main aim of such a voluntary disclosure is to shed light on the firm’s value creation and distribution processes; additionally, these reports can be regarded as a means of communication to those investors who determine their portfolios’ asset allocation on the basis of a company’s commitment to the concept of sustainability.

In response to the emerging collective interest in Socially Responsible Investment (SRI), also termed *ethical or sustainable* investment, and with the aim of providing investors with further insight into corporate sustainability performance, organizations of recognized prestige have developed indexes linked to financial markets (*López et al.*, 2007; *Searcy & Elkhawas*, 2012). Among these, of particular prominence are the Dow Jones Sustainability Indexes (DJSI) and the FTSE4Good Index (*Knoepfel*, 2001; *Cerin & Dobers*, 2001; *Chatterji & Levine*, 2006).

In our paper the attention is focused on an Italian entity operating within the Aerospace and Defence field; the holding company of the high-tech Group, listed in the FTSE MIB and the NYSE, has been recently included in the Dow Jones Sustainability Index (DJSI). As a consequence, the management of the analyzed entity has decided to issue a master plan to implement specific sustainability initiatives meanwhile looking for a financial rationale to justify its decision making.

With the purpose of broadening the functionality of existing models, we suggest an integrated management control system which, providing a link between intangible assets and capabilities that create value for a sustainable development, can be regarded as an effective support to corporate management.

In particular, it could be reasonably assumed that the adoption of an integrated management control system may positively impact the assessment process companies are subject to for inclusion in sustainability indexes.

From a methodological point of view, the investigation is the result of an on-going research project carried out together with the management of the analyzed company, that is, it takes an “action research” perspective. The observations and conclusions reached here are limited to this case study and based on the Authors’ interpretations of facts; therefore care should be taken in generalizing any of the outlined findings.

The paper is structured as follows. In Section 2, brief review of the relevant literature on sustainability indexes and management control systems is presented. The research methodology is described in Section 3, whereas Section 4 summarizes the findings of the analysis. Conclusions follow in Section 5.

2. Literature Review

Socially Responsible Investment and Sustainability Indexes

Over recent years, commitment to corporate sustainability - by definition “a business approach that creates long-term shareholder value by embracing opportunities and managing risks deriving from economic, environmental and social developments” (RobecoSAM, 2013) - has been gaining increased prominence worldwide. In the wake of the international financial meltdown, the general awareness of corporate misconduct has indeed undeniably amplified the pressure on enterprises to demonstrate their performance in terms of contributions towards the social and environmental dimensions.

The growing awareness that ‘ethical’ investments might produce better financial performance, has prompted numerous companies to publish on a voluntary basis *ad hoc* reports, commonly referred to as sustainability reports, with the aim of guiding investment decisions (Berthelot *et al.*, 2012). Within this context, the Global Reporting Initiative (GRI), has issued a set of guidelines which provide the most recognised global framework for sustainability reporting. Nonetheless, most of the indicators displayed in sustainability reports is qualitative in nature and, therefore, do not lend themselves well to financial valuation (Lackmann *et al.*, 2012).

With the aim of providing guidance for investors seeking further insight into sustainability performance, an array of sustainability indexes has been designed to measure the performance of those firms that set industry-wide best practices with regard

to sustainability. For companies, inclusion in Socially Responsible Investment indexes can be regarded as a means to enhance corporate reputation by signalling responsible behavior: it has indeed been argued that sustainability indexes serve as informational intermediaries between companies and their stakeholders (such as analysts, brokers, and financial institutions) by evaluating the disclosed sustainability related information (*Robinson et al.*, 2011). From the investor's point of view, such indexes provide an independent and reliable tool which allows investors to identify the world's sustainability leaders for different industries and to perform regional and global benchmarking (*KPMG*, 2013).

On the academic side, the extant literature on sustainability indexes has tried to point out whether inclusion in, or deletion from, such indexes has a significant impact on the value of listed companies (*López et al.*, 2007; *Curran & Moran*, 2007; *Consolandi et al.*, 2009; *Doh et al.*, 2010; *Cheung*, 2011; *Robinson et al.*, 2011; *Becchetti et al.*, 2012; *Clacher & Hagenrdoff*, 2012; *Lackmann et al.*, 2012), the relative strengths and weaknesses of these indices (*Chatterji & Levine*, 2006) as well as benefits and challenges of sustainability ratings (*Delmas & Blas*, 2010; *Sadowski et al.*, 2010; *Windolph*, 2011). However, as pointed out by *Fowler and Hope* (2007) and more recently by *Searcy* (2012), little is currently known about how sustainability indices are used in practice by corporations and what steps corporations have taken to be or remain included in the DJSI.

Within the realm of sustainability indexes, the most widely recognized are the Dow Jones Sustainability Indexes (DJSI) and the FTSE4 Good. Since the examined research project involves a company which has been recently listed in the DJSI, in the following a brief overview of the aforementioned is provided.

Dow Jones Sustainability Indexes

Established in 1999, the Dow Jones Sustainability Indexes (DJSI) track the performance of the world's largest companies leading the field in terms of corporate sustainability, i.e. "a company's capacity to prosper in a hypercompetitive and changing global business environment" (*RobecoSAM*, 2013). The DJSI family, maintained collaboratively by S&P Dow Jones Indices and RobecoSAM, includes global and regional broad market indices, sub-indices excluding alcohol, gambling, tobacco, armaments and firearms and/or adult entertainment, and global and regional blue-chip indices.

Since its inception, Robeco SAM has been conducting the annual Corporate Sustainability Assessment (CSA): over 2.500 of the largest companies in terms of float-adjusted market capitalization from all industries within the Dow Jones Global Total Stock Market Index are invited to participate in RobecoSAM's CSA. The assessment, based on information provided by the companies through the online questionnaire, is built on a range of financially relevant sustainability criteria covering the economic, environmental and social dimensions. Each single dimension is initially given equal weighting (33%) and includes a defined set of general criteria (Table 1); industry-specific criteria are also evaluated. Each indicator receives a score of between 0-100 points, which is then multiplied by the weight of the industry-specific relevant criteria.

Economic Dimension	Environmental Dimension	Social Dimension
<ul style="list-style-type: none"> • Corporate Governance <ul style="list-style-type: none"> • Codes of Conduct, Compliance, Corruption & Bribery • Risk & Crisis Management • Customer Relationship Management • Investors Relations Management 	<ul style="list-style-type: none"> • Environmental Management System • Environmental Performance <ul style="list-style-type: none"> • Climate Strategy • Product Stewardship • Biodiversity 	<ul style="list-style-type: none"> • Human Capital Development • Talent Attraction and Retention • Occupational Health and Safety • Stakeholder Engagement • Social Reporting

Along with the Corporate Sustainability Assessment and in conjunction with RepRisk - the leading provider of information on compliance by companies with the principles of the UN Global Compact - a Media and Stakeholder Analysis (MSA) is carried out. The purpose of the MSA is “monitoring media and stakeholder commentaries and other publicly available information from consumer organizations, NGOs, governments or international organizations to identify companies' involvement and response to environmental, economic and social crisis situations that may have a damaging effect on their reputation and core business” (RobecoSAM's Corporate Sustainability Assessment Methodology, 2013 p. 10).

Should a company incur a reputational risk - such as economic crime or corruption, fraud, illegal commercial practices, human rights issues, labor disputes, workplace safety, catastrophic accidents or environmental disasters – the information publicly available is taken into account in calculating the total score of MSA.

In the light of what has been said above, there is no doubt that a sustainability-oriented management control system, could significantly have a positive impact on the assessment process companies are subject to for inclusion in the DJSI.

Consequently, we suggest that:

Proposition 1

A sustainability-oriented management control system, could significantly have a positive impact on the assessment process companies are subject to for inclusion in the DJSI.

3. Research Methodology

The theoretical paradigm underlying our research is the interpretivist model. In light of interpretivism, sociological phenomena cannot simply be observed but must also be interpreted by the researcher. This means that there is not one absolute reality, but rather different possibilities are generated by the perspective adopted to interpret the facts (ontological dimension). Moreover, there is no separation between researcher and subject since the process of understanding derives from deductive-inductive development (epistemological dimension) (Ryan *et al.*, 2002, p.34).

The selection of a company belonging to the aerospace and defence sector is consistent with our research aims because in this sector there are large global competitors, whose products and services incorporate a high value of high technology that spreads not only from the financial capital of the firms but also from its human, structural and relation-based capital spheres.

In particular we decided to focus on the case of a large company leader in systems integrators whose headquarters are located in Italy. The selection of this entity is consistent with our research addressing the management choice of a specific IC approach among the several existing in literature. In recent years the company's CEO has demonstrated his interest in increasing the company's IC through the realisation of an organisational unit entirely devoted to promoting product innovation, increasing patents and trademarks, strengthening personnel competences and enabling communities and academic relationships.

Finally, the company CEO is concerned with adopting an IC measurement approach. This allowed us to be involved in a company project aiming to identify, measure and

manage intangibles resources. Our analysis offers also a picture of how managers can intervene in processes of knowledge development, sharing and application within the firm.

Accordingly it is extremely important to define our role, as researchers inside the company, which was not of researchers just observing phenomena, nor consultants but rather driven by “action research” principles.

3.1 Action research

Action research attempts to combine the process of research and action based on what *Shein* (1987) describes as a key assumption – that one can never really understand any human system without trying to change it. Thus, a key aim of action research is to increase both researchers’ and practitioners’ understanding. *Reason & Bradbury* (2006, p. 1) define action research as a process that “...seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people”.

The researcher is seen to act on that situation in concert with the host organisation, observes process and outcome, and analyses findings in view of the relevant literature. This methodology not only reflects upon the observations of the researcher, but also on the impact the interventions have in the organisation. The main benefit for researchers is the ability to develop insights into the implementation of new management innovations in organisations; for practitioners the benefit is to gain the assistance and knowledge of academics as a resource in the implementation process (*Dumay*, 2010).

There is not an agreed set of methodological protocols, or rules, shared by all researchers; however action research usually begins with the establishment of initial contact between the action researcher and representatives of the organisation. This early stage of research, often called the entry stage, entails identification of perceived ongoing problems within the organisation, who “the client/stakeholder” is, and who will participate in the research, how, where and when.

During the entry stages of the action research process, either the organisation or the researcher can take the initiative in presenting the problem. The action research mode involves a close collaborative relationship, where there is a mutual agreement at each stage of the action research sequence in order to contribute both to the practical concerns of people and to the goal of social science. Diagnosis is a pivotal stage in action research

because the researcher may introduce a conceptual scheme and theories to organisational members that enable them to reinterpret how they understand their situation. The aim is to develop an organisation's members understandings and to co-determine and plan possible interventions.

4. Analysis and Findings

4.1 Context: the aerospace and defence sector and company management

Players in the aerospace and defence sector are generally large, integrated multinational companies that are highly diversified in terms of both the products they manufacture and their geographical presence. This scale makes it difficult for new companies to enter the market, a problem further exacerbated by the high capital outlay and expertise needed for market success to be achieved. Rivalry in this market is strong. Expertise and knowledge is crucial to the success of companies, as the work is highly specialised. Companies in the industry are obliged to adhere to strict regulations involving national security, export restrictions and licensing for military goods, accounting rules and safety requirements.

The analysed company, entirely owned by an Italian listed multinational company, designs and develops Large Systems for Homeland Protection, systems and radars for air defence, battlefield management, naval defence, air and airport traffic management, coastal and maritime surveillance. Considering the strategic sector in which the company operates, detailed information about the company is not included and not relevant in order to discuss our findings.

4.2 The entry stage

Alvesson and Deetz (2000, p. 17), said that the task of "insight" is to demonstrate "our commitment to the hermeneutic, interpretive and ethnographic goals of local understandings closely connected to an appreciative of the lives of real people in real situations". So, insight from a critical interventionist perspective involves trying to understand the impact of practice on both people and the organisations to which they belong.

The early stage of research, often called the entry stage, entails identification of: perceived ongoing problems within the organisation, who "the manager/stakeholder" is, who will participate in the research, and how, where and when.

Thus, the first issue is the identification of the main users of IC information. In the case study analysed the primary IC information user identified is the company's top management. While disclosure of IC information to external stakeholders is a further important aim, it is not included here because the entry stage was focused on managerial decision making.

The joint research group was composed of two managerinvolved in the project and two academics. In the entry stage the main role of the researchers was to introduce the IC conceptual scheme and theories to organisational members enabling them to reinterpret how they understand their company, while the main role of the practitioners was to assess their usefulness in practice.

Supervisors of the research group outcomes were a senior professor and the company CFO, while the main goal was to present for validation to the company's CEO a model to evaluate the measurement and management of the intangible assets of the company, which can be integrated in managerial practices supporting company decisions.

During the entry stage of the action research process, either the manager or the researcher can take the initiative in presenting the problem. In a consulting environment, the client most usually presents the problem, and in "basic" research the researcher generally asks for access to research a problem in which he or she is interested. The essential difference between the action research mode and the others lies in the former's close collaborative relationship, where there is a mutual agreement at each stage of the action research sequence in order to contribute both to practical concerns and to the body of knowledge.

4.3 Diagnosis

Diagnosis forms a pivotal stage in action research; it implies an understanding of the organisational context, an analysis of the practical problems and challenges faced. Diagnosis entails also the production of ideas for how to change the organisation.

In this case, the "researcher and "practitioner" create a model to evaluate the measurement and management of the intangible assets of the company, which can be integrated in managerial practices supporting company decisions.

4.3.1 Visualizing the company's Intellectual Capital within a sustainability framework

All the information gathered about the sector and the company profile allowed us understand why it is of crucial importance for the company to focus its attention on intangible resources. In fact, due to the fast growing competition in innovation and new technologies, the company constantly needs to increase intangible stock, as well as the effectiveness and efficiency of its use.

The first step of the process consists of the mapping of the available intangible resources that must be reinforced or acquired in response to management's suggestions and that support the strategic objectives of the company (Demartini & Paoloni, 2013) (see Figure 1).

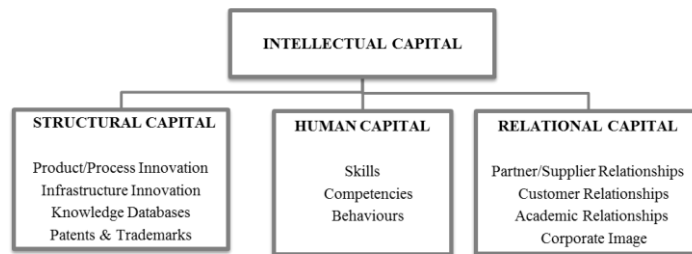


Figure 1: Case study - Visualizing IC

Next, coherently with the new sustainability thinking, the Top Management decided to integrate the aforementioned IC visualization of the company with sustainability categories (Figure 2). It has therefore been decided to integrate the proposed scheme with the main intangibles which are monitored and assessed by the Dow Jones Sustainability Index (RobecoSAM, 2013).

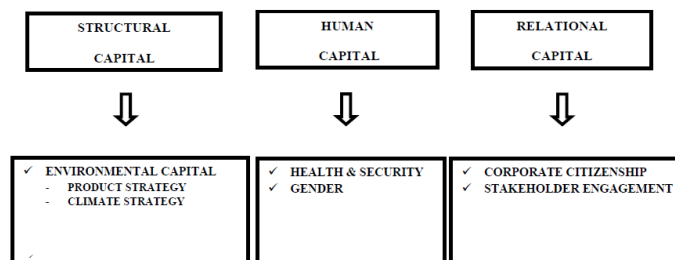


Figure 2 – Implementing Sustainability categories as per DJSI

Afterwards, each project launched by the company that has a relevant impact on IC undergoes calculation, evaluation and reporting. Even in this case, the traditional vision of IC is used in the three areas represented by Structural, Human and Relational capital.

On one hand, the application of the model represents a managerial innovation for the company's single unit whereas, on the other, it offers an powerful reporting tool for the whole firm.

4.3.2 How the process works in practice

The pilot project the research group was responsible for concerns the implementation of the outlined model to a series of specific initiatives that the company planned for 2013 in line with a sustainable management, namely: *Life Cycle Assessment (Eco Design)*, *Eco Recycling*, *Age Diversity Management*, *Green Communication*, *Green Procurement* and *Charity & Welfare*.

As this project is ongoing, the following analysis concerns only the IC Measurement activity. The Intellectual Capital Measurement model implies the identification and use of a tailor-made measurement system. In order to monitor each single initiative, a set of performance indicators is available:

- *effectiveness indicators* (to monitor if the organization has reached the planned goals);
- *efficiency indicators* (to monitor the related costs);
- *indicators to measure the impact the initiative has on the company's IC* and
- *indicators to measure financial performance*.

In the following, in order to show how the process works concretely, we will concentrate on the *Green Communication* and the *Green Procurement* initiatives.

Green Communication Initiative

The aim of the project is to set a plan for communication, both internal and external, in order to increase the awareness of the company's commitment to sustainability. To this end, the company has decided to realize a communication campaign addressed to external stakeholders (local authorities and communities, customers, etc...) in order to communicate the low impact of radar emissions on the population. Moreover, a digital "green platform" giving information on the web about the company's sustainable projects has been launched.

Indicators are defined by personnel in charge of specific initiatives with the support of experts on intangibles management control, whose task is to gather data for management reporting. Possible indicators - useful for the *Green Communication* initiative - are listed in Table 1.

Table 1 – Indicators for *Green Communication* initiative

EFFECTIVENESS AND EFFICIENCY INDICATORS		EFFECTS ON FINANCIAL PERFORMANCE (SHORT AND MEDIUM/LONG TERM)
<p><u>EFFECTIVENESS</u> Indicators with respect to the fixed goals</p> <p><u>EFFICIENCY</u> Incurred vs estimated costs</p>		<p><u>REVENUES INCREASE</u> Potential increase in revenues due to an increase of the "green" value perceived by customers, local governments and end users.</p>
IMPACT ON INTELLECTUAL CAPITAL		
STRUCTURAL CAPITAL	HUMAN CAPITAL	RELATIONAL CAPITAL
<p><u>INFRASTRUCTURES INNOVATION</u> Number of implemented portals</p> <p><u>ENVIRONMENTAL CAPITAL</u> PRODUCT STRATEGY: Reduction of paper use for promotional material / leaflets / brochure (€)</p>	<p><u>BEHAVIOURS</u> Degree of diffusion of "green" culture within the company (to be measured with a proxy, e.g. how many times the portal has been accessed)</p>	<p><u>STAKEHOLDER ENGAGEMENT</u> Effectiveness of the digital "green" platform (to be measured with a proxy, e.g. . how many times the portal has been accessed)</p>

Green Procurement Initiative

The aim of the project is the review of the process that leads to the inclusion in the register of suppliers, as well as the related evaluating/monitoring criteria and the associated documents (letter, questionnaire, evaluation form, etc.) in order to take into account the sustainability requirements expressed in the Dow Jones Sustainability Index questionnaire. To this end, the letter sent to the suppliers for inclusion in the register has been revised and then published on the company's intranet. Additionally, new requirements have been introduced both in the questionnaire and evaluation form.

Even in this case, indicators will be defined by personnel in charge of specific initiatives with the support of experts on intangibles management control, whose task is to

gather data for management reporting. A list of possible indicators - useful for the *Green Procurement* initiative – is shown in Table 2.

Table 2 – Indicators for *Green Procurement* initiative

EFFECTIVENESS AND EFFICIENCY INDICATORS		EFFECTS ON FINANCIAL PERFORMANCE (SHORT AND MEDIUM/LONG TERM)	
<p style="text-align: center;"><u>EFFECTIVENESS</u> Indicators with respect to the fixed goals</p> <p style="text-align: center;"><u>EFFICIENCY</u> Incurred vs estimated costs</p>		<p style="text-align: center;"><u>REVENUES INCREASE</u> Increased revenues (greater value in use for customers) in the medium/long term Capitalization of patents and environmental certifications (to be evaluated ad hoc)</p> <p style="text-align: center;"><u>COST REDUCTION</u> Reduction of volumes, packaging, transport and energy costs (€ or %) in the medium/long term</p>	
IMPACT ON INTELLECTUAL CAPITAL			
STRUCTURAL CAPITAL		HUMAN CAPITAL	RELATIONAL CAPITAL
<p style="text-align: center;"><u>PROCESS INNOVATION</u> Number of new processes integrated into the management system</p> <p style="text-align: center;"><u>INFRASTRUCTURES INNOVATION</u> Number of implemented portals Digital Supplier Register</p> <p style="text-align: center;"><u>ENVIRONMENTAL CAPITAL PRODUCT STRATEGY</u> Reduction of the volume of hazardous substances (€ or %); Reduction of volumes/reduction of packaging and transport costs (€ or %)</p> <p style="text-align: center;"><u>CLIMATE STRATEGY</u> Reduction of CO2 emissions (€ or %) Reduction in energy consumption (€ or %)</p>			<p style="text-align: center;"><u>SUPPLIER RELATIONSHIP</u> Number of suppliers that meet “green” requirements (% of green procurement)</p>

5. Discussion and conclusion

The opportunity to be involved in a research group allowed us to follow the process of choosing a useful IC approach/tool. As this project is ongoing, the following discussion analyses only the diagnostic stage; discussion on the implementation of the pilot project will follow next year.

The traditional tripartite IC model takes into account the human, structural and relational capital as assets of the company and, therefore, examines how they can be best developed according to the company's strategy. Sustainability responds to the expectations of the stakeholders by developing and maintaining a social justification for the company.

As argued by *Surroca et al.* (2010) and *Perrini et al.* (2012), we believe that intangibles are the mediating variables between sustainable management and corporate financial performances. This kind of projects, in fact, supports firms in the accumulation process of intangible resources, such as skills, competencies, knowledge, innovation, values, legitimacy, trust and reputation. So far, it is clear that in a knowledge economy, Intellectual Capital is the driver for "creating and managing sustainable competitive advantage" (*Petty & Guthrie*, 2000, p.155) and for value creation in the medium-long run (*Lev* 2001).

In regard to Proposition 1 - *a sustainability-oriented management control system, could significantly have a positive impact on the assessment process companies are subject to for inclusion in the DJSI*, we believe that the application of the outlined model represented an organizational innovation that significantly contributed to the company's managerial system, helping to maintain inclusion in the DJSI.

Consistent with *Orth and Kohl* (2012), we deem that more focus should be placed on the concept of how integrated thinking is embedded within an organization, rather than concentrating only on the content and features of the company's voluntary disclosure such as Intellectual Capital Statement, Sustainability reporting or an Integrated document.

In our case study, Top Management awareness of the usefulness of integrating IC and corporate social responsibility perspectives into the company's management system and communication process arose following the inclusion of the company in the Dow Jones Sustainability Index.

Furthermore, our findings aim to demonstrate that measurement is not the main goal of managerial accounting, rather a means to manage and create value. As *Mouritsen &*

Larsen point out (2005), in fact, there is an additional *management control agenda* where information about IC is an input to management activities. This means, to be able to understand the relationships existing between measurement on one side and operational activities, strategies and context on the other. In such a way, we founded that is crucial for managers to be aware of the mechanism that allows a certain sustainability-driven initiative to increase specific intangibles (operational-side) and which intangibles need strengthening in order to increase the competitive advantage of a firm (strategy-side) within a particular context.

To date, the main critical factor arising from the diagnostic stage is the accurate identification of the projects and the actors involved in the new process for the identification, measurement and management of Intangible Capital.

The process mentioned above provides a comprehensive view of IC practices within the company; however, in order to make it work, the cooperation of all owners of the information is requested. Retrieving data involves identifying such individuals, which is not always easy in a big business reality; it also implies interfacing with the various parties to obtain all contributions. This is not straightforward since the model is still at an experimental stage and not yet widely accepted in the business management system. To overcome these obstacles that might impede the implementation of IC management procedures within the firm, we suggest pilot projects are a convenient starting point so that emerging problems and opportunities can be dealt with as they arise by personnel involved in day-to-day activities. The chance that a new reporting system is effective relies also on its “value in use” as perceived by the “owners” of the information.

Despite the critical aspects of the model, there are also many advantages. Thanks to the holistic view of the entire IC within the company, through an approach based on monitoring each single initiative, it was possible to implement actions to support the management of these projects, bridging the inefficiencies that would otherwise remain.

The observations and conclusions are limited to the analyzed case study and based on the Authors’ interpretations of the facts. Therefore, care should be taken in generalizing any of the outlined findings. Future research will continue to monitor the way in which the company manages, measures and reports on its Intellectual Capital. Longitudinal research should continue to provide insights into managing, measuring and reporting IC over time.

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Negative Emotions and Knowledge Work Performance

Maiju Vuolle*, Harri Laihonen

Department of Information Management and Logistics
Tampere University of Technology
P.O. Box 541
FI-33101 Tampere, Finland

** Corresponding author*

Structured Abstract

Purpose – The purpose of this paper is to understand the role of negative emotions in modern work life. The paper aims to identify antecedents and consequences of negative emotions especially in the context of knowledge work performance. The viewpoint is managerial and underlying assumption that negative emotions are not always bad.

Design/methodology/approach – This paper is based on a literature review. First, the nature and roles of negative emotions in organizational context are investigated by analysing models and theories explaining how emotions are linked to workplace events, behaviors and outcomes. Second, antecedents and consequences of negative emotions and affective states (e.g., angry, frustrated, worried, sad) are explored. The paper aims to construct a conceptual model for the basis of later empirical research.

Originality/value – This paper introduces a managerial approach to identify and manage the triggers and impacts of negative emotions in knowledge-intensive organizations. To complement the more conventional approach of preventing and eliminating negative factors, this paper focuses on the positive aspects of negative emotions.

Practical implications – The outcomes of the paper provide new understanding for managing negative emotions in companies in a way that they can be transformed into positive asset and business value. This paper identifies various events and behavioral links that could be intervened and influenced in order to attain positive performance outcomes.

Keywords – Negative emotions, knowledge work, performance

Paper type – Academic Research Paper

1 Introduction

Individual knowledge workers are central performance drivers of knowledge-intensive organizations (Amabile, 1998; Dove, 1998; Drucker, 1999; Käpylä et al., 2011). Therefore, management literature has increasingly focused on the peculiarities of knowledge work and continuously seeks new ways of organizing and managing these valuable assets. The literature on knowledge-intensive organizations (Alvesson, 1993; Starbuck, 1992, 1993; Blackler, 1995) recognizes several organizational characteristics that need to be considered when developing management systems. Literature on knowledge workers, on the other hand, has focused more on the actual work and highlights the importance of objectives, purpose of work and provides various means to improve knowledge work performance (e.g., Davenport, 2008; Dove, 1998; Drucker, 1999; Miller, 1977).

The management literature has put a lot emphasis on contextual factors, ways of working and purpose of work. It has recognized motivational aspects of work and discusses ways to motivate and compensate knowledge workers. However, what has remained on a fairly little attention is the inner work life, which is an important driver of knowledge worker's performance (Amabile & Kramer, 2007). Despite all efforts and methods used by the organizations and managers, motivation and performance of a knowledge worker results from "the constant interplay of perceptions, emotions and motivations triggered by workday events, including managerial action" (Amabile & Kramer, 2007, p. 6). Therefore, a central question and challenge for modern management is to better understand how inner work life works and how we can affect personal motivation factors by better understanding the role of emotions in every day work-life.

The aim of this paper is to introduce and connect the concept of inner work life to knowledge-based management research and to contribute by recognizing the antecedents of knowledge work performance from this perspective. The study complements the existing knowledge-based performance management research by linking the emotional aspect of knowledge work to the existing frameworks. The benefits of positive emotions have received a lot of attention in recent years but the potential of negative emotions seems to be neglected in current literature. Negative emotions, such anxiety, fear and guilt are usually seen bad and leading nothing but stress, burnout and depression. However, this paper approaches those emotions from different point of view and suggests negative emotions should not be demonized. This paper considers situations where negative

emotions can lead to positive outcomes at work. Figure 1 presents the research framework for this study.

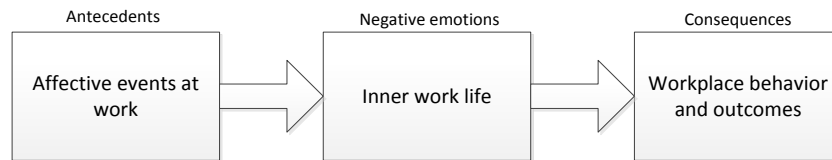


Figure 1 Research framework for analysing the role of negative emotions at work

This study was conducted using literature review method. Literature search was conducted through Scopus and Emerald using search terms related to emotions (affect, emotion, feeling and mood), words illustrating negative affectivity and emotions based on the hierarchy of basic negative emotions (e.g., negative, anger, anxiety, fear, sadness; see Fleur et al., (2003)) as well as words presenting workplace behavior and outcomes of knowledge work (e.g., performance, creativity, well-being). We first estimated the popularity of our topic by choosing three best ranked knowledge management journals based on the global ranking list of knowledge management and intellectual capital academic journals by Serenko and Bontis (2013). Using the search terms described above, we found zero paper. Thus, it is evident that the positive outcomes of negative emotions are neglected in current knowledge management research. Papers for this study were selected based on title, abstract and keywords. After reading the abstracts, articles were chosen for further analysis. The papers selected for this study investigate either positive and negative emotions or negative emotions alone and their links to the antecedents and consequences of emotions. All of the selected papers needed to have some sort of shift or twist of having positive outcomes from negative emotions and illustrations how negative emotions can be crucial part of creating positive outcomes.

The rest of the paper is organized as following. Section 2 examines previous definitions and frameworks for knowledge work and the performance of knowledge work in order to provide background for the context of this paper. Section 3 reviews the literature related the nature and roles of emotions and affects in organizational context and analyzes various models and theories explaining how emotions are linked to workplace events, behaviors and outcomes. Based on these studies we identify the antecedents and consequences of negative emotions. Section 4 presents the summary and the conceptual model of the emotions in knowledge work performance framework. The

concluding section summarizes the key findings of the paper and suggests directions for further research.

2 Performance of a knowledge worker

In 1959 Drucker proposed that knowledge worker is a person who works primarily with information or is who develops and uses knowledge at workplace (Drucker, 1959). Since then, knowledge work is defined in many ways but there is no generally accepted definition for it in the literature (Dahooie et al., 2011; Kelloway & Barling, 2000). For example, knowledge work has been defined as a profession, a characteristic of individuals, an individual activity and as organizational behavior that include the creation, application, transmission and acquisition of knowledge (see Kelloway & Barling, 2000). According to Davenport (2008), knowledge workers have high degrees of expertise, education or experience, and their jobs consist of the creation, distribution or application of knowledge. The main problem in defining knowledge work is that knowledge has some role in every work (Dahooie et al., 2011). Therefore, the various types and nature of knowledge work are important to understand in order to better manage, measure and improve the activities and performance of knowledge work. Knowledge workers can be classified, for example, based on the level of interdependence and complexity of work (Davenport, 2008), based on the mobility of work tasks (Greene & Myerson, 2011) or along the tacitness and learnability of work practices (McIver et al., 2013).

Performance can be viewed from various perspectives, such as individual work performance, team performance and organizational performance. In this paper, we focus on the work performance of individual knowledge worker. Work performance can be seen as a multidimensional concept, including task performance, contextual performance (or organizational citizenship behavior, OCB) and counterproductive work behavior (CWB) (see, e.g., Koopmans et al., 2013). Viswesvaran and Ones (2000) define work performance as “scalable actions, behavior and outcomes that employees engage in or bring about that are linked with and contribute to organizational goals.” Task performance refers to in-role behaviors that employees perform in exchange for pay. Contextual performance, on the other hand, include extra-role activities such as “volunteering to carry out actions that are not formally part of the job, helping others, following organizational rules or procedures when personally inconvenient, endorsing

and supporting organizational objectives and persisting with extra effort to successfully complete one's task". (Goodman & Svyantek, 1999).

The literature has suggested several performance management and measurement frameworks for approaching knowledge work performance (e.g., Jääskeläinen and Laihonen, 2014; Ramirez and Nembhard, 2004; Ray and Sahu, 1989; Takala et al., 2006; Thomas and Baron, 1994). Takala et al. (2006) approach the performance of strategic work from four aspects: results, process, behavior and physiology. Jääskeläinen and Laihonen (2013) recognize two specific components that relate to performance of knowledge-intensive organizations: performance of a knowledge worker and customer-perceived performance. The strength of these frameworks lies in recognizing the important value drivers (e.g., employee competencies and working atmosphere). More recent literature has stressed the changing nature of work-life and focused increasingly on new and smarter ways of working. This literature deals with the application of non-traditional and flexible work practices, locations and utilization of ICT for carrying out knowledge work (van der Voordt, 2004; Gorgievski et al., 2010; Palvalin et al., 2013; Ruostela et al., 2014). For example, Palvalin et al. (2014) introduced a framework for knowledge work performance in order to analyze and measure the impacts of workplace initiatives, such as office redesigns and mobile working (Figure 2). This framework recognizes contextual factors and personal ways of working as performance drivers. Contextual factors include physical location, virtual and social workplaces as well as organizational context (e.g., Bosch-Sijtsema et al., 2009; Vartiainen, 2007). Whereas contextual factors define the overall atmosphere and support for conducting knowledge work, personal ways of working measures whether the workers are willing or motivated to work efficiently (Ruostela and Lönnqvist, 2013; Koopmans et al., 2013). In this framework, the results and outcomes include well-being at work and productivity.

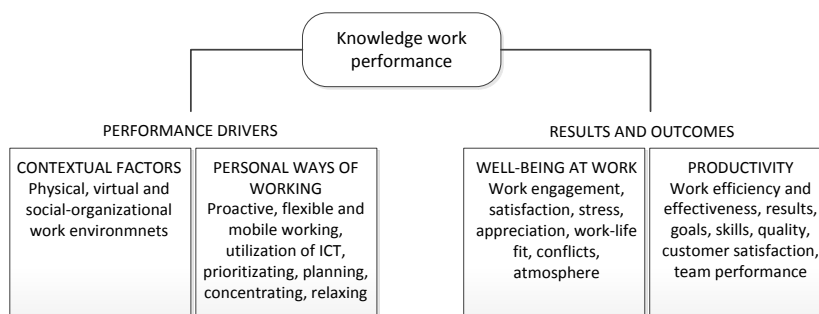


Figure 2. Knowledge work performance (Palvalin et al., 2014).

The framework provides good starting point for examining knowledge work performance as the importance of broader social and contextual elements have been noted in recent work design literature (Morgeson & Humphrey, 2008). However, it lacks the viewpoint of the task context, which provides understanding for the motivational work features, such as autonomy, task variety, significance, job complexity and feedback (Morgeson & Humphrey, 2008). It can be stated that employee's perception on these three aspects (task, contextual factors and individual work practices) affects his/her well-being and productivity. In this paper, productivity is linked to task performance as defined above. Inner work life acts as a mediator between the drivers and outcomes of work as depicted by the research framework presented in Figure 1.

Next, we investigate how emotions are linked to various types of performance drivers and outcomes in the previous literature. In this paper, drivers and outcomes are seen as antecedents and consequences of emotions.

3 Antecedents and consequences of negative emotions in workplace

3.1 Emotions and affect in workplace

Despite the increasing attention of management research towards workplace emotions, literature on knowledge-based management and especially knowledge work performance have paid almost no attention on these very profound phenomena of work life. In order to better understand how human affective experience influences on our work performance it is necessary to shortly present some of the key concepts. Fleur et al. (2003) propose a hierarchy of emotions presented in Figure 3. Emotions (or affects) are divided in to negative (sadness, fear, anger, and shame) and positive (contentment, happiness, love, and pride), which both consists of four basic emotions. Each of these categories of basic emotions contains several more specific emotions.



Figure 3. Hierarchy of basic positive and negative emotions (Fleur et al., 2003).

Fleur et al., (2003) studied consumers' emotions but here the similar categorizations are used for approaching workplace affects. An important distinctive characteristic of emotions is that those are always about something or someone (Cropanzano et al., 2003). This means that emotions have an object of interest or a defining event. This is important from the management perspective, because these objects and events offer concrete objects for management initiatives to focus on. Thus, if we can understand and recognize antecedents of certain emotions we can develop methods to avoid, overcome and harness these affects.

Yet, before proceeding to antecedents it is necessary to understand more about the dynamics of emotional life of human beings. Affect circumplex originally presented by Russell and Feldman Barrett (1999) and further developed by Cropanzano et al. (2003) offers a conceptual tool for studying the nature and dynamics of emotions. The circumplex is presented in Figure 4. Circumplex has two axes: high activation – low activation and pleasant – unpleasant. Various emotions can be categorized to the four quadrats of the circumplex.

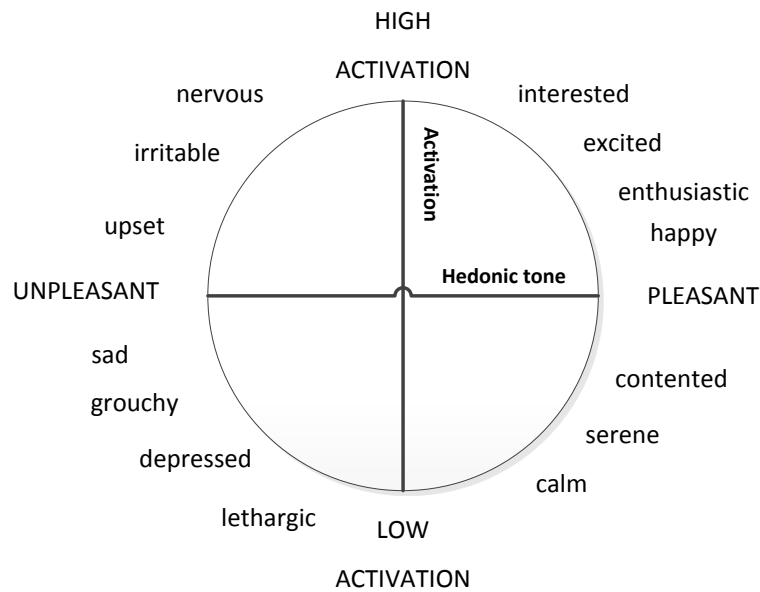


Figure 4. Circumplex of negative and positive affects (Adapted from Cropanzano et al., 2003).

Again from the management perspective it is important to understand, which emotions are so called high activation emotions. Further, it would be useful to have

methods and tools available for feeding these emotions and to provide early warnings when employees are having emotions that would take them to an area of low activation. This turns the question to the affective events that through employees' interpretation processes affect their working motivation and performance (cf. Amabile & Kramer, 2007).

3.2 Identifying antecedents and consequences of negative emotions

In their recent study, Ohly and Smith (2013) systematically identified and classified positive and negative work events. Based on affective events theory (AET), work events are important antecedents of distinct emotions, attitudes, and work behavior. Positive and negative affective work events were sampled from employees using a diary study design. They used concept mapping methodology as an exploratory approach to analyze the data on affective work events. Four positive and seven negative work event clusters were identified:

- Goal attainment, problem solving, task-related success
- Praise, appreciation, positive feedback
- Perceived competence in or through social interactions
- Passively experienced, externally determined positive experiences
- Hindrances in goal attainment, obstacles in completing work tasks, overload
- Conflicts and communication problems
- Technical difficulties, problems with work tools and equipment
- Managerial and internal problems, organizational climate
- Ambiguity, insecurity, loss of control
- Health problems and private issues
- Problems in interactions with clients or patients. (Ohly & Smith, 2013)

Some studies have investigated also the links between affective work events, negative emotions and positive performance outcomes. For example, Spector and Fox (2010) studied affective events as antecedent situations that can lead to the acts of counterproductive work behavior (CWB) and organizational citizenship behavior (OCB). They found that under some circumstances these active behaviors may occur together or sequentially. Using an emotion focused framework (boredom, anger and guilt), they discuss five situations that lead from one form of behavior to the other: Understimulation at work, co-worker lack of performance, organizational constraints, lack of expected

rewards for OCB, and unjustified (to the actor) acts of CWB. Negative emotions played a mediating role to each of these five situations. Understimulation can lead to boredom, co-worker lack of performance, organizational constraints, and lack of expected rewards can lead to anger, all of which can result in CWB. However, engaging in CWB under some conditions can lead to guilt and then OCB. Moreover, both productive and counterproductive extra-task behavior were linked to coping with feelings of boredom. Boredom can be seen as one type of work well-being, together with burned-out, work engaged, workaholic and 9 to 5 (or satisfied). Thus, when investigating emotions at workplace, employee well-being is useful to be defined as a multidimensional concept based on the both positive and negative reactions to job demands and resource. Each type is having different relationships with job and personal characteristics. (Salanova et al., 2014; Shaufeli & Salanova, 2014). It is suggested that boredom that is caused by understimulation can be transformed into positive outcomes.

There are various studies providing evidence on happy productive worker, that is, happiness improves productivity and performance of workers. However, there are also cases investigating angry knowledge workers, which means situations where negative emotions are associated with high performance. For example, Cushen and Thompson (2012) demonstrate that, contrary to mainstream and critical scholarship, skilled technical workers in knowledge-intensive firms can be uncommitted, angry and high performing at the same time. There are also more dynamic views on emotions at workplace. Bledow et al. (2011) present the affective shift model of work engagement that is based on the assumption that both positive and negative affect have important functions for work engagement. The model proposes that a core mechanism underlying the emergence of high work engagement is a shift from negative to positive affect. Work engagement results if people move from a situation in which negative affect is experienced to a state of high positive affect.

Creative performance is one important approach in knowledge work context as knowledge workers are expected to engage in continuous innovation and learning (e.g., Drucker, 1999). Creativity refers to both novelty and usefulness (Davis, 2009). There are models such as a mood-as-input and a dual-tuning perspective that explain conditions under which negative moods are positively related to creative performance (George & Zhou, 2002; George & Zhou, 2007). George and Zhou (2002) found that negative moods were positively related to creative performance when perceived recognition and rewards

for creative performance and clarity of feelings were high. Later George and Zhou (2007) developed a dual-tuning perspective concerning how positive and negative moods interact to influence creativity in supportive contexts. They found that when supervisors provided a supportive context for creativity and positive mood was high, negative mood had a strong, positive relation to creativity, with creativity being the highest when the context was supportive and both positive and negative moods were high. They explored three alternative ways in which supervisors can provide a supportive context: by providing developmental feedback, by displaying interactional justice, and by being trustworthy.

According to Gutnick et al. (2012) negative emotions have been shown to stimulate creative performance through increased persistence and that avoidance-related motivational states can enhance creativity by activating goal-directed behavior. They developed the pressure-creativity model that conceptualizes how pressure triggers challenge and threat appraisals, which in turn influences creativity by shaping employees' cognitive flexibility and/or persistence through pressure.

Table 1 Summary of the literature review

<i>Antecedents</i>	<i>Emotions</i>	<i>Positive Outcomes</i>	<i>Source</i>
Affective work events	Positive and negative emotions	-	Ohly & Smith (2013)
Understimulation, engaging in CWB	Negative emotions (boredom and guilt)	OBC (Contextual performance)	Spector & Fox (2010)
Job demands and job resources	Negative and positive emotions	Well-being	Salanova et al. (2014); Shaufeli & Salanova (2014)
	Affective shift model	Work engagement	Bledow et al. (2011)
	Negative emotion (anger)	High performance	Cushen & Thompson (2012)
	Mood-as-input model	Creative performance	George & Zhou (2002)
	Dual-tuning positive and negative emotions		George & Zhou, (2007)
	Positive, neutral and negative emotions	Creative performance	Davis (2009)
Work pressure	Negative emotions	Creative performance	Gutnick et al. (2012)

4 Summary: Negative emotions in a performance framework

The management literature considers work performance mainly as a straightforward phenomenon and mostly ignores workers individual perceptions and interpretations on the various events and incidents taking place within his/her workplace or its environment.

This paper contributes by highlighting the important role of employees' inner work life as a crucial determinant of work performance (cf. Amabile & Kramer, 2007). It is fairly well understood that positive mood and emotions drive motivation and lead to good performance. Majority of management literature and also management practice concerns ways to motivate and encourage employees to perform better. The other side of the inner work life has received less attention. Thus, the paper focused on negative emotions that are necessarily encountered in each workplace. The main interest of the paper was on the hidden potential of negative emotions, that is, whether there is something that could be turned into business potential or used as a performance driver.

The paper studied the phenomenon based on the literature review and aimed to recognize the antecedents and consequences of negative emotions. Figure 5 summarizes the findings of the literature review and constructs a conceptual framework that will be used as the basis for empirical research later on.

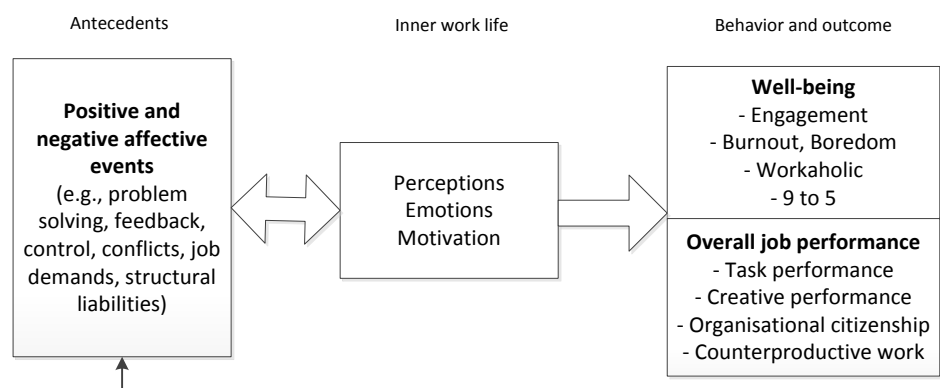


Figure 5 Conceptual model of emotions and knowledge work performance

The main contribution of the paper relates to the conceptualization of the phenomenon in connection to knowledge work performance. Emotions have previously been studied mainly in literatures of work, organization and personnel psychology. Here those are explicitly linked to the management of knowledge work and knowledge-based management more generally.

According to our literature review, there are situations where negative emotions can influence knowledge work performance in positive ways. The findings of the study can be summarized as following:

- 1) Negative emotions related to certain types of affective events, such as understimulation, pressure and previous counterproductive work behavior can lead to positive work behavior and high performance (e.g., Spector & Fox, 2010; Cushen & Thompson, 2012)
- 2) Negative emotions within inner work life can lead to engagement and creative performance through affective shifts and dual-tuning (George & Zhou, 2002; George & Zhou, 2007). There is also a curvilinear relationship between affective intensity and performance (Davis, 2009).
- 3) Negative emotions are related to various types of well-being (Salanova et al., 2014; Shaufeli & Salanova, 2014) and overall job performance of knowledge workers. The type of creative task and contextual perspective are important to take into account when analyzing situations in which negative emotions enhances performance.

5 Conclusions

Despite the increasing interest towards emotions in organization studies, emotions and especially negative emotions still seem to be neglected in knowledge management research. The paper was a first attempt to link these two research streams. The conceptual framework of the paper provides a starting point for the empirical research. It is interesting to see how the empirical findings correlate with the theoretical ideas presented in the paper. Already the very first interviews and other empirical experiences have shown that negative emotions and their antecedents are extremely difficult issues to be studied. However, empirical finding most certainly help in developing the model further. This provides an interesting research task for the near future.

Another future research task relates to the possible value of emotions and especially negative emotions on the renewal capability of knowledge workers and knowledge organizations. Individuals' ability to learn and tolerate continuous change and stress are strongly determined by their inner work life. Thereby, coping with the cognitive load of modern work life necessitates a careful analysis of various affects and emotions in

connection to more traditional approaches of work well-being and knowledge work productivity. A more in-depth understanding about the behavioural outcomes and inner work life discussed in this paper lays the foundation for approaching and improving knowledge workers cognitive capabilities and outcomes.

Further, building on the increased understanding about the phenomenon it is also possible to develop practical methods and tools both for the purposes of individual knowledge workers and managers. A practical tool box of methods for handling affective events causing negative emotions would be highly useful for us all. Thus, this research area relates closely to the management of knowledge assets and intellectual capital and should be discussed more intensively also in the knowledge-based management literature. There are also interesting research openings in the area, which have studied the positive side of negative emotions through emotion regulation and reappraising, which need to be more thoroughly investigated (e.g., Brooks, 2013; Grant, 2013).

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Business Model and Integrated Reporting: a first analysis

Roberto Aprile *

Department of Economics, University of Bologna
Via Zamboni, 33 - 40126 Bologna

Elisabetta Magnaghi

Department of Management, University of Lorraine
1 rue Augustin Fresnel – 57072 Metz
University of Pisa, Via C. Ridolfi 10 - 56124 Pisa

* *Corresponding author*

Structured Abstract

In this period we are assisting to some news having a strong impact on management of the companies, on reporting and on the standard setters activity. On one side the International Integrated Reporting is attracting more and more attention, not only from many companies, but also from many audit organizations and accounting standard setters. On the other one the management of large the Companies cannot avoid to consider, manage and report about social, environmental and governance issues, and this aspect is affecting the corporate reporting requiring to consider not only the traditional financial dimension, but also these further aspects. One of the main recent innovations about management and reporting is focused on the definition of models for sustainable growth and value creation dynamics according to a sustainable growth perspective. In this way we can find the work of the IIRC that has introduced the Integrated reporting and the Integrated report (IR). IR is strongly based on the concept of Business Model defined as “the chosen system of inputs, business activities, outputs and outcomes that aims to create value over the short, medium and long term”. On this issue, the Technical Task Force of the International Integrated Reporting Council (IIRC) established a Technical Collaboration Group (TCG) prepared the “*Background Paper for <IR>*”. Meantime a pilot program of the IIRC, which involves many companies with the purpose to verify and help the development of the Framework for the Integrated Reporting has been carried on.

The **aim of this paper** is to realize a first explanatory analysis of **Business model** considering three different aspects: the definition stated by IIRC and within its documents, the existing International literature where there is not an univocal definition and the empirical side represented by the Pilot Program of IIRC.

The **research question** is to identify which aspects of the BM should be considered in the light of these different contributions to better represent and report the sustainable growth and value creation dynamics according to a sustainable growth perspective. The paper also has the purpose to put in evidence eventually critical aspects in the BM rules and applications trying to shed more light on how this aspect could be really useful in the

successful development of the Integrated Reporting. This aspect is also relevant since IR represents a recent innovation it is not so much analysed by academics and it would require to be analysed basing on a theoretical perspective.

Three different **methodologies** are adopted: after an explanatory analysis of the International literature review about Business Model we would realize a Document analysis approach (Bowen, 2009) about the documents issued by the IIRC and a Case study approach for the empirical side of the research (Stake, 1993; Yin, 1995). **The empirical side will cover 18 Companies included in the Database of the IIRC.**

The originality of this paper is related both to the fact that it addresses a new issue that is not particularly analysed since it is young and since it is still developing, and to the complete approach of the analysis combining the theoretical aspects with the empirical applications of the companies.

Practical implications of this paper are connected to the fact that the findings could help companies in finding a better way of analysing, implementing and representing their Business Model generating a good outcome both for the entity and for its stakeholders. The results could also be useful for the IIRC that is still developing its standards.

Keywords: business model; integrated reporting; case study; value creation; intellectual capital.

Paper type: Academic Research Paper

1. Introduction and research objectives

One of the main introductory aspects to consider is that accounting and accountability change over years to face different users' requirement (Hopwood A., 1978; Hopwood, A. and Miller, P., 1994; Zambon S., 2002b; Zambon S. and Zan L., 2000). In this period, we can assist to an increasing need of extra-accounting information (also called non-financial information. See Beattie V. and Smith S.J., 2013) sometimes included in specific reports (IC Report, Sustainability Report, ...).

In the latest years an International Organization, the IIRC (*International Integrating Reporting Council*) is trying to reach a convergence by summarizing the main elements of these reports (included the financial report) in an unique report called Integrated Report (IR). This report, strongly focused on the *value creation process* finds one of the key elements in the definition (and connected reporting) of the Business Model (BM) of the entity.

Integrated Reporting represents substantially a recent issue that is still evolving, searching for a proper identity and a widespread adoption in the World, in particular with

reference to larger companies that mainly affect the environment in which they operate (in a wide sense meaning).

IIRC tries to define a model of report that could represent in a concise way the multidimensional performance and risks of the entities, together with their strategy of value creation, in the past, in the present and in the future.

This report has also an hidden purpose. By forcing entities to report such multidimensional analysis obliges them to consider the possible impact that actual actions can generate in the future helping executives and managers in perceiving better results for investors, for stakeholders and for entities themselves.

IR is strongly based on the concept of Business Model defined as “the chosen system of inputs, business activities, outputs and outcomes that aims to create value over the short, medium and long term”. On this issue, the Technical Task Force of the International Integrated Reporting Council (IIRC) established a Technical Collaboration Group (TCG) prepared the “Background Paper for <IR>”.

Meantime a pilot program of the IIRC, which involves many companies with the purpose to verify and help the development of the Framework for the Integrated Reporting has been carried on.

This paper tries to realize a complete exploratory analysis of the three dimensions involved, that are the analysis of the existing literature and of the theory addressing this issue, a study of the rules and definitions supplied by the IIRC and the practical approach of the entities in reporting about their BM.

This paper, as a consequence, combines a bottom-up approach to an upside-down one, trying to find common elements and diversities in the three levels of analysis.

2. Research Method

In this paper we adopt three different methodologies to approach the study of the Business Model proposed by the IIRC.

First of all we realize a deep literature review trying to find the common elements in the definition of Business Model and the elements that are considered to be much important for its understanding and for its reporting. As suggested by Beattie and Smith

(2013; p. 3), “*The concept [of BM] is holistic, multi-level, boundary-spanning and dynamic¹*”.

As a consequence it is not easy to find an unique theoretical background since many contributions arise from the management literature in general (that gave way to a more narrative-based rather than quantitative measure-based²); from the resource-based view (RBV) theory, from the strategic management perspective³ and from the dynamic capabilities concept.⁴ Another stream of research impacting on the BM can be found in the literature on strategic competitive advantage and in particular to the one specifically addressing, the business model^{5 6}.

Beattie and Smith (2013; p. 4) also add that, “*the frameworks and models were developed largely from management practice, and included little in the way of formal theory*”. As a consequence it is necessary to adopt not only a theoretical approach, but also an empirical one to complete the analysis under all different point of view.

After the literature review the paper will compare the Framework proposed by the IIRC with the contributions arising from the first step of analysis trying to find the communalities, the element of the definition proposed consistent with the different theories and the elements that could be useful to introduce with the purpose of completing the definition allowing to supply useful information for the users of the reports describing the BM.

The research method adopted for this step is the *document analysis*, considered as a qualitative research method (Glenn A. Bowen, 2009). Our paper is based on the analysis of the following documents:

- ✓ *The International <IR> Framework by IIRC*
- ✓ *Background Paper <IR> Business Model*

Other documents considered to complete the analysis and to facilitate the comprehension and comparison of the previous documents are the following ones:

¹ “*It is further shown that key concepts in the strategic management literature can usefully inform the business reporting debate. The analysis supports the current calls for integrated disclosure around the central business model story*”.

² *Beattie and Smith (2013; p. 11)*

³ *Developed in the 1980s and early 1990s by Wernerfelt (1984) and Barney (1991).*

⁴ *For a recent review about the RBV, see Barney & Clark (2007). About the Dynamic capabilities concept see Barreto (2010).*

⁵ *This literature emerged in the mid-1990s along with the rise of the Internet (Zott, Amit & Massa, 2011, p. 1022).*

⁶ *As suggested by Beattie and Smith (2013), “However, as Teece (2010) notes, the concept has no established theoretical basis in either the economics or the business disciplines. Since then, research using the concept has exploded, as documented in a recent review of the business model literature (Zott et al., 2011)”.*

- ✓ *Background Paper <IR> Value Creation*
- ✓ *King Code of Governance for South Africa 2009*
- ✓ *King Report*
- ✓ *The Broad Based Business Reporting, (The Institute of Chartered Accountants - Australia)*
- ✓ *GRI (The Sustainability Reporting Guidelines)*
- ✓ *BIS (2011)*
- ✓ *BIS (2012)*
- ✓ *UK Corporate Governance Code*
- ✓ *IFRS (about Business Model).*

The document analysis involved three steps: to skim the documents (superficial examination), to read (thorough examination) and to interpret (Glenn A., 2009) them. This analysis also aims to point out contradictory aspects, general patterns and different positions emerging from the documents and attributable to the different subjects investigated (Glenn A., 2009; Bowen, 2008).

As Beattie and Smith put in light (2013; p. 8) to classify the Business Model it is useful “*either a bottom-up taxonomy grounded in real-world examples or a top-down typology generated from theory*”. For this reason the research consists also in a third step in which we analyse the case studies of description of the BM within the Integrated Report realized by companies participating to the Pilot Program of the IIRC and selected by the IIRC itself ⁷. These contributions can be found at the website ⁸ and comprise an extract of 19 reports made by 18 companies. These reports refer to 2011, 2012 and 2013. This means that not all these documents can be consistent with the recent documents issued or published by the IIRC.

The adoption of the case study methodology seems to be particularly consistent with the purpose of this paper. It in fact addresses a new issue (“the focus is on a cotemporary phenomenon within a real-life context” (Yin, K., 2009; p. 2). Of the same advice Beattie and Smigh (2013; p. 3) that specify: “*Siggelow (2007) argues that the use of case studies in this way is valuable as it provides concrete examples of constructs and offers the opportunity to get closer to these theoretical constructs and the relationships between them. Using this approach, the present paper responds to Bukh’s call. It is concluded*

⁷ In the website of IIRC.

⁸http://examples.theiirc.org/search?x=31&y=6&organisation_type=&organisation_region=&organisation_industry=&report_type=&report_year=&fragment_content=7

that the business model concept offers a powerful overarching concept within which to refocus the IC debate”.

The analysed case studies (*multiple case study approach*), try to give a reply to these questions:

- ✓ Are the report consistent with the definition supplied by the IIRC?
- ✓ Which elements of these reports can be considered useful to improve the current definition supplied by the IIRC?

3. The importance of business model in corporate reporting

In recent years Business Model gained importance in narrative reporting and it is currently getting a lot of attention. The business model has been incorporated in recent financial reporting regulations. The term “Business Model” is incorporated in:

- ✓ IFRS 9 paragraph 4.1: “Chapters 4 and 5 of IFRS 9 specify how an entity should classify and measure financial assets, including some hybrid contracts. They require all financial assets to be:
 - classified on the basis of the entity’s business model for managing the financial assets and the contractual cash flow characteristics of the financial asset.
 - initially measured at fair value plus, in the case of a financial asset not at fair value through profit or loss, particular transaction costs.
 - subsequently measured at amortized cost or fair value”.
- ✓ UK Corporate Governance Code in its last version (2010, p. 18, section C.1.2), specifies: “the directors should include in the annual report an explanation of the basis on which the company generates or preserve value over the longer term (the business model) and the strategy for delivering the objectives of the company.
- ✓ In 2013, FASB, in its proposal for financial instruments, proposed a similar use of business model for classifying financial instruments, but in January 2014 FASB abandons converged approach to Business Model assessment.
- ✓ The concept of Business Model was introduced by IASB into the accounting of deferred taxes, in 2010, with amendments to IAS 12.
- ✓ EFRAG (European Financial Reporting Advisor Group), published a bulletin, in July 2013, on The role of Business Model in Financial Reporting, in association with

French ANC, German ASCG, Italian OIC and UK FRC⁹, with a comment deadline of 30 September 2013. The research paper was issued in December 2013 with a comment deadline of 31 may 2014.

The bulletin presents the meaning of the term Business Model, assumed by EFRAG and others accounting authority. This terms is undefined in IFRS literature. The bulletin provides a conceptual discussion as to whether Business Model is essential for the key characteristics in the IASB Conceptual Framework: two fundamental qualitative characteristics, *relevance* and *faithfully representation* and fours enhancing qualitative characteristics, *comparability*, *verifiability*, *timeliness* and *understanding*. Timeliness and verifiability characteristics has not considered relevant in their discussion. They explain the term “business model as the value creation process of an entity, i.e. how the entity generates cash flows”. Through this definition, they conclude that it is difficult to meet these objectives if the business is ignored in financial reporting. It is time for a change and it should be included in Conceptual Framework with appropriate guidance for standard setting because Business Model can play a role in Conceptual Framework. It can play a role also in recognition of assets, in measurement and in presentation and disclosure.

4. Literature Review

The concept of business model is relatively recent. According to Osterwalder, Pigneur and Tucci, in 1957 it has been used for the first time, without neither a theoretical framework was provided, nor its definition was supplied. We had to wait years 70’s to see the first discussions on the BM (Ghaziani & Ventresca, 2005). Beginning in the 90’s the first definition will appear. The following table sets out the recent key definitions in the literature on Business Model.

1	<i>Brandenburg er & Stuart (1996)</i>	The total value creation of a business model is the total value for all business stakeholders such as customers, partners and, suppliers.
2	<i>Slywotzky (1996)</i>	The totally of how a company selects its customers, defines and differentiates its offering, defines the tasks it will perform itself and those it will outsource, configures its resources, goes to market, creates utility for customers and captures profits”.

⁹ EFRAG (2013) *Conceptual Framework Bulletin The role of Business Model in Financial Reporting*.
<http://www.efrag.org/Front/p290-2-272/Conceptual-Framework---Bulletin--The-role-of-the-business-model-in-financial-reporting.aspx>

3	<i>Timmers (1998)</i>	An architecture of the product, service and information flows, including a description of the various business actors and their roles; a description of the potential benefits for the various business actors; a description of the sources of revenue.
4	<i>Linder and Cantrell (2000)</i>	The organisation's core logic for creating value.
5	<i>Gordijn et al. (2000)</i>	A business Model answer the question: who is offering what to whom and expects what in return? A Business Model explains the creation and adding value in a multipack stakeholder network as well as the exchange of value between/stakeholders.
6	<i>Torbay et al. (2001)</i>	The organization's architecture and its network of partners for creating, marketing, and delivering value and relationship capital to one or several segments of customers in order to generate profitable and sustainable revenue streams.
7	<i>Amit & Zott (2001)</i>	A business model depicts the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities.
8	<i>Weill & Vitale (2001)</i>	A description of the roles and relationships among a firms consumers, customers, allies and suppliers that identifies the major flow of product, information and money, and the major benefits to participant.
9	<i>Applegate (2001)</i>	A description of a complex business that enables study of its structure, the relationships among structural elements, and how it will respond in the real world.
10	<i>Fisken and Rutherford (2002)</i>	The business model outlines how a company generates revenues with reference to the structure of its value chain and its interaction with the industry value system.
11	<i>Chesbrough & Rosenbloom (2002)</i>	The business model provides a coherent framework that takes technological characteristics and potentials as inputs, and converts them through customers and markets into economic inputs. The business model is thus conceived as a focusing device that mediates between technology development and economic value creation.
12	<i>Magretta (2002)</i>	The business model tells a logical story explaining who your customers are, what they value, and how you will make money in providing them that value.
13	<i>Bouwman (2002)</i>	A description of roles and relationships of a company, its customers, partners and suppliers, as well as the flows of goods, information and money between these parties and the main benefits for those involved, in particular, but not exclusively the customer.
14	<i>Bray (2002)</i>	The business model is defined by the performance drivers, business processes, people and infrastructure put in place to achieve business objectives.
15	<i>Chesbrough & Rosenbloom (2002)</i>	The heuristic logic that connects technical potential with the realization of economic value.

16	<i>Dubosson-Torbay, Osterwalder and Pigneur (2002)</i>	The architecture of a firm and its network of partners for creating, marketing and delivering value and relationship capital to one or several segments of customers in order to generate profitable and sustainable revenue streams.
17	<i>Hedman & Kalling (2003)</i>	Business model is a term often used to describe the key components of a given business. That is customers, competitors, offering, activities and organization, resources, supply of factors and production inputs as well as longitudinal process components to cover the dynamics of the business model over time.
18	<i>Chaharbaghi, Fendt & Willis (2003)</i>	Define Business Model as a representation of management thinking and practices that help business see, understand and run their activities in a distinct specific way.
19	<i>Seddon et al. (2004)</i>	A business Model outlines the essential details of a firm's value proposition for its various stakeholders and the activity system of the firm uses to create and deliver value to its customers.
20	<i>Osterwalder (2004)</i>	A conceptual tool that contains a set of elements and their relationships and allows expressing a company's logic of earning money.
21	<i>Shafer et al. (2005)</i>	A representation of a firm's underlying logic and strategic choices for creating and capturing value within a value network.
22	<i>Osterwalder et al (2005)</i>	A conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value relationship capital, to generate profitable and sustainable revenue streams.
23	<i>Morris et al. (2005)</i>	A business model is a concise representation of how an interrelated set of decision variables in the area of venture strategy, architecture and economics are addressed to create sustainable competitive advantage in defined markets.
24	<i>Osterwalder, Pigneur and Tucci (2005)</i>	A business model is a conceptual tool that contains a set of elements and their relationships and allow expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and architecture of the firm and its network of partner for creating, marketing and delivering value and relationship capital, to generate profitable and sustainable revenue streams.
25	<i>Tikkanen et al. (2005)</i>	Business Model can be conceptualized as the sum of material, objectively existing structures and process as well as intangible, cognitive meaning structures al the level of a business oragnization.
26	<i>Andersoon et al. (2006)</i>	Business models are created in order to make clear who the business actors are in a business case and how to make their relations explicit. Relations in a business model are formulated in terms of values exchanged between the actors.

27	<i>Kallio et al. (2006)</i>	The means by which a firm is able to create value by coordinating the flow of information, goods and services among the various industry participants it comes in contact with including customers, partners within the value chain, competitors and the government.
28	<i>Rajala & Westerlund (2007)</i>	The ways of creating value for customers and the way in which a business turns market opportunities into profit through sets of actors, activities, and collaborations.
29	<i>Brousseau, & Penard (2007)</i>	The business model as a pattern of organizing exchanges and allocating various costs and revenue stream so that the production and exchange of goods or services become viable, in the sense of being self-sustainable on the basis of the income it generates.
30	<i>Seelos & Mair (2007)</i>	Business Model is a set of capabilities that is configured to enable value creation consistent with either economic or social strategic objectives.
31	<i>Laudon and Traver (2008)</i>	A business model is a set of planned activities (sometimes referred to as business processes) designed to result in a profit in a marketplace”.
32	<i>Janseen et al. (2008)</i>	A business model reflects the core business of an organization and is useful to describe (and even prescribe) the organization from the perspective of its main mission, and the products and services that it provides to its customers.
33	<i>Amit & Zott (2008)</i>	The business model is a structural template of how a focal firm transacts with customers, partners and vendors; that is, how it chooses to connect with factor and product markets. It refers to the overall gestalt of those possibility interlinked boundary-spanning transactions.
34	<i>Doganova & Eyquem-Renault (2009)</i>	The business model is a narrative and calculative device that allows entrepreneurs to explore a market and plays a performative role by contributing to the construction of the techno-economic network of an innovative.
35	<i>Demil and Lecocq (2010)</i>	“Business model as, the description of the articulation between different business model components or building blocks to produce a proposition that can generate value for consumers and thus for the organization”
36	<i>Baden-Fuller et al. (2010)</i>	The logic of the firm, the way it operates and how it creates value for its stakeholders.
37	<i>Al-Debei & Aviston (2010)</i>	The business model is “an abstract representation of an organization, be it conceptual, textual, and/or graphical, of all core interrelated architectural, cooperational, and financial arrangements designed and developed by an organization presently and in the future, as well all core products and/or services the organization offers, or will offer, based on these arrangements that are needed to achieve its strategic goals and objectives”.

38	<i>Svejenova et Al. (2010)</i>	An organizational devise that reveals a company's logic for creation and capturing value did also its approach to constant renewal.
39	<i>Wikström et al. (2010)</i>	Business models describe the organizations activities and how deliver value to the costumer and strategy decides how the business model is utilized by considering competition and thereby stressing the need to position.
40	<i>Johnson (2010)</i>	The essence of business model as a representation for how a business crates and delivers value both for the costumers and the company.
41	<i>Teece (2010)</i>	In essence, a business model is a conceptual, rather than financial, model of the firm.
42	<i>Osterwalder & Pigneur (2010)</i>	The business model is like a blueprint for a strategy to be implemented through organizational structures, processes and systems.
43	<i>Sorescu et al. (2011)</i>	A business model is a well-specified system of interdependent structures, activities, and processes that serves as a firm's organizing logic for value creation (for its customers) and value appropriation (for itself and its partners).

From these definitions arising from the literature about Business Model emerges that many of them are not going particularly in depth about and are not always easy to represent a guidance for entities who want to report about BM. There is in some ways a sort of lack between these definitions and the empirical possibility to transform them in concrete report of the entities.

5 Business model for Integrated Reporting

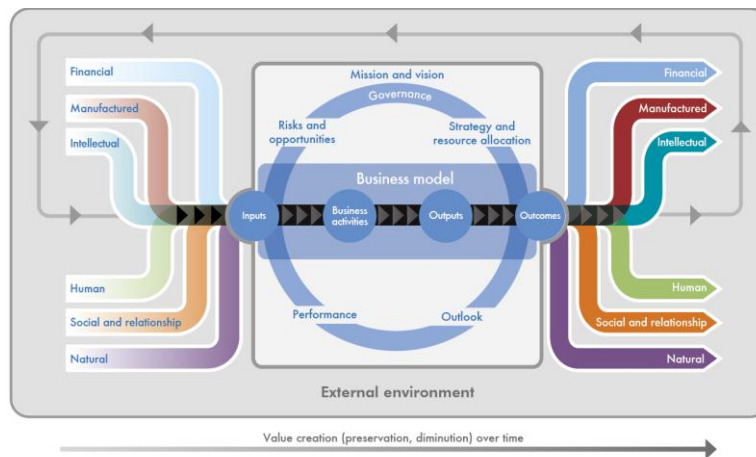
In a first step, we should explain the definition of business model provided in two recent publications of the IIRC: *Background Paper <IR> Business Model* released in March 2013¹⁰ and *The International <IR> Framework by IIRC* released in December 2014.

The *International <IR> Framework* supplies this definition: "An organization's business model is its system of transforming inputs, through its business activities, into outputs and outcomes that aims to fulfill the organization's strategic purposes and create value over the short, medium and long term. The key elements of an IR Business Model are inputs, business activities, outputs and outcomes"¹¹.

¹⁰ The paper was edited by CIMA (Chartered Institute of Managements Accountants), IFAC (International Federation of Accountants) and Pwc.

¹¹ The international <IR> Framework (2013, p. 25). <http://www.theiirc.org/international-ir-framework/>

This first definition is important because considers Business model as a **system that transforms resources through its business activities.**



“The organization should identify key inputs, and to the extent that they are material to understanding the robustness and resilience of the business model, how they relate to the capitals on which the organization depends¹², or that provide a source of differentiation. The discussion should include a concise, meaningful account of how these inputs link to opportunities and risks, strategy and performance” (*Background Paper <IR> Business Model*, 2013, p. 11).

Activities, the heart of Business Model, convert “inputs into outputs through business activities. These activities may include the planning, design and manufacture of products or the deployment of specialized skills and knowledge in the provision of services” (*Background Paper <IR> Business Model*, 2013, p.13).

Organizations should identify their key products and services. There are, potentially, other outputs, such as waste and other by-products, that may also need to be discussed within the business model disclosure depending on their materiality”. It also “should explain the key outcomes that arise from their business activities, outputs and effect on the capitals. Outcomes can either be internal or external to the organization and ordinarily require consideration of the entire value chain, rather than that owned or controlled simply by the organization”(Background Paper <IR> Business Model, 2013, p.13).

¹² <IR> identify six capitals possible in input in an organization, financial capital, manufactured capital, human capital, intellectual capital, natural capital and social and relationship capital.

“Features that can enhance the effectiveness and readability of the description of the business model include:

- ✓ Explicit identification of the key elements of the business model.
- ✓ A simple diagram highlighting key elements, supported by a clear explanation of the relevance of those elements to the organization.
- ✓ Narrative flow that is logical given the particular circumstances of the organization.
- ✓ Identification of critical stakeholder and other (e.g., raw material) dependencies and important factors affecting the external environment.
- ✓ Connection to information covered by other Content Elements, such as strategy, risks and opportunities, and performance (including KPIs and financial considerations, like cost containment and revenues)”.
The key element of the IIRC’s definition of Business model are:

SYSTEM >> transform INPUT (resources, capitals) >> by ACTIVITIES (process) >> >> into OUTPUT and OUTCOMES >> to fulfill CREATION VALUE over time

Comparing the definition supplied by the IIRC with the 44 previously analysed we can see that some of them are telegraphic or that do not presents more elements than the IIRC’s definition (1/4/5/13/15/16/19/21/22/29/34/36/39/41/43). In others definitions there is a lack in the key element of Input or Activities (3/7/8/9/10/11/17/20/24/25/26/7/28/31/32/33/35/37/38/40). On the contrary, the IIRC definition seems to be more close to some definitions of literature (2/6/12/14/18/23/30/44).

6 Business Model within the IR of the Companies participating to the Pilot Project

In the following table we analyse the extract of the IR addressing BM as selected by the IIRC in its website. The dimensions selected are the ones emerging from the short documents and summarized as follows:

Entity and Year	N. of pages	Explication of the kind of business	Schema of BM	Main Resources	How to implement resources	How to implement value creation	Dynamic Dimension and forward looking information	Other aspects
ACCA 2012	4	Not specifically	No	Yes	Yes	Yes	Not specifically	Mission
ARM 2011	2	Yes	No	No	No	Not specifically	No	No
Cima 2012	2	No	No	Yes	Yes	Yes	Not specifically	No
Fibria 2011	2	Yes	Yes	Not explained	No	No	No	Governance
Gold Fields 2012	2	Not specifically	Yes	Not complete	Yes	Yes	Not specifically	No
Hyundai E & C 2012	2	No	Yes	Yes	Yes	Yes	Not specifically	Management policy; Green value; Social value; Economic value
Indra 2011	4	Yes	Yes	Yes	Yes	Yes	Not specifically	No
New Zealand Post 2013	2	No	No	No	No	No	Not specifically	Scorecard Targets
Sasol 2011	2	Yes	Yes	Yes	Not specifically	Not specifically	Not specifically	No
Sasol 2012	2	Yes	Yes	Yes	Not specifically	Not specifically	Not specifically	The document is not a copy of the one of the previous year
Smithfield 2012	6	Yes	Yes	Yes	Yes	Yes	Yes	How to face risks
Standard Bank 2011	2	Yes	No	No	No	Not specifically	Not specifically	Key financial ratio
Stockland 2012	2	Not specifically	Yes	Yes	Not specifically	Yes	Not specifically	Value chain schema
The Crown Estate 2013	2	Very short	Very short	Very short	Very short	Very short	Not specifically	No
Transet 2013	4	Yes	Yes	Yes	Not specifically	Not specifically	Not specifically	Financial highlights, Economic, social and environmental dividends
Tullow Oil 2011	2	Yes	Yes	Not specifically	Not specifically	Yes	No	No
Vancity 2011	2	Yes	Yes	Yes	Yes	Yes	No	No

Vodacom 2012	2	No	No	No	No	Yes	No	Schema of “what we live for”
Xastra 2011	2	Yes	Yes	Not specifically	Not specifically	Yes	Not specifically	Working partnership

In this analysis the locution “not specific” is also considerable as a synonymous of “not in depth”.

From this analysis we can see that the majority of the documents contains descriptive information and not economic not perceptual quantification. There is a clear lack in the narrative information that is substantially ignored within the documents analysed ¹³. Information is generally regarding the past or the current year whereas it is not explaining the future dimensions. It is in some ways a static information more than a dynamic one ¹⁴.

The number of pages devoted to the BM are quite limited (generally only two pages). Only some of the entities introduce a schema of the BM. Many of them explain the main resources involved but in a very synthetic way.

There is not, in general, an analysis of the dynamic of the sector and of the main competitors ¹⁵.

Another substantially missing aspect is represented by the description of merger and acquisition operations or other operations of partnership with other entities ¹⁶.

¹³ Beattie and Smith (2013; p. 10), analysing the existing literature put in light as follows: “Mouritsen, Larsen & Bukh (2001) note that narratives permit the mechanisms of value creation to be accounted for more freely than numbers. Examples include the balanced scorecard developed by Kaplan & Norton (1992) and Sveiby’s (1997) Intangible Assets Monitor. Some writers view such frameworks as offering possible templates for business model reporting (Nielsen, Fox & Roslender, 2012)”.

¹⁴ Beattie and Smith (2013; p. 8): “Alternatively, or additionally, the distinction could be viewed in terms of a static strategy versus a dynamic business model, emphasising the role of dynamic capabilities in a transformational business model (Demil & Lecocq, 2010)”. (P. 19): “The business model can be used in static sense or in a dynamic sense, as business models change due to internal and external factors, related to markets, technologies and institutions. Dynamic business model descriptions capture this process of change (Demil & Lecocq, 2010). Since the interviewees were not specifically asked about change aspects related to IC and value creation, it is unsurprising that only a few mentioned such aspects (Teece et al., 2007)”.

¹⁵ Beattie and Smith (2013; p. 8): “the ICAEW’s (2010) report on business models in accounting, which focusses on the economic theory of the firm. The business model reflects management intentions. It describes what a firm does internally versus what it does through the market”.

¹⁶ Beattie and Smith (2013; p. 18): “Boundary-spanning partnering such as this allows both parties to share resources, costs and risks and/or serves to develop dynamic competitive capabilities and mitigate environmental dynamism by fostering dynamic learning mechanisms (Yaprak, 2011; Li et al., 2013). The crucial importance of boundary-spanning value creation activities was identified by several interviewees, in terms of their relationships with suppliers”.

Also the matter of the opportunities and risks is substantially neglected within the analysed reports ¹⁷.

In some ways we can say that these extracts of the reports represent a first attempt of describing a Business Model, whereas a very deep improvement seems to be necessary to reach the purposes defined by the IIRC that is considering the BM as the key element to explain the value creation process in the short and in the middle and long period.

7 Conclusions and further developments

From this exploratory analysis we can derive that there has been a great progress in the understanding of the Business Model and in its role in the value creation process. Basing on different theoretical backgrounds, BM literature gradually and increasingly shifted to a convergence specializing on the BM itself. The definitions analysed put in evidence how deep and important is the issue and how it is developing in recent years.

From the analysis we also can see that the definition supplied by the IIRC is quite useful and complete for the purposes of managing and reporting the value creation process. In some ways the definition supplied is generally more wide than the others offered by the literature addressing the BM issue. Such definition and all the documents issued by the IIRC could be further developed after analyzing the results of the Pilot project.

From the empirical side, on the contrary, it seems that entities are just able to run over this issue, avoiding to go in depth and to give to many information to the users of the report. It seems to be at an early stage of the BM reporting and the main aspects emerging from the analysis seem to be the following ones. The narrative part is really too short to allow the reader to understand the way in which resources, relationships, risks and other aspects are managed, also in the light of the internal and external dynamic processes. There is a lack of information about how the business is really managed and which changes and risks could happen in the next future. It is difficult to find a narrative exposition and a quantitative representation that could put in evidence the results achieved (possibly under the economic, social and environmental dimension).

Further developments of this research could be represented by a deep investigation of the future empirical side, also with the purpose to try to find a bridge between the upside

¹⁷ See AICPA, 1994.

down and the bottom up approach (from the theory to the practical aspects, but also from the empirical data to a theoretical approach).

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Knowledge strategy and business model alignment in IT start-ups

Yaroslav Pavlov *

Department of strategic management
IBS-Moscow, Russian Presidential Academy of National Economy and
Public Administration
Moscow, prospect Vernadskogo, 82, 119571, Russian Federation

Anna-Sophia Yanson

Department of IT in Management
Graduate School of Management, St. Petersburg State University
St. Petersburg, Volhovsky per., 3, 199004, Russian Federation

** Corresponding author*

Structured abstract

Purpose — The purpose of the paper is to explore the question of alignment between knowledge strategy and business model. These two elements are considered as a central parts of organizational strategy at early stages of start-up development. The empirical investigation of the alignment of business model and knowledge strategy is the main long-term objective of this study. However in this paper we concentrate on theoretical foundations of the alignment between knowledge strategy and business model.

Design/methodology — This study uses ground theory as a general approach. As the context of the study we choose Russian IT start-ups. This choice of this setting is driven both by specificity of the setting that makes it easier to indicate particular practice or instrument.

Originality/value – There are several things by which our research adds value for management theory. First, we integrate two important domains of strategy research, which is crucially important for the development of the field. Second, we clarify the concept of knowledge strategy and its' formulation. Next, we explain the process of business model development in very specific settings. Finally, main theoretical concepts are considered at the startup stage.

Practical implications – The perspective discussed in this work also has important managerial implications, as it represents a bridge between academic research and managerial practice. The reason for this is the topic itself, which has high priority in managerial and entrepreneurial practice. Moreover, qualitative method used depicts real managerial practice rather than purely theoretical constructs. We also provide directions for the start-uppers on the issue of the development of knowledge strategy and business model. Moreover, we explain the importance of the alignment between these two issues. Finally, we give directions on how it should be done.

Keywords – knowledge strategy, business model, IT start-up, alignment

Paper type – Academic Research Paper

1 Introduction

The issue of alignment and fit is one of the most important areas of the management research (Venkatraman, 1989; Walter et al., 2013). The most of the attention to the alignment issue in current research is given to the alignment between internal and external environment (Miller, 1992) or between strategy and operational functions (Henderson and Venkatraman, 1993; Ma et al., 1998). It is also possible to find an inquiry on knowledge strategy and strategy alignment (Zack, 1999; Asoh et al., 2008; Tounkara et al., 2009). Some of the researchers also underline that knowledge management itself is an instrument of alignment. The same things are said about business model. Some studies (Van de Ven and Walker 1984) in the strategy field emphasize the role of strategic design as a framework for business modeling and its importance for the survival and success of new ventures (Teece, 2010; Casadesus-Masanell & Ricart, 2010).

Business model are frequently considered as a social artifact that helps entrepreneur communicate to potential investors

(Verstraete and Jouison-Laffitte, 2011). Business models (BM) include theory and assumptions about customer behavior and agency. (Baden-Fuller and Haefliger, 2013). A business model reflects management's hypothesis about what customers want, how they want it and what they will pay, and how an enterprise can organize to best meet customer needs, and get paid well for doing so (Teece, 2010). Put differently, business model refers to the logic of the firm, the way it operates and how it creates value for its stakeholders (Casadesus-Masanell & Ricart, 2010; Zott, C., Amit, & Massa, 2011; Sabir et al, 2012). By business model, we posit so, the way by how an organization converts a given set of strategic choices in order to create and capture this value (Smith et al., 2010). Osterwalder et al. (2005) point out also that business model provides conceptual alignment of the different functional areas. He indicates that knowledge management also has a function of alignment in the organization by provision of the knowledge integration between different parts and levels of organization (Timmers, 1998; Osterwalder et al., 2005).

Thus, an interaction between knowledge strategy and business model can be a critically important step in integration of strategy research. The integration of the different areas is crucially important for further development of strategy research (Jemison, 1981). Moreover, study of alignment seems to be the most promising in terms of the explanation of the performance differences among the organizations, which is the basic question of strategic management. And a business system, in essence, is the way a company defines

and differentiates its offers, defines the activities that properly match its strategy, selects its processes, configures and allocates its resources, enters the market, creates utility for its actual and potential customers (Lopes and Martins, 2006).

2 Business Model concept

In recent years, the business model concept has been the focus of attention from both academics and practitioners. This concept also has been the subject of an incremental number of practice-oriented studies.

The term “business model” was first used in the context of data and process modeling (Osterwalder, Pigneur et al 2005), and it became the established expression among those working in the emerging new technologies sector at the end of the 1990s. Later this definition was extended to managerial and academic spheres. Generally speaking, business models define how the pieces of a business fit together (Magretta 2002). The increased usage of the BM term is highly correlated with the emerging of web business, globalization and contract manufacturing (Bellman et al. 1957, Osterwalder et al. 2005). The alterations that were responsible for its development were not only technological, the economic factors (e.g. way of value creation) and the regulatory factors also played important role (Redis, 2007).

Business model concept has been discussed in the context of different disciplines, including economics, innovations, management, strategy, e-business, and entrepreneurship (Amit and Zott, 2001; Hedman and Kalling, 2003; Teece, 2010) and that could partly explain the reason why business model concept become the victim of complexity (Weill, Malone, and Apel, 2011).

Thus, Osterwalder (2004) provides a detailed analysis of business model literature and gives the following definition: a business model is a conceptual tool that contains a set of elements and their relationships and allows expressing a company’s logic of earning money. Following to Osterwalder, Pigneur, and Tucci (2005), a business model addresses the relationship between business strategy, organizational structure, and the available technological resources.

In this vein, Osterwalder developed the Business Model Canvas – specific method for business modeling. This method consists of business model blocks (components), which are: value propositions (the goods and services offered); key activities (the most important activities); key resources (the resources for creation the value for the customer); partner

network (relationships considered essential to accomplishing the value proposition); customer segments (target market(s) intended to be served); channels (channels of distribution); customer relationship (the type of relationship the firm wants with its customers); cost structure (characteristics of the cost and expense); revenue streams (the way the firm makes money).

The research on business model has focused primarily on two complementary streams: taxonomies of business models and definitions of components of business model.

WWW-boom period gave crucial opportunity of creating values in very different ways for customer's demands (Amit and Zott, 2001). Business model has break down into various parts. For instance, Osterwalder, Pigneur and Tucci, (2005) suggest nine modules; Mason and Spring (2010) - three components, Johnson, Christensen, and Kagermann (2008) offer four parts of business model. Thus, in literature we can find and other researchers presented various dimensions of business model.

In essence, business model frameworks classification based on the value proposition and revenue generation mode. Business model compiled with elements and referred as building blocks.

The review of the received literature on business models reveals that scholars do not agree on what a business model is. However, the common issue to the most of existing research is defining business models with an emphasis on how a firm makes money. Scholars have also highlighted that the business model can play an important role in a firm's strategy. For example, Richardson (2008) mentioned that the business model explains how the activities of the firm work together to execute its strategy. Following Casadesus-Masanell and Ricart (2010), the business model is a reflection of a firm's realized strategy.

The terms 'strategy' and 'business model' often are viewed as interchangeable (Magretta 2002). Mistakenly, the both these terms are used for referring to everything that gives to the organization a competitive advantage (Stahler 2002). A literature review revealed that while business models and strategy are connected, they are distinct from each other (Mansfield and Fourie 2004). One of the key differences that is underlined in current literature is that business model represents how the pieces of the organization fit together, while the strategy focuses on competition (Magretta 2002). By contrast, Seddon et al. (2004) follow different view on distinguishing between business model and strategy, defining the business model as an abstraction of a firm's strategy. However, this approach

is inferior in current business literature.

We can also illustrate the business model as a storytelling about the business that is focused on how pieces fit together; while the strategy is more about describing how the firm differentiates itself and deals with competition. The important consequence of the idea that business models do not consider the firm's competitive positioning is that any business model is potentially applicable to many different firms. Another difference between strategy and business models is that strategy includes execution and implementation, while the business model is more about abstract description of the business functioning as a system. An important conclusion from this is that a 'strong' business model can be managed poorly and fail, just as much as a 'weak' business model may succeed due to strong management and implementation skills (Osterwalder et al. 2005). A business model, in essence, makes explicit the underlying economic logic that defines how the firm creates value, but it doesn't provide an implementation plan.

Business model, in certain way, is a representation tool for explicating a firm's current or future value creation and value-capturing logic (e.g. Shafer et al. 2005), also BM serves as a structured template for how to transact with business partners (e.g. Amit and Zott 2001), and as a cognitive framework for translating technological input into economic output (e.g. Chesbrough and Rosenbloom 2002), finally, as a narrative device for structuring discourses throughout new venture creation processes (e.g. Doganova and Eyquem-Renault 2009).

Business model is inherent to every firm, whether it is a new venture or an established player (Magretta 2002), because business model locates the firm's value network, defines how it transacts with customers and partners, and the products that are exchanged.

3 Business Model Innovation

The innovation of business models is one of most challenging tasks for managers (Chesbrough 2006; Christensen and Raynor 2000) as both rapid technological and environmental changes proceed (Johnson et al. 2008). The risks and high costs associated with changing the existing business model place the task for innovation at management and strategic departments (Peterovic et al. 2001). Understanding a new business models for companies and helping to design and measure them are important research issues, not so well covered until now.

To profit from innovation, managers need to surpass not only at product innovation

but also at business model design, understanding business design options as well as customer demands and technological trajectories. Innovating with business models will not give a competitive advantage, but new business models, or improvements to existing ones, can give an opportunity to generate higher returns to the business pioneers (Teece 2010). The business model innovation can itself become a competitive advantage only if the business model is sufficiently differentiated, difficult to replicate and aligned with organizational strategy.

In most of cases, the need for a new business model often emerges from a serious crisis concerning the firm and its existing business model (Johnson, Christensen, & Kagermann, 2008). So designing sustainable business model is a challenging innovation task. More and more companies nowadays are using business model innovation as an alternative or complement methods to product or process innovation. Innovation at the level of the business model can convey into a sustainable performance advantage if it is aligned with the competitive strategy of the organization.

Many authors mentioned that business model innovation refers to the search for new ways to create and capture value for its stakeholders, and finding new ways to generate revenues and define value propositions for customers and partners (e.g., Amit and Zott 2001; Magretta 2002; Zott and Amit 2007, 2008; Baden-Fuller et al. 2008; Casadesus-Masanell and Ricart 2010; Gambardella and McGahan 2010; Teece 2010). And as a result, business model innovation affects the whole enterprise (Amit and Zott 2001). And more important - innovative business models - can provide the basis for sustainable business success, even in competitive environment with well-established incumbents (Casadesus-Masanell & Zhu 2012). But the key to the effective business model innovation is an alignment between business model and competitive strategy.

4 Business models and knowledge management

There are several ways in which business model and knowledge management concepts are interrelated. First of all, capturing, storing, and following business models in a company are a form of knowledge management that will increasingly gain importance. The world becomes more global and hypercompetitive and in this case competitive advantage often depend on success in managing business model knowledge.

Second, an important point in managing business model is describing it explicitly. In knowledge management this process is known as externalization: articulating tacit knowledge into explicit knowledge (Nonaka et al. 1995).

Next, knowledge management can be an instrument for business model and competitive strategy alignment. As knowledge management supports an integration of knowledge across organization, it allows connecting business model knowledge with competitive strategy knowledge.

Moreover, knowledge strategy in a high extent represents competitive strategy of the organization. This is especially true for knowledge intensive organizations. The mechanism of this representation can be explained as following. The decision about how company compete is reflected by its' strategies for knowledge sourcing, knowledge sharing, knowledge creation, etc. All these decisions about knowledge in organization are driven by the decision about ways of competition. Actually, they directly represent this ways of competition with focus on organization's knowledge.

5 Knowledge strategy

Basing on review of the prior research (Bierly and Chakrabarti, 1996; Zack, 1999; Earl, 2001; von Krogh et al., 2001; Casselman and Samson, 2007; Sawabe and Egashira, 2007; Denford and Chan, 2011) we identified key components of knowledge strategy. Key components that were identified are following: knowledge focus, knowledge advantage, knowledge domain width, knowledge domain novelty, knowledge boundaries of organization, knowledge protection, codification/personalization orientation, disaggregation, organization of knowledge flows, knowledge valuation.

Considering specificity of knowledge management in entrepreneurial firms, we can make accent on two main issues. First of all, the idea that in small entrepreneurial firms knowledge management in huge extent is externally oriented (Sparrow, 2001; Hutchinson and Quintas, 2008). Second, that small firms manage their knowledge mostly in informal ways (Hutchinson and Quintas, 2008).

Finally, drawing upon the idea of knowledge – strategy alignment (Zack, 1999) and the idea of knowledge capabilities of Casselman and Samson (2007), who propose two major types of capabilities: knowledge process capabilities and knowledge infrastructure capabilities, we propose the concept of strategic knowledge capability. Strategic

knowledge capability represents a framing of M. Zack's (1999) idea of knowledge – strategy alignment as a dynamic capability (see Teece, 1997, 2007).

As it was said before knowledge management and business model concepts have several possibilities for integration. However, we decided to concentrate on knowledge strategy issue. This is done for several reasons, first of all, both business model and knowledge strategy can be considered as dimensions of strategy in holistic view on organization. Moreover, knowledge strategy is probably is the only strategy that is visible in early stages of startup development. For example Morecroft et al (2006) build their model of growth strategy for biotechnology startup around strategic view on organizational knowledge. Finally, knowledge strategy has special importance for knowledge intensive firms.

6 Design and methodology

The object of the study is IT startups. There are several reasons for that. First, there are more possibilities to discover the process of alignment. Next, at this stage most of companies shape both business model and knowledge strategy. The survival and success of IT startups depends on effective business model design and implementation. The business model of a new venture defines as the way of “how [the firm] plans to make money long-term” (Afuah and Tucci, 2001, p. 4). So in this context the business model has become “the method of doing business by which a company can sustain itself” (Rappa, 2001, p. 1) by expressing the value proposition, identifying the market segment and core competence etc. The successful business model becomes an example to be imitated or compared. And at this point it shapes not only the specific new venture that it represents, but also, through the process of replication, business models and new ventures come (Doganova & Eyquem-Renault, 2009).

Young and new technology-based companies typically face growth challenges characterized by intense product and/or process innovations—frequently combined with business model innovations. This requires originality, strategic vision, and new ways of defining the value proposition and delivering it to the customers, through the innovative development of business models (Christensen and Rosenbloom 1995; Chesbrough and Rosenbloom 2002; Chesbrough 2004). Business model innovation per se is increasingly identified as the real differentiator in conceiving and delivering novelty to the market (Johnson et al. 2008). In the fast-moving technology market space, product innovation without business model innovation may not provide enough competitive advantage. (Amit

and Zott, 2012). Relationships between different players give access to new knowledge and also enable young companies to focus on core activities where they have distinctive knowledge.

Representative of business community in Russia frequently point out (in Mass Media and personal talks) that most of Russian IT start-ups have unique technological skills, however they fail because they don't think about their business model. The most of the IT new ventures are started by students with technological background. And the lack of collaboration between technological universities and business-schools can partly explain high rate of failure. In such case, than IT and business students do not have natural environment for interaction, it becomes especially important which knowledge strategy IT start-up will follow. The knowledge sourcing and knowledge sharing decisions have high impact on the development of managerial capabilities of IT start-ups. And we believe that at conditions of the hypertrophied chasm between IT and business students the process of the alignment between knowledge strategies and business model becomes more visible, because the start-up team need to decide how to acquire lacking knowledge. Thus the question is how knowledge strategy and business-model shape each other in the start-up. This question actually can be split into two parts: 1) how knowledge strategy influence on formulation of the business model; 2) how business model formulation change knowledge strategy.

To answer this question we decided to use grounded theory approach (Strauss and Corbin, 1998) and the multi-case method (Eisenhardt, 1989). We conducting several semi-structured interviews with heads of IT start-ups. As we do not have access to the start-ups at the moment than idea was born, we conduct retrospective interviews. And the data analysis is held according to the procedure offered by Strauss and Corbin (1998). The coding of each data source is done independently by two researchers. In addition specially trained master student does the coding of the same materials to make it less dependent on prior assumptions and more objective.

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“Seeing” and “Sensing” Intellectual Capital in and between different Business model Eco systems

Peter Lindgren*

M-BIT Research Group
Business and Social Sciences,
AU Herning, Aarhus University, Denmark

Ole Horn Rasmussen

M-BIT Research Group
Aalborg, Denmark

Kristin Falck Saghaug

Department of Business and Management
Center for Industrial Production
University of Aalborg
Fibigerstræde 10, 9220 Aalborg

** Corresponding author*

Structured Abstract

Businesses today use enormous resources to search for Intellectual Capital (IC) that can value their Business Model Innovation. However business often focus the search for IC in their nearest Business Model Ecosystem and do often not “see” and “sense” valuable IC in BM ecosystems that are not or only peripheral related. Thereby many business rely their business model innovation on the same “pool” of IC – preventing them to release different IC that could eventually give valuable advantage to their business. Some research indicate that it is a good idea to search for IC in different BM Ecosystems – however there is a lack of research on Why this does not take place more and - How to release and relate to Intellectual Capital (IC) in BM Ecosystems that are different to those that the business is already operating in? The paper shows 3 case examples on how 3 different business relates to IC in different BM Ecosystems and value their business model innovation. The paper address the potential and challenges to release IC from different Business Model Ecosystems.

Design/methodology/approach - The paper provides case studies of IC exchange between different BM ecosystems. It shows a map of different business model ecosystems and maps the challenges to releasing IC.. The research methodology was chosen as to be an action research approach and was carried out from 2010 to 2014. The findings shows characteristic of different BM Eco systems related to the multi business model approach (Lindgren & Horn Rasmussen, 2013). Mapping our findings in a BM ecosystem perspective and the BM relation axiom enabled us to get a first picture of - What is the business BM relations to IC in different BM ecosystems? The mapping enabled us and

the business to “see” and “sense” potentials but also challenges to release valuable IC to Business Model Innovation (BMI) from different BM Ecosystems?

Originality/value - The paper illustrates how business by using IC from different BM Ecosystems potentially can improve their BMI results and the sustainability of their BMs. The research reveals that Business mainly focusing and releasing IC internal or from their nearest BM ecosystem prevents themselves from valuable BMI.

Practical implications Business struggle with releasing valuable IC from their business BM's. The research shows that they potentially could get valuable IC from different BM ecosystems that are outside their BM Ecosystem. This is however a challenge to many businesses when they cannot “see” and “sense” the IC in different BM ecosystems. They hereby miss the opportunity to adapt important IC to develop their business and escape “red ocean” business model ecosystems (Chan and Mahoughne 2008, Markides 2008). One consequence of this is that the practice of multi business model innovation and releasing intellectual capital (IC) becomes more difficult and complex to carry out than necessary.

Paper type – Academic Research Paper

Keywords.: BM Eco systems, Intellectual capital, Relations, Multi Business Models, relationship axiom

1. Introduction

Business Model Ecosystems (BME) and Intellectual Capital (IC) have not had substantial attention by academics and practitioners. BM ECO systems have however been the subject of a growing research interest in our research center “Multi Business Model Innovation and Technology ” (MBIT) because we found that there is very little knowledge about how BM Eco systems are constructed and function together but there is much knowledge of Business models (Zott 2010,Fielt 2011, Teece 2011, Lindgren 2013).

IC practice and the release of IC between BM Eco systems and how to release IC both directly and/or indirectly between BM Ecosystems have not been a special focus of BM research. Further there is little knowledge of what are the barriers to release IC between BM Ecosystems and why this valuable IC is not released.

Before commencing the study we have to acknowledge firstly that there until now is no accepted language for BM ECO system's that would allow us as researchers to examine BM Ecosystems. We therefore have to build such language and propose a language for BM Ecosystems - to approach a preliminary study of BM Eco system and their exchange of IC. The paper therefore commence with studying present knowledge on the definition of what a ecosystem and later a BM eco system is. Then the paper continue

to give a first attempt to how could a BM Ecosystem be defined and finally present different case studies of BM Eco systems on behalf of this framework.

In this context we build upon a comprehensive review of academic literature on eco systems and ecosystem frameworks, where we attempted and explored the origin of the term ecosystems. This literature basis we relate to our Multi Business Model framework (Lindgren 2013). The broad and multifaceted literature review reveals us with several insights, and enables us further to develop our BM Eco system definition and answering later the overall research question – What are the barriers to release IC between Bm Ecosystems.

2 Research question

For managers of business our previous research shows that the discovering of their business different BM's relations in the Business (Lindgren 2011) seems to inherent revelatory information and unreleased IC. The basic according to our research is firstly to let the business “see” their “AS – IS BM's” relations and then start “seeing” and “sensing” BMI relations potential to the business. Therefore it is interesting to address the following questions

How can a BM ecosystem be defined?

What are BM ecosystems relations to IC?

What are the barriers to release IC between BM eco systems?

How can business release IC between BM Eco systems?

3. Empiric illustrations and data analysis

We have chosen to illustrate from different research project where the majority of the projects are further elaborated in the “sister-paper” to this paper (Horn Rasmussen et.al. 2014). Consequently, we have been going from theory to the different case in order to identify potential links which makes sense. Such methodology doesn't verify any theory. However, the indications tell us that we might have some results which give meaning for the search for a research program in the Lakatos sense. We are aware of our verifying focused methodology must go close in hand with the proposed ontology and we are aware

of a need to try to “shot our hypothesizes down”. However, this is not part of the mission of the paper.

4. Defining a BM Eco system

When studying literature on Ecosystems and Business Ecosystems many researchers take their point of entry from a bio ecological perspective. We commence our study from this point of entry and try to draw an analogy and comparison to the term BM Eco system.

The term "ecosystem" was introduced by Arthur Roy Clapham in early 1930s and became more widely known via the works of Arthur Tansley, a British ecologist(Tansley 1934). Tanslev devised the concept to draw attention to the importance of transfers of materials between organisms and their environment. He later refined the term, describing it as "The whole system..."including not only the organism-complex, but also the whole complex of physical factors forming what was called “the environment”. Tansley regarded ecosystems not simply as natural units, but as mental isolates. Tansley later defined the spatial extent of ecosystems using the term ecotope.

The term “Business Ecosystem” was introduced by Moore (Moore 1993) in his Harvard Business Review article, titled "Predators and Prey: A New Ecology of Competition". Moore defined "business ecosystem" as:

“An economic community supported by a foundation of interacting organizations and individuals—the organisms of the business world. The economic community produces goods and services of value to customers, who are themselves members of the ecosystem. The member organisms also include suppliers, lead producers, competitors, and other stakeholders. Over time, they coevolve their capabilities and roles, and tend to align themselves with the directions set by one or more central companies. Those companies holding leadership roles may change over time, but the function of ecosystem leader is valued by the community because it enables members to move toward shared visions to align their investments, and to find mutually supportive roles.”

Moore used several ecological metaphors, suggesting that the business could be regarded as embedded in a (business) environment, that it needs to coevolve with other businesses, and that “the particular niche a business occupies is challenged by newly arriving “entrants” ” (Porter 1985). This meant that businesses need to become proactive

in developing mutually beneficial ("symbiotic") relationships with customers, suppliers, and even competitors.

DeLong (DeLong 2000) defined business ecology as "a more productive set of processes for developing and commercializing new technologies" that is characterized by the "rapid prototyping, short product-development cycles, early test marketing, options-based compensation, venture funding, early corporate independence".

G. Evelyn Hutchinson combined Charles Elton's ideas about trophic ecology with those of Russian geochemist Vladimir Vernadsky to suggest that mineral nutrient availability in a lake limited algal production which would, in turn, limit the abundance of animals that feed on algae. Raymond Lindeman took these ideas one step further to suggest that the flow of energy through a lake was the primary driver of the ecosystem. Howard T. Odum and Eugene P. Odum, further developed a "systems approach" to the study of ecosystems, allowing them to study the flow of energy and material through ecological systems. (Odum 1953).

We suggest that competences – which includes IC in a BM - availability in a BM Ecosystem limit BM Innovation (BMI), which would, in turn, limit the abundance of businesses and thereby BM's that feed on competences. The flow of value from e.g. IC through a BM Eco system is one driver of a BM Ecosystem. Values from IC flow not just internal through relations internal BM's - but also between BM's internal the business and BM ecosystem – the relationship axiom (Lindgren 2013). Then BM ecosystems are related to values also between BM Eco systems. Fundamentally value and thereby IC value from IC cannot flow without a relation. The study of value flow between BM Eco systems becomes hereby interesting to answer our research question. However to do the study a deeper understanding of a BM ecosystem, its relations and its BM's relations is fundamental.

An ecosystem is regarded as a community of living organisms (plants, animals and microbes) in conjunction with the non living components of their environment (things like air, water and mineral soil), interacting as a system. A BM Ecosystem is proposed as a "community of businesses" offering "AS IS BM" and proposing "TO BE BM" in conjunction with their BM environment.

These biotic and abiotic components of an ecosystem were regarded as linked together through nutrient cycles and energy flows. As ecosystems are defined by the network of interactions among organisms, and between organisms and their environment, they were

said to be of any size but usually encompass specific, limited spaces (Chapin 2002, Schultze 2005) although some scientists say that the entire planet is an ecosystem). (Willis 1997, Schultze 2005, Krebs 2009). The biotic and abiotic components of a BM Ecosystem are proposed as linked together through value cycles and BMI flows.

Energy, water, nitrogen and soil minerals are essential abiotic components of an ecosystem. Competences (Technology, Human resource, organisational systems and culture) (Lindgren 2010) are essential dimensions of a BM Ecosystem. Competence of a BM Ecosystem that are valued, can be found and developed makes the BM Ecosystem attractive to relate to other BM Ecosystems – and hereby the amount of competences can grow – but also diminish related to the values content.

The energy that flows through ecosystems is obtained primarily from the sun – regarded maybe as another Ecosystem outside the ecosystem of the earth – maybe include in the Ecosystem – depending on the viewpoint and context of the ecosystem. Value that flows through BM Ecosystems is obtained from other BM's inside the BM Eco systems – sometimes from BM's in different BM ecosystems outside the BM Ecosystem.

Energy - from the sun - generally enters the system through photosynthesis, a process that receive, creates, captures, and consume carbon from the atmosphere. Value– from another BM Ecosystem – must generally enter the BM Ecosystem through a value innovation process – A Business Model Innovation process. A BMI proces that create, captures, delivers and consume received value when optimum enrich the competences in BM's in the BM Ecosystem.. However if the value and herunder IC outside the BM Ecosystem cannot relate to a BM Ecosystem or the BM Ecosystem cannot relate to other BM Ecosystem then the BMI process cannot and will not take place. Further if the BMI process in the BM Ecosystem does not fit to the offered value then the BMI process cannot or will neither take place. Essentially values form one BM Ecosystem must give meaning to another BM Ecosystem, it must give value and it must be able to transfer via established relations.

By feeding on plants and on one another, animals and humans play an important role in the movement of matter and energy through ecosystems. By feeling on BM's and on one another, competences play an extremely important role in the movement and innovation of value and hereby IC through BM Ecosystems and between BM Ecosystems.

In Ecosystems animals and humans influence the quantity of plant and microbial biomass present. By breaking down dead organic matter, decomposers release carbon back to the atmosphere and facilitate nutrient cycling by converting nutrients stored in dead biomass back to a form that can be readily used by plants and other microbes. (Chapin 2002) - abiotic components. Competence influence the quantity and quality of BM's present. By breaking down dead or old BM's other BM's can release value from e.g. IC back to the BM ecosystem and facilitate new value innovation and development of competence cycling by converting competences stored in old or dead BM's to a form that can be used by other BM's and other BM Ecosystems.

Ecosystems are often considered as controlled both by external and internal factors. External factors such as climate, the parent material which forms the soil and topography, control the overall structure of an ecosystem and the way things work within it, but are not themselves influenced by the ecosystem(Chapin 2002). BM Ecosystems are also considered controlled by external and internal factors (Porter 1985)

Other external factors can include time and potential biota from other Ecosystems. Ecosystems are however dynamic entities—invariably, they are subject to periodic disturbances and are in the process of recovering from some past disturbance(Chapin 2002). BM Ecosystems are also dynamic entities, and they are also subject to periodic disturbance – oil BM Ecosystem, solar Energy BM Ecosystem.

Ecosystems in similar environments that are located in different parts of the world can have very different characteristics simply because they contain different species (Chapin 2002). Equivalent similar BM Ecosystems in different parts of the world have different characteristics s can be seen in the wind energy BM ecosystem in EU, China, US and South America.

The introduction of non-native species can cause substantial shifts in a ecosystems function. Introduction of new entrants (Porter 1985) or radical new BM's (Christensen 2005) to a BM Ecosystem can also cause substantial shifts in the BM Ecosystems function (Ryanair introduction to flight industry, Led Light in buble light industry). Evolvement of non-native BM's in new BM Ecosystem's can simply disrupt existing BM Ecosystem because they take value away from some BM Ecosystem and even change or destroy the control system of old BM Ecosystems (Itunes, Amazone, Facebook, Ikea, Schale gas and Oil).

Internal factors not only control ecosystem processes but are also controlled by them and are often subject to feedback loops (Chapin 2002). BM Ecosystems processes are also controlled by internal factors which effects the BM Ecosystems value and IC exchange processes – and hereby BMI. Summing up on the fundamentals to IC release between BM Ecosystems gives the following list.

Table 1. Fundamentals to value and IC release between BM Ecosystems.

Value offered from different BM Ecosystem must give meaning to the other BM Ecosystem.
Relations between BM, Business and BM Ecosystems must be established
There are competences in one BM Ecosystems BM's that are attractive to another BM Ecosystem
One BM Ecosystems wants, need or demand exchange of value and IC from different BM Ecosystem
BM Ecosystem control processes enables relations and are willing to enable relation to be established
BM Competence are free – not restricted or prevent to exchange to other BM Ecosystem
BMI competences are available in BM Ecosystem

While the resource inputs are often said to be generally controlled by external processes like climate and parent material in an ecosystem, the availability of these resources within the ecosystem is often controlled by internal factors like decomposition, root competition or shading. Other internal factors include disturbance, succession and the types of species present. Although humans exist and operate within ecosystems, their cumulative effects are large enough to influence external factors like climate (Chapin 2002). The value inputs and competence development to a BM Ecosystem can also be regarded as controlled by external processes like government and society – but maybe more important mentally by the participants in the BM Ecosystem – the BM's. However the availability generally of BM's competences – tangible or intangible – within the BM Ecosystem is often controlled by internal factors like competition, rivalry, entry and exit barriers (Porter 1985), patents and degree of openness (Chesbrough 2008), ownership and ownership rules, trust, culture, motives (Child and Faulkner 1998). Although competence exist and operate within BM Ecosystems, and we as researchers can see that the cumulative effect are large in specific BM Ecosystems and even between BM Ecosystems – this often is not enough to release value and IC due to both internal and external factors.

Biodiversity affects ecosystem function, as do the processes of disturbance and succession. Ecosystems provide a variety of value propositions upon which animals, people and things depend. Multi dimensionality and difference (Saghaug 2010) of BM's,

Business and BM Ecosystems can also affect BM Ecosystems functions and ability to do BMI. Processes of disturbance and change of succession in BM's dimensional construction, businesses and BM Ecosystems can provide a variety of new vital value propositions upon which BM, business and BME can evolve and survive. Classifying ecosystems into ecologically homogeneous units has until now be considered as an important step towards effective ecosystem management, but there is no single, agreed-upon way to do this. However the practise within classification, clustering and even society support of BM Ecosystems has previous been the same – dividing BME into clusters, industry sectors, innovation networks (FI 2013). Hereby controlling and supporting BM Ecosystem to be separated and preventing them to relate, “see”, “sense” each other – and exchange valuable IC.

An ecosystem consists in a biological term ((Willis 1997, Schultze 2005, Krebs 2009) as a biological community that can occurs in some locale, physical and/or chemical factors that make up its non-living or abiotic environment. There are many examples of ecosystems -- a pond, a forest, an estuary, a grassland. The boundaries are not fixed in any objective way, although sometimes they seem obvious, as with the shoreline of a small pond. Usually the boundaries of an ecosystem are chosen for practical reasons having to do with the goals of the particular study. The same can be stated related to BME's – where again there is often no natural boundaries – but just mental boundaries.

The study of ecosystems mainly consists of the study of certain processes that link the living, or biotic, components to the non-living, or abiotic, components intern a ecosystem. This is also the case with BM Ecosystem's however the majority of work have been on business and BM Ecosystem level – not between BM eco systems and internal BM's.

Energy transformations and biogeochemical cycling are the main processes that comprise the field of ecosystem ecology. Value transformationis the main processes that comprise the field of BM system ecology. Ecology generally is defined as the interactions of organisms with one another and with the environment in which they occur. BM ecology is defined as the value interactions of organisms and things with one another and with the BM Eco system in which they operate “AS IS” BM's and wants to operate – “TO BE BM's”. We can study ecology at the level of the individual, the population, the community, and the ecosystem. We argue that we can also study BM ecosystems at the level of BM component, BM dimension, BM, BM portfolio, Business and BM Eco system level.

Studies of individuals are concerned mostly about physiology, reproduction, development or behavior, and studies of populations usually focus on the habitat and resource needs of individual species, their group behaviors, population growth, and what limits their abundance or causes extinction. Studies of communities examine how populations of many species interact with one another, such as predators and their prey, or competitors that share common needs or resources. Studies of BM's have until now concerned mostly about BM construction (Osterwalder 2010, Zott 2011, Teece 2012), Business Model innovation (Chesbrough 2008, Zott 2010, Zott 2011, Osterwalder 2010, Taran 2011). There is a major lack of studies on the habitat and competence needs of individual BM's, BM's group behaviors, BM Eco Systems growth and decline, and what limits their abundance or causes extinction. Studies of BM Ecosystems examine how populations of how many BM's – BM Eco systems - interact with one another, such as predators and their prey, or competitors that share common needs or IC is still lacking.

In ecosystem ecology all of the above mentioned are put together and tried to be understood to find out how eco systems operates as a whole. Until now BM Ecosystem ecology have been put together and tried to be understood mainly as from a business theorem perspective and how the BM ecosystem operates as a whole in an industry (Porter 1985), sector (or cluster perspective examines a region's industry clusters, economic infrastructure, market dynamics and policy climate. A cluster is classical regarded as a group of businesses sharing resources, using similar technologies, and forming linkages and alliances. These linkages can take the form of buyer-supplier relationships, turnover and using same pole of employees, joint marketing, training, or research initiatives, associations, and lobbying. One of the unique features of cluster analysis is the focus on linkages between businesses, and on implications for shared strategies – often called "Co-opetition" – in which businesses selectively compete in some respects (say, in output markets) yet cooperate in other respects (say joint training programs).

This means - in an Ecosystem perspective - that, rather than worrying about particular species, researchers try to focus on major functional aspects of the ECO system. These functional aspects include such things as the amount of energy that is produced by photosynthesis, how energy or materials flow along the many steps in a food chain, or what controls the rate of decomposition of materials or the rate at which nutrients are recycled in the system. In an BM Ecosystem perspective – rather than worrying about

particular BM's we in this paper try to focus on major functional aspects of BM Ecosystems and the challenges and barriers to exchange of IC. We focus on the the amount and quality of BM's that is created, captured, delivered, received and consumed in a BM Ecosystem. In this context how values and IC flow between BM Ecosystems or what controls the rate of decomposition of Values and IC between BM Ecosystems.

From the above mention we can clarify and compare the parts of an ecosystem by listing them under the headings "abiotic" and "biotic" components. Related to a BM Eco system w propose to do a first attempt of clarification by listing them under th headings of "values" and "Competences".

Table 2. Fundamentals to value and IC release between BM Ecosystems.

Ecosystem		BM Ecosystem	
Abiotic components	Biotic components	Value dimension	Competence dimension
Sunlight	Primary producers	Products	Technologies
Temperature	Herbivores	Services	HR
Precipitation	Carnivores	Processes	Organizational Systems
Water or moisture	Omnivores	Value Chain	Culture
Soil or water chemistry (e.g., P, NH ₄ ⁺)	Detritivores	Business Models	
etc.	etc.	etc.	etc.

All of these vary over space and time both for Ecosystems and for BM Ecosystems. By and large, this set of components and dimensions – BM Ecosystems environmental factors is important almost everywhere, in all ecosystems - in BM Ecosystems and Between BM Ecosystems. Energy enters the biological ECO system as light energy, or photons and is transformed into chemical energy in organic molecules by cellular processes including photosynthesis and respiration, and ultimately is converted to heat energy. This energy is dissipated, meaning it is lost to the system as heat; once it is lost it cannot be recycled. Without the continued input of solar energy, biological systems would quickly shut down. Thus - the earth is an *open system* - with respect to energy. IC enters BM Ecosystems as values and creates valuable energy transformed into into "BMI energy" in BM components – attitudes created by attributes – which are the real drivers to any BMI processes. Without the continued input of value and IC BM's, Business and BM Ecosystems would as in species in Ecosystems also quickly dye and vanish Form the BM Ecosystem.

Elements such as carbon, nitrogen, or phosphorus enter living organisms in a variety of ways. Plants obtain elements from the surrounding atmosphere, water, or soils. Animals may also obtain elements directly from the physical environment, but usually they obtain these mainly as a consequence of consuming other organisms. These materials are transformed biochemically within the bodies of organisms, but sooner or later, due to excretion or decomposition, they are returned to an inorganic state. Often bacteria complete this process, through the process called decomposition or mineralization.

Values and IC also enter BM's, Business and thereby BM ecosystems in a variety of ways – but always through relations. BM Ecosystems obtain value and IC from surrounding BME's and from BM's inside the Ecosystem. BM Ecosystems can therefore grow from value and IC obtained from inside the BM Ecosystem or obtain from outside the BM Ecosystem. These values and IC are transformed in the BME within the BM's, but equivalent – sooner or later - due to “excretion or decomposition” BM's value and competence are also returned to an inactive state – dead BM's or “sleeping” values and IC. These dead BM can however on a later perspective turn out to be valuable – if they can be found and released – to BMI and new BM.

During decomposition these materials are not destroyed or lost, so the earth is a **closed system** with respect to elements (with the exception of a meteorite entering the system now and then). The elements are cycled endlessly between their biotic and abiotic states within ecosystems. Those elements whose supply tends to limit biological activity are called **nutrients**.

During decomposition the components of any BM's have until now been considered as they could not be destroyed or lost. Any BM Ecosystem have been considered until late 2000's (Chesbrough 2008) also been considered as closed BM Ecosystems, however with respect to new BM's or BM dimensions (a disruptive BM (Christensen 2005) or a new Entrants (Porter 1985) entering the BM Ecosystem. The BM's value and IC can therefore also be considered as cycling endlessly between BM's in the BM Ecosystem.

Table 3. Comparing Fundamentals of Ecosystems and BM Ecosystems.

• Ecosystems	• BM Eco systems
• Ecosystems are made up of abiotic (non-living, environmental) and	• BM Ecosystems are made up of “AS IS” and “TO BE” BM and dead BM's

<p>biotic components, and these basic components are important to nearly all types of ecosystems. Ecosystem Ecology looks at energy transformations and biogeochemical cycling within ecosystems.</p>	<p>and these basic BM are important to nearly all types of BM Ecosystems. BM Ecosystem studies looks at value and IC transformation and cycling within and between BM Ecosystems.</p>
<ul style="list-style-type: none"> • Energy is continually input into an ecosystem in the form of light energy, and some energy is lost with each transfer to a higher trophic level. Nutrients, on the other hand, are recycled within an ecosystem, and their supply normally limits biological activity. So, "energy flows, elements cycle". 	<ul style="list-style-type: none"> • Value are continually input into a BM Ecosystem in the form of technology, HR, organizational systems and culture. Some value and IC are lost with each transfer because there is no relation, receiver, capturing BM or a BM that can consume the Value or hereunder the IC.
<ul style="list-style-type: none"> • Energy is moved through an ecosystem via a food web, which is made up of interlocking food chains. Energy is first captured by photosynthesis (primary production). The amount of primary production determines the amount of energy available to higher trophic levels. 	<ul style="list-style-type: none"> • Value is moved through a BM Ecosystem via relations, which is made up of interlocking relations components. Value is created, captured, delivered, received and consumed by a BMI process consisting of primary and secondary functions (value chain functions) carried out by competence inside the BM or competences outside the BM.
<ul style="list-style-type: none"> • Ecosystem function is controlled mainly by two processes, "top-down" and "bottom-up" controls. 	<ul style="list-style-type: none"> • BM Ecosystem function is controlled mainly by two processes, "top down" and "bottom up" controls.

5. BM Eco system case research

A BM ecosystem is context based related to topic, time, actor and viewer. The case shows different context and BM Ecosystems of the renewable energy market.

5.1. Renewable Energy BM Eco system (RE)

The market for renewable energy is rising all over Europe due to the vision "Re-thinking 2050" by the European Renewable Energy Council (EREC 2010). EREC launched a plan called "Re-thinking 2050" in April 2010, where the vision was to have a 100% renewable energy in 2050 for all the European countries. Professor Arthouros Zervos, president of EREC stated that "We do not inherit the Earth from our ancestors: We borrow it from our children", and he further argued that the technology is ready for this changes, why is it more a choice of taking the right decisions for the future, then taking the easily road (Zervos 2010). 97 % of the electricity consumed shall come from

high renewable energy sources such as solar, wind, biomass, geothermal etc. This high renewable energy sources should have 75 % of the gross final energy consumption (Memo 2010). Hereby Zervos indicated that European energy challenges should be solved by different BM Ecosystems (Solar-, wind, Biomass, geothermal etc.) supply of Energy and each BM Ecosystem should do BMI to reach the vision. However Zervos do not mention release and exchange of IC between different BM Ecosystems. Therefore it often seems that the different BM ecosystems in renewable energy market seems to focus on BMI and IC release within the BM Ecosystem and not between. Further it seems as the individual BM Ecosystems regard themselves as competitors to each other and together to fossil Energy BM Ecosystem. This could explain sometimes why BMI is not moving faster towards archiving the vision – simply because the individual BM Ecosystems do not exchange IC or maybe do not see valuable IC in each other BM Ecosystem.

5.2. The Danish and global Wind Industry BM Ecosystem (DWI)

Globally, the Danish Wind Energy BM Ecosystem is a part of the Global wind energy BM Ecosystem and holds a quarter of the total global turnover. In 2013 the Danish wind energy BM Ecosystem exports saw a minor drop to 48.7 billion DKK (6.5 billion EUR) compared to 52.3 billion DKK (7 billion EUR) in 2012. (DWI 2014) The global BM Ecosystem grew however by 35.3 GW to a cumulative capacity of 318 GW by the end of 2013. This development was driven by China and USA (28.7 percent and 19.2 percent of the total MW installed). BM related to the Danish Wind Energy BM Ecosystem stand therefore at the forefront of new BM ECO System reality where new and different IC is highly needed. New competing BM ecosystems enters the BM energy ecosystem, new business models turns up, new business model rules and regulations and new BM relationships points to a transition towards rethinking and innovating the existing practise of releasing intellectual capital in the Wind BM Ecosystem. For the purpose of this paper related to the Wind Energy BM Ecosystem the challenges is to create, capture, deliver, BM's that continuously are becoming greener. In this transition, a great deal of BMI opportunities lie open for those business and societies businesses ready to fill and understand identified gaps through developing their own sustainable green BM's within the new BM Ecosystem market reality of amongst other low-carbon and new BM values.

The European market is the largest in the world when it comes to offshore turbines (Marcacci 2013). The Chinese market have had an upturn in 2013 (Wind 2014) because

the Chinese government was giving a large subsidy to the wind turbines that are installed in China. (Berger) foresight that this BM Ecosystem called APAC market is reaching 1.5GW of new annual capacity additions worth €4.8 billion by 2020. (Marcassi 2013). Berger further foresight Canada, America, and Mexico to be home of 500MW annual capacity additions reaching a total investment of €1.6 billion by 2020

This all means that the BM Eco system for renewable energy based on Wind Energy is very attractive and many businesses are interested in getting a piece of the BM ecosystem, estimated to over 1470 billion euros in EU. However the wind BM ecosystem not only as we have seen above compete internal but also compete with other BM Ecosystems as solar, biomass, geothermal and other renewable energy sources. This also means that there is focus on BMI in the renewable BM Eco system, where different BM Eco systems are interrelated and competing each other to get the largest piece of the renewable energy market. Accordingly in 2050 the estimates are that Wind Energy BM Ecosystem will dominated the EU market with 1552 TWh. As second is Photovoltaic (PV) with 1347 TWh and then biomass with 496 TWh. The estimates are further that for Wind Energy BM ecosystem they will need to invest 6 billion euros over the next 10 years, which will mean releasing existing and new IC from different BM eco systems. This will lead the Wind Energy BM Ecosystem to contribute with up to 20 % of the EU electricity by 2020 and 33 % by 2030. As seen in figure

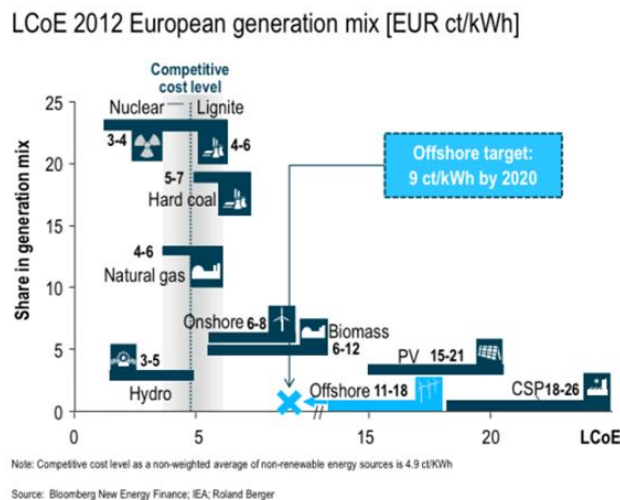


Figure 1. LCoE 2012 European generation mix.

2), today's wind turbines are not the most cost-effective energy source. The graph shows the leveled cost of energy (LCoE) in the different BM Ecosystems in the BM

Energy ECO system. Look at onshore turbines BM's the cost is 6-8 euro-cent per kilowatt-hour (kWh) produced. Today (2013) the offshore turbine LCoE BM's is 13 euro-cent per kWh. The offshore wind turbines BM's are more expensive due to the large size and problem with logistics. Further is it costly to set offshore turbines in ever-deeper waters. Never the less does Berger (Berger 2014) states that: *"The offshore wind businesses will become increasingly important in the years ahead"*

Because Wind energy comes in very unstable due to the wind the Wind Energy have found and interest to relate to other BM Ecosystems to find IC that can help and support in e.g. developing Energy Storage devices, convert electricity to other types of energy types – Gas, Hydrogen. Also reduction of subsidies to the BME Ecosystem have change the BME's motivation and drive to find different IC. DWI and the Wind Energy BME have until now not been particularly interested in relating to different BME's. However lately due to business and technology interest there has been more interest. These relations have primarily been establish from a bottom up perspective as different businesses in the BME have tried to relate to different BME's to find valuable IC.

5.3 AH Industries

AH Industries is one business in the Danish Wind Mill BM Ecosystem and delivers products, consultancy services and site management to other Businesses BM's in the Wind Mill BM Ecosystem. One of AH Industries specialities is to machine metal in any size to parts for the Wind Mill businesses as Siemens, Vestas, Suzlon and GE. The Wind Mill businesses Siemens, Vestas e.g.assemble BM's from many suppliers and offers the Windmills to Energy Businesses as DONG, Watenfall e.g. AH Industries are competing other suppliers in the Wind Energy BM Ecosystems and have until lately primarily been focused on value and IC exchange inside this BM Ecosystem. However lately AH Industries began to enter other BM Ecosystems – e.g. Concrete BM Ecosystem, Hydro Power BM Ecosystem. This was done by acquisition of two businesses.

AH's interest to join different BME's was primarily of economic interest and not as such about transferring knowledge and IC. Therefore the different Business Unit have until now operated separately and not related very much. AH control strategically relations between different BME's and tries to have different Business Units and thereby BM'S to stick to their core Business. This often prevent them "to think and relate out of the box".

5.4. MCH (MCH)

MCH is one of Scandinavians largest and most flexible amusement centers with over 900.000 visitors each year. MCH has 4 BM portfolios – The Fair center Herning, MCH Herning Congresscenter, MCH Arena and Jyske Bank BOXEN. MCH has the competence to provide meetings for 15 people, congres for 2.000 participants, football matches and arena for 11.000 spectators and fairs up to 50.000 guests. MCH competence is to provide BM's and BM Eco systems where amusements, business model exchange are core. Amusements can be a broad spectrum - rock, teater, musicals and big sportsevents. MCH host and set up more than 500 arrangements pr. year and is one market leader in setting up BM Ecosystem of amusement. MCH competence are professional and serviceminded employess, topmodern facilities. Unique experience and facilitating people and technology to meet each other is MCH's core competence.

MCH set up every second year a Industri Fair – a BM Ecosystem – for the WindMill Industry and other Industries – other BM Ecosystems. The Industry Fair called HI – Fair – functions as a BM Ecosystem for 5 days. Many business with many different BM's operates in the HI – BM Ecosystem led by MCH. All BM's present at and under the HI – BM Ecosystem negotiates with MCH to be able to offer their BM's in the BM Ecosystem.

Until now MCH have had very limit interest to relate to different BME but due to decline in some of MCH's BME they have decided to opening up e.g. to University BME.

6. Discussion

Ecosystems and BM Ecosystems seems to share much related to characteristics, structure and living. Maybe that is not that strange because BME are built on biological ecosystems – and therefore they are interrelated and share values and competences. However mentally we often regard BM, Business and BM Ecosystems mentally as something different to “a swarm of fish or flies”. Maybe we can learn much about BM Ecosystems via studying biological ecosystems – and maybe we have not paid attention enough to learn from these ecosystems that are related to other outputs than money and profit.

The approach of our research was to use a proposed BM Ecosystem framework to “see” and “sense” challenges and barriers to IC exchange between different business model ecosystems.

In this process the business we “downloaded” information on BME’s “AS IS” and “TO BE” BM’s existing and potential relations to BM’s and thereby IC in other BM Ecosystems. IC and potential relations to IC – which the Business in focus might not in their daily work be able to “see” and “sense” by themselves before mapping in the relation. Relations to IC that in their daily business operations were valuable could now be visible and measured. When all relations for each BM Eco System were mapped – which we found that were extremely time consuming – it showed “To BE” and “AS IS” BM relations to IC, which enabled the business potentially to understand better the challenges and barriers to IC exchange with different BM Ecosystems. Firstly we discovered a large BM Ecosystem – the BM Ecosystem of renewable energy. In this BM ecosystem we discovered sub BM Ecosystems as Wind Energy, Solar, Biogas, Wave energy BM Ecosystems. The BM Ecosystems were mapped to each specific BM Ecosystem relations were observed and registered. However we did not get a full and detail picture of the relations – but we could discover that many relations which could turn out to be valuable relations to BMI were lacking or were not set up. BM Ecosystems within the renewable BM Eco system were mostly concentrating on building up internal relations, running internal relations and exchange of value and IC internal their BM Ecosystem. Lack of meaning, motive, motivation, competition was some of the explanations to why IC from one BM Ecosystem was not released to another. However when the question of fossil versus renewable energy BM ecosystem came up – (Cop - 2009) mentally it was possible to discover that the renewable BME’s mutually could melt together and exchange IC. These observations was registered both for tangible and intangible values and relations. This was registered related to creating, capturing, delivering, receiving and consumption of values send through the relations established between the BM Ecosystems. This means it was now possible to a BM Ecosystem to “see” and “sense” which values and IC really had an impact and contributed to a certain BME and the BM’s inside the BME.

The work is time consuming – as earlier mentioned - and would by preference have been much easier to do if it could have been digitalized – or was digitalized between and inside the BME’s . We argue that most of the information about relations to IC between BME’s are “sleeping” and “unused” relations, which is a major reason to why IC between BM Ecosystems are not released or not released before there is a need for them. As we saw in the MCH BME MCH had many relations but did not activate these before they

were challenges to the survival of some of their BME's. However sometimes this is too late because relations are broken, BM's and BME's have moved away or closed them self for new entrance. The relations to value and IC outside BME's can also quit simple be found and mapped if customers and network partners from BM's in different BM Ecosystems are included or overlapping more BM Ecosystems. As we observed in the Wind Mill BME many of the Businesses were present in more BM Ecosystems, which enabled value and IC exchange between BME's via specific Businesses. As for research purpose we used some supporting tools (Amidon 2008, Alee 2011, Russels 2010) to map the relations, which helped us to overview the value stream and relations between BME's . More research has however to be carried out here to get a better picture as some information are lacking – especially “Seeing” and “sensing” the relations and value flow from outside BME.. However we observed

that different BME's very seldom exchange value and IC – unless they are motivated and forced to do so.

In this case Universities and Governments can play a very central role to support and motivate for more value and IC exchange between different BME's.

Better methods of mapping intangible relations to value, IC and hidden knowledge are however vital to get a better and more relational picture of a BME's relations. Alee's value network tool has again been helpful to use ´when mapping intangible value and relations inside a BME and to some extend between BME's. Russels, Amidon's and Hagedorns (Hagedorn 2005, Amdion 2008, Alee 2011) relations framework and tools are helpful when mapping relations more in a social BME network context and perspective – especially intangible relations to knowledge zones. The 4 interrelated BME use cases each represent different BME's seen in different contexts. They show different relations approaches to “see” and “sense” relations to and between BME's. The “Seeing” and “Sensing” part was only done from the specific BME view point but could have been seen from other viewpoints. The 4 BME casesshowed us that they had very different characteristics related to those challenges we earlier discovered to why IC is not released between BME'. These are comment in table 4.

Table 3. BME relations related to the 4 BME cases

Cases	Characteristics	Quadrant 1 inside the BME	Quadrant 4 outside the BME
The REBME	Multi BME Based Primarily Inside renewable energy BME Based	Many tangible and intangible relations internal to different BME's inside renewable Energy BME Ecosystem.	Several identified potential BME's with unreleased tangible and intangible relations to IC.
The DWI BME	Single BME Based Primarily supporting Inside BME IC concerns	Many tangible and intangible relations internal Wind BME. Many tangible and intangible relations to many competences inside Wind Energy BME.	Few identified tangible and intangible relations to different BME's with potential unreleased IC.
The AH BME	Primarily Single BME based	Few tangible relations internal to different BME's. Many tangible relations to the same competence in BME	Very few identified tangible and intangible relations to different BME's with potential unreleased tangible and intangible IC
The MCH BME	Primarily Single BME based	Many tangible relations internal to different BME's. Many tangible relations to few key competences in BME's	Few identified relations to BME's with potential unreleased tangible and intangible IC

Table 4. Characteristics and relations to IC of different business.

Fundamentals for Value and IC flow can be released	RE	DWI	AH	MCH
Value offered from different BM Ecosystem must give meaning to the other BM Ecosystem.	NO	Yes	Yes	YES
Relations between BM, Business and BM Ecosystems must be established	NO	Limit relations	Limit relations	Limit relation yet
There are competences in one BM Ecosystems BM's that are attractive to another BM Ecosystem	NO	Yes – but still limit interest	Yes – but until now limit interest	Yes – but until now limit interest
One BM Ecosystems wants, need or demand exchange of value and IC from different BM Ecosystem	NO	Very limit interest	Very limit interest	Until know very limit interest but due to decline in BME now opening up
BM Ecosystem control processes enables relations and are willing to enable relation to be established	NO	Not particularly	Not particularly	Until now not particularly but in change
BM Competence are free – not restricted or	Yes	Yes	NO	Yes

prevent to exchange to other BM Ecosystem				
BMI competences are available in different BM Ecosystem	Yes	Yes	Yes	Yes

When one analyze the characteristics and the relations of the 4 BM Ecosystems cases individually it shows that the BME's are quiet introvert – they use relations mostly to IC internal the BME or relation to IC of known and close BME Ecosystems. It seems that there is much unused potential IC to release for both "TO BE" BM and change of "AS IS" BM's when BME's relate and do more interaction with BME's that are different.

The use cases studied point overall to a need of having different BME's focus more on "seeing" and "sensing" each other. BME's have however to "learn" how to relate to different BME's IC and then learn how to release IC strategically through tangible and intangible relations to different BME's. Business that try to release tangible and intangible IC "blindly" from different BME's often miss the real IC relation opportunities and values. They will not be able to "find" IC that they are really looking for and which could create sustainable business model opportunities to their BME's. Further they might not even be able to release IC, which are vital for their BME's because they do not real "see", "sense" and understand the relations to IC and interdependencies to relations of other BME's. Thereby the meaning of releasing value and IC from different BME's get lost.

7. Practical implications

BME's can in the work of mapping relations to IC in different BME's have advantage to use different methods to map relations. We propose that BME's has to work with different methods and hereby "learn" their relations to different IC. Especially 5 areas seem to be important in this work:

1. Use user friendly relations mapping tools for BME's relation mapping.
2. Use different relations mapping methods and tools
3. Use methods and tools which can map actual and potential BM s relations - both for "A'S IS" and "TO BE" BM in different BME's

4. Use BM relations methods and tools that can map value stream and relations over time
5. Use different viewpoints related to mapping relations of BM
6. Use methods and tools that can also show the implementation and operation part of value stream and relations – the "ACT - DO" phase and part of relations of different BME's.

In the process of mapping relations business in different BME's also need in beforehand to be aware of their potential relations and relations that they or more precisely their BM's are not part of – the "IN OUT", "OUT IN" and especially "OUT OUT" relations. Mapping these is a question of "seeing" and "sensing" out of the box. This of course demands resources and time to go deeper inside and outside the business and its business models. In our research we observed more times that business often begin BMI without analyzing carefully enough their BM's relations, relations to IC. Hereby they miss to identify where the business BM's real and hidden relations to IC really are and thereby find those relations to potential IC that can be in many case already be used in their BMI from different BME's.

The Business can when mapping relations to different BME's IC face a real revelations and new self transcending knowledge about relation to IC.

8. Conclusion

BM ecosystem can be defined form very different contexts however the ecological system approach gives much inspiration to how a BM Ecosystem could be defined. The difference is however that ecological systems are mostly related to physical system approach whereas BM Ecosystem also are related to mental approach – which BME do my business belong to.

This paper shows different BME's relations to IC and challenge to relate to IC in different BME's. Hereby it is possible to "see" and "sense" from a specific BME viewpoint the operating BME's business BM's tangible and intangible relations to IC inside and outside the BME's. The BME cases were firstly mapped with their relations to different BME's by "downloading" their tangible and intangible relations of BME's. We map them and found 2 relations context

1. *“IN IN” relations* - focusing on the relations of BME’s - its relations to other BME’s inside the BME. The view point was seen from the single BME’s side inside the BME.

2. *“OUT OUT” relations* focusing on relations to different BME’s outside the BME. The view point was seen from the single BME’s side outside the BME.

BME’s have stronger “IN IN” relations than “OUT OUT” relations which is not surprising. However it seems as if when BME’s and Businesses inside BME’s begin to mentally feel pressure on survival then they begin to be more open to relations to different BME’s. Therefore the meaning of relating to different BME’s IC play a very important role to why BME’s relate or do not relate to different BME’s.

The important barriers to release more IC between BM eco systems are meaning, control, and need. Meaning and need seems to be fundamental to have BME’s to relate – where control can be a serious prevention to open up relations to different BME’s. Fundamentally relations have to be established to release IC.

Business can release more IC between BM Eco systems but there has to be a meaning. When society and governments together with strong BME’s continues to control and support single BME evolvement then they seems to prevent more release of IC.

9. Further Research

Mapping relations inside and outside BME’s is today very complicated and time consuming to carry out. There are today few tools that support BME IC relations mapping. Value network relations tools “tell” the business about value streams – both “tangible” and “intangible” and Social network relations tools “tell” about which Business from which BME is related to which BME. When put into the BME relationship axiom the value stream or potential value stream transfer between BME’s becomes visible. However the tools still only shows a fragmented picture of the value stream and not if really if IC transfer is really carried out and further potential value transfer.

New methods and more research to better encompass how BME’s can release more IC and hidden knowledge is highly needed. Especially we believe that more digitalization of business relations inside and outside BME’s will give a better understanding about what relations and relations to IC in different BME’s really exists – and How to release more IC from different BME’s. The digitalization of the BM will also give possibilities for BMI leaders to apply and see different BMI scenarios and effects of their BMIL strategies

related to releasing IC from different BME's. This work we have just commenced to carry out.

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Appendix 1 The Multi Business Model Approach

The Multi Business Model Approach was proposed by Lindgren et All in 2012(Lindgren 2012) as a matter of definition that any business must be considered as having more than one business models.

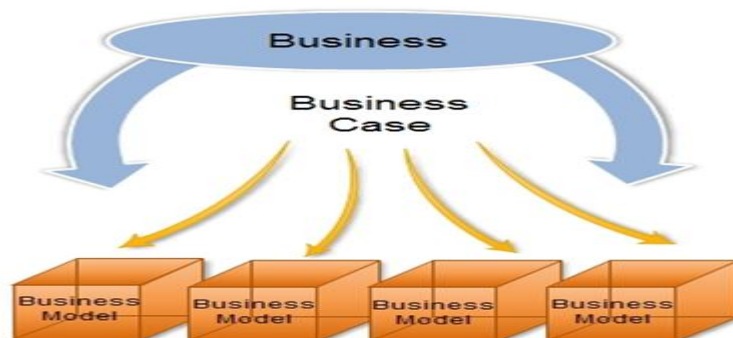


Figure 2 The Multi Business Model Approach (Lindgren et all 2012)

Business model Eco systems and Intellectual Capital II. Why is Intellectual Capital from business BM´s relations not released from a general Veblenian framework condition perspective?

Ole Horn Rasmussen *

M-BIT Research Group
Aalborg, Denmark

Peter Lindgren

M-BIT Research Group
University of Aarhus - Herning

Kristin Falck Saghaug

Department of Business and Management
Center for Industrial Production
University of Aalborg
Fibigerstræde 10, 9220 Aalborg

** Corresponding author*

Structured Abstract

Purpose - The idea of business model innovation and releasing of IC gets into problems if the theoretical works of Veblen acts as corner-stone in order to understand BM Eco-systems. IC - per definition - meets a systemic framework where the normative idea of meaning becomes part of the theoretical and practical discussion. We have mish-match between what the economy is able to produce compared with what the economy in practice produce. We have a cavalry of actors (IC) with specific intentional acting. Taken together the interplay between these elements create specific conditions for the context dependant term “sustainability” (McNeill, 2000).

Design/methodology/approach - The paper provides a theoretical study of the Veblenian framework conditions to BMI, ecosystems and the requirements to sustainably BM from a Veblenian perspective. The empiric research methodology is primarily an action research approach. Mapping our findings with reference to Veblen and a BM ecosystem perspective we get a new picture of BM-Ecosystems relations to IC? Methodologically the idea of national innovation systems (Lundwall 1992, 2010), eco-system (Heikkilä & Kuivaniemi (2012), BMI processes and empiric illustrations are linked to Veblen . This illustrates how releasing of IC depends upon economic organization combined with the general rules of the game.

Originality/value - The research reveals that BMI with absentee ownership prevents release of radical BMI IC. Because of the rules of the game these businesses per definition don't have the incentive. Businesses are at management level hereby not able to create, capture, deliver, receive and consume the real potential of different business model ecosystems. The only way to secure sustainability is the creation of a fundamental change – a transformation. Point of departure must be defined as the institution Politics or pressure from the outside (Horn Rasmussen 2008 inspired by Veblen 1914, 1923a).

Practical implications Businesses struggle continuously with releasing valuable IC. This challenge exists because of the economic organization and the inherent conservative institutions including the institution of “Make-believe”. The absence of important potential IC to develop their business introduces a need for a discussion of new strategies at both a micro- and macroeconomic level to improve and increase the release of IC to BMI. Business should be more structured about their mapping and releasing methods to IC inside and outside their business, focus on the different roles of actors and the general framework conditions for releasing IC in the economic system.

Keywords: Intellectual Capital, Veblen Grand Theory, Institutional and evolutionary economics, BM Eco systems, Actors

Paper type – Academic Research Paper

1 Introduction

From a system – or macro - point of view - the idea of business model innovation and the releasing of IC gets into a huge dilemma if the theoretical works of Thorstein Veblen acts as one of the corner-stones in order to understand Business Model Eco-systems. IC - per definition - meets a systemic framework where the normative idea of meaning, meaninglessness and rationality becomes part of the theoretical and practical discussion with reference to at least three themes. First of all we have what Veblen announces as “The State of Industrial Art”. It refers to the mish-match between what the economy is able to produce compared with what the economy in practice produce. Secondly, and this is the main focus in this paper, the theoretical work of Veblen operates with a cavalry of actors. Each actor have - what we from a Veblenian perspective can call it – intellectual capital, which – per definition - is bound up into a specific intentional acting defined at a general level. Thirdly, those two elements represent two different aspects – or framework conditions - of how intellectual capital is released in any practical Business Model Innovation process. Taken together we claim that the interplay between these two elements create an overall general framework for a discussion of the context dependant

term “sustainability” (McNeill, 2000). Being more precisely, multi business model innovation and releasing intellectual capital (IC) from a business BM’s through the business model innovation process rest upon – at least – two different framework conditions where the dominating model (The Veblenian Modern System 2 interpreted by Horn Rasmussen 2008) act as the superior because it defines “The Overall and General Rules of the Game”. For an illustration of what Multi Business Innovation is about see appendix I.

Because the Veblenian approach is primarily theoretical there is a need for qualified definition of the empirical object. Our contribution to this task and the methodological reflection has an initial reference to the idea of BM Ecosystems (BMI) and Intellectual Capital (IC). However, the relationship between the two notions has not had substantial attention by academics and practitioners. Consequently, the contribution from the paper is explorative.

There is until now also no accepted language for BM Ecosystems that would allow researchers who examine different BM’s relations and the potential to release BM’s IC between different BM Ecosystem. The paper attempt to contribute by proposing how the link between BM, Business Model Components, Business Model portfolio, the business and the different ecosystems represent the potential for a BMI process, which together with some general rules of the game, as defined by Veblen, lay down the framework conditions for a business’ BMI process.

Based upon – primarily – our action research we discuss how the theory presented is reflected in selected and concrete BMI processes.

2. The idea of ontology in the paper

The methodological reflection has reference to ontology¹ and the idea of explanation. The most influential theoreticians are Roy Bhaskar and Tony Lawson (Lawson 1997: ; Lawson 2003a: ; Lawson 2003b) and Jon Elster (Elster 1983: ; Elster 1986: ; Elster 1989). The reflections of Lawson, based upon the thoughts developed by Bhaskar, belong to critical realism. They aspire to develop a universal ontology of economics. On the one

¹ “By ontology I mean the study (or theory) of being or existence, a concern with the nature and structure of the “stuff” of reality. Now, all methods have ontological presuppositions or preconditions, that is conditions under which their usage is appropriate” (Lawson 2003b:12)

hand, this ambition can be postulated to represent an alternative means of thinking as compared with Elster and the discussion in which the potential of multiple explanations is offered². On the other hand, Lawson and Bhaskar argue for the existence of an ontological hierarchy of explanations within economics. Their method is to seek behind the cause to the cause of the cause etc. This implies a position of endless regress. We can never be absolutely certain that we have found the truth. This also indicates a kind of openness to multiple explanations. One methodological challenge in the research process is to test the usefulness of an Elster/Lawson combination. Elster's idea is to go from macro to micro, i.e. reductionism. He focuses on explanation by mechanisms.

To explain is to provide a mechanism, to open up the black box and show how the nuts and bolts, the cogs and wheels of the internal machinery (Here the term "mechanism" should be understood broadly, to cover intentional chains from a goal to an action as well as causal chains from an event to its effects) (Elster, 1983: 24).

Our task is broader, because we are inspired by the term "transformation". Transformation is a result of a radical change in at least one of the central rules of the game (Horn Rasmussen, 2008). A demarcation to a focus on mechanisms would make the term "mechanisms" identical with the term "rules of the game". This is not our initial intention. While Elster's universe is the micro-foundation of the economy and a general neglect of anything other than the micro-universe, the philosophy of Tony Lawson as based upon Bhaskar points in the direction of the meta-universe. Methodologically, the combination between Elster and his priority on causal and intentional explanations within social science, and the search for an universal meta ontology as inspired by Lawson is on the one hand contra-dictionary. On the other hand, the methodological idea is that such a combination may involve more theoretical insights. This may contribute with a heuristic element to the research process. The latter argument supports the attempt to make such methodological combination.

This leads us to a position where a construction a kind of patchwork of explanations may contribute insight to our research question. However, as we are going to demonstrate much of the patchwork construction may very well refer to the theoretical perspective. What level of abstraction does the arguments belong to? The task may be implemented as

² In Elster (1983) the idea of explanations (causal, functional and intentional explanations) is confronted with theories of technical change (neoclassical theories, Schumpeter's theory, evolutionary theories and marxist theories).

adequately as possibly. As one might already notice, this brings us to the first consequence of our study; when we conclude, we have merely made a contribution to a new beginning based upon a deeper understanding of solving our problem. This is the position of the critical realism approach, which by definition always will argue in such a manner. Besides, there is a link to Lakatos and his methodological approach for a continuously search for and establishment of new research programmes. By now, the link between explanations and understanding should be indicated. Understanding represents the deepest archive of knowledge. Explanations are the means, while understanding is the aim. The general issue in this methodological reflection concerning what could be perceived as “A contribution to a concept of explanations in order to reach a better understanding.” The task is not to neglect a search for a model, but rather, the ambition *to create an initial foundation for a model during the compilation of different theories*. This forwards a crucial question; how do we select our theoreticians, what are the arguments and what is our delimitation? In this paper we have chosen to focus on Thorstein Veblen because he argues for certain systemic limitation for any BMI process. We find it useful to investigate if the Veblenian perspective offers important insights in order to understand the question of releasing IC in the process of BMI? In order to investigate the question we find that point of departure could be understanding of the object for BMI. Within a macro level the idea of National System of Innovation has for a long academic period contributed to define the foundation of the knowledge economy. However, recently the idea of eco-systems has been much debated both within the academic and industrial communities. Based upon this compilation we are going to present a contribution to how to create a link between a macro and a micro perspective with an explicit reference to business model innovation (BMI).

3 Research question

For managers of business our research indicates that the unawareness of different BM ecosystems in relation to the focal Business Model Ecosystem seems to inherent revelatory information and unreleased IC related to BMI. The basic for a business is firstly to know and define their own “AS – IS BM ECO Systems”. Next step could be to know and define relations to other BM ECO systems and then start “seeing” and “sensing” potential BM relations to different BM ecosystems. This address at least two questions. How is their Business Model Eco system related to IC and how is their IC

released? And further: How can business release IC through BM relations to other BM Ecosystems? In the meantime and simultaneously for giving a precise answer to these questions we find it important to step up and give an answer to a more general question:

How does IC release in the economic system?

The idea is that a combination of different explanations and understandings – within different levels of abstraction - will increase our general archive of knowledge and consequently contribute to improve the theoretical knowledge in the academic communities with reference to innovation processes. Besides, such potential for increasing the existing knowledge might be of practical importance for the concrete IC work within the businesses at a micro economic level.

4 Veblen and his contribution to understand Business Models, Business Model Innovation, Eco-Systems and IC

4.1 Introduction to the relevant elements in The General Theory of Veblen

It is our hypothesis that The General Theory of Veblen as outlined by Horn Rasmussen (2008) may contribute to the understanding of Business Models, Business Model Innovation, Eco-Systems and IC. The theoretical work of Veblen is complex. However, in this section we focus on seven elements of The General Theory and investigate how they can be linked to both the theoretical and empirical work related to BM, BMI, Eco-Systems and IC.

The elements are:

1. The Mechanism: The Interstitial Adjustment of the Industrial System
2. The Mechanism: All politics are business – Politics one
3. The Institution: Make Believe
4. The Institution: State of Industrial Art
5. The Institution: Politics two
6. Evolution of the Actor Cavalry
7. Evolution from handicraft to modern system 1 and 2

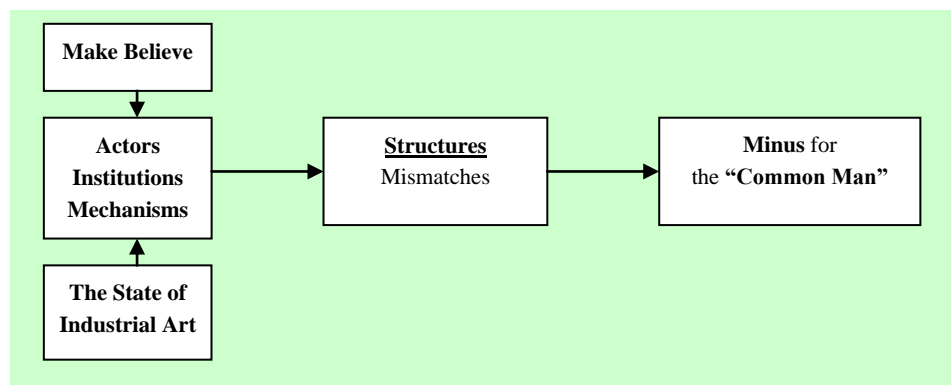
Taken together we are going to demonstrate how these elements from The General Theory of Veblen contribute to create a new understanding of the framework conditions for BMs, BMI, Eco-Systems and releasing of IC in the economic process at a general

level. However, our research indicates that even we are talking about theoretical “innovation performance” at a general level, the theoretical elements can be illustrated from our concrete work with businesses and their BMI-processes.

We present the above elements step by step after a brief discussion of two definitions and after that a longer – but necessary - presentation of the overall idea of how the economic system has changed and created other framework conditions for BMI than normally taken for given. First we must touch upon the necessity of discussing the idea of mechanism. How are the relationship between a mechanism and an institution? In Veblen, principles are an institution, not a mechanism, because principles are context-dependant. Mechanisms are closer to the idea of a universal and the continuous existence of “something” working underneath the institutions and elements in the institutions that define the content of the institution. The definition of an institution is “An institution is of the nature of a usage which has become axiomatic and indispensable by habituation and general acceptance” (Veblen 1923a: 101 note 1). Second, we now go into a description of the Veblenian approach for evolution during his analysis of the shift from handicraft to capitalism in order to present some important framework condition for BMI.

4.3. Veblen’s model of structural change – the foundation of the theory

According to Veblen the scientific task is a matter of understanding a delicately balanced complex of sub-processes. Based upon his works Horn Rasmussen (2008) has constructed the model, or rather “His Interpretation of the Economic Theory”. First, he scrutinises the general model of Veblen:



Source: Horn Rasmussen (2008)

Figure 3.1: The General OHR-Veblen Model of Structural Change – part one

The interaction between actors and institutions based upon some fundamental mechanisms leads to a number of specific structures. These structures reflect a complex system of mismatches. The mismatches are the results of the economic process. These results are negative for what Veblen terms “common man”³. However, it is two other kinds of mismatches, which is part of the reasons for the creation of the mismatches. Within our context, it is appropriate to refer to the two mismatches as two rules of the game (It is important to notice the double character of the term “mismatch”; as a result of the economic process and as a rule behind the economic process). The most fundamental mismatch is that the net product of society is lower than its social potential. Veblen defines social potential in terms of the concept⁴: “The State of the Industrial Art”. The State of the Industrial Art is a dynamic concept. The general reason for the mismatch in the institution “The State of the Industrial Art” is another mismatch; Veblen claims that there is a mismatch between the dominating habits and the need for new habits. We are talking directly about a conflict between the existing “rules of the game” and the need for new such rules. The dominating habits constitute an institution and consequently a dynamic concept. Horn Rasmussen (2008) names this institution “Make Believe”. In order to understand the two discrepancies and their relation to the dynamic process of industrial structural change, he argues that Veblen operates with:

1. Three universal capitalist mechanisms
2. Five institutions and two sub-institutions
3. Two general and six specific mismatches in structures as a result of capitalist evolution

The mechanisms are:

1. Interstitial adjustment
2. The market and the price system
3. All politics are business – politics I

³ “...he is called common because such is the common lot of men under the new order of business and industry; and such will continue (increasingly) to be the common lot so long as the enlightened principles of secure ownership and self-help handed down from the eighteenth century continue to rule human affairs by help of the new order of industry” (Veblen 1919: 131). We delve deeper into the idea of the common man in the section dealing with “Politics”.

⁴ In the outlining of Veblenian economics, Horn Rasmussen primarily use the term “concept” as the general point of reference instead of e.g. the term “idea”. The term “concept” may refer to something more firm than “idea”. However, it is rather difficult to distinguish between the two terms, as a concept can be argued to be an idea and an idea can be argued to be a concept.

The institutions are:

1. The institution “Make-Believe” and its sub-institutions “Vested Rights of Ownership” and “Money and Profits”
2. The institution “State of Industrial Art”
3. The institution “Competitive System”
4. The institution “Credit and Business Capital”
5. The institution “Politics II”

The mismatches are:

1. Mismatch between potential and actual social net products – The institution “State of Industrial Art”
2. Mismatch between dominating habits and the social need for new habits – The institution “Make-Believe”
 - 1.1 Mismatch between owners and non-owners
 - 1.2 Mismatch between large owners and small owners
 - 1.3 Mismatch between businessmen and the corporation and its absentee owners
 - 1.4 Mismatch between businessmen and industrial intellectuals
 - 1.5 Mismatch between community, businessmen and corporations
 - 1.6 Mismatch between the vested interest of the common man and the vested interest of absentee owners, businessmen and industry.

The actors, or as Horn Rasmussen pronounces it “The Cavalry”, the mechanisms, the institutions and the mismatches constitute the general theory.

Next part of the “OHR-Veblen model” has the first focus on the dynamic character of the above model. Structural change is characterised as an adaptive, evolutionary and conservative process. Horn Rasmussen claims that this is the Veblenian definition of structural change or, in the terms of Veblen: “Structural development”. Veblen assumes that the life of mankind – like other species – is a process of selective adoption. This inspiration is close in line with the concept of Darwin. Life is a struggle for survival. Societal change is a matter of the change of institutions as “a process of natural selection of fittest habits of thought” (Veblen 1899: 101). Veblen argues:

The forces which have shaped the development of human life and of social structure are no doubt ultimately reducible to term of living tissue and material environment ... may best be stated in terms of an

environment, partly human, partly non-human, and a human subject with a more or less definite physical and intellectual constitution (Veblen 1899: 101).

The development process is based on the past habits in these institutions. Veblen is even more precise.

A generic inquiry into institutions will address itself to the growth of habits and conventions, as conditioned by the material environment and by the innate and persistent propensities of human nature; and for these propensities as they take effect in the give and take of cultural growth, no better designation than the time-worn "instinct" is available (Veblen 1914 (1964): 2).

The distinctive feature by the mark of which any given instinct is identified is to be found in the particular character of the purpose to which it drives. 'Instinct', as contra-distinguished from tropismatic action, involve consciousness and adaptation to an end aimed at (Veblen 1914 (1964): 4).

This means that *all of the actions of mankind are teleological*. Accepting this argument raises the question about the general theory of Veblen as a fundamentally *intentional theory*?

The fact that the habits of the past are part of "the rules of the game" in the present produces an inherent and potential unbalance between the needs of the present and what the present is actually supported by. Horn Rasmussen (2008) underpins this as a first example to what could be termed; *a concept of mismatch*.

Contrary to mainstream or neoclassical economists Veblen is a fundamentally a disequilibrium theoreticians. Veblen introduces the concept of "The Interstitial Adjustments of the Industrial System". Horn Rasmussen (2008) interprets it as a fundamental mechanism in the theory of Veblen. *Interstitial adjustment characterises the inherent mechanism of the aims of different groups of businessmen to create or hinder the instability of the industrial system*⁵. The point of departure is the inherent contradiction

⁵ *The concepts of "sabotage" and "waste" is not part of the elements we have chosen to this paper. However, the concepts play a major role in the process of interstitial adjustment. The "interstitial adjustment" mechanism is present at any time, as are "sabotage" and "waste". However, dealing with these concepts has been chosen to be part of the "Institution Competitive System". We could have categorised both concepts as part of the "interstitial adjustment" mechanism, but we find that "sabotage" and "waste" contain so many dynamic- and context-dependent elements that we would lose some of the dynamics pointed out by Veblen in doing so.*

between the interest of the community as a whole and the businessmen. “Instability” is of great importance to certain groups of businessmen because of the possibility to realise large gains. “The end is pecuniary gain, the mean is disturbances of the industrial system” (Veblen 1904: 16)⁶. Especially the new and rising class of pecuniary experts “whose business is strategic management of the interstitial relations of the system” (Veblen 1904: 17) is claimed to have interest in large disturbances. This class is “the captains”, and their operations must be understood with reference to obtaining control over some large portion of the industrial system. When the control is obtained, the interest of the captains is to maintain business conditions as they are and to further facilitate the support of the position. The position of the businessmen shifts from an interest in instability to a wish for continuity. Anything in their interest relates to the ability to obtain gains. Their aim is pecuniary optimising. The method is to use transactions and make deals (“the business jargon borrowed from gaming slang” (Veblen 1904: 18)).

This focus on a capitalist theory of instability, non-equilibrium and mismatch contributes to making the universe of Veblenian Economics available to any analysis of structural change. Veblen expresses this in the following manner: “In the nature of the case, this process of selective adaptation can never catch up with the progressively changing situation in which the community finds itself at any given time” (Veblen 1899: 102). The evolution proceeds, stage after stage, with the institutional element as a conservative factor. In order to illustrate Veblen’s perspective clearly, his focus is to consider the character of the process of structural change. His economics have never addressed the technical complexities within the industry, e.g. the complex technological knowledge constituting the material foundation of industry. A central dimension in the Veblenian universe is the existence of resistance to change; as a general rule, there is an inherent resistance to change. This conservatism is the source of a theoretical assumption and the idea of the inner relations in the institutions versus the “outer relations”. Change occurs because of external pressure. The interpretation of Horn Rasmussen (2008) of the Veblenian approach to the concept of change at this point refers to a “*Radical Change*” and the introduction of a new steering system. Without being explicit about the term “transformation”, Veblen makes considerations concerning our concept of transformation. However important this may be, Veblen does not follow the assumption about “outer

⁶ *In order to understand the mechanism, it must be noted that Veblen does not include the so-called “old-fashioned businessmen” in this group of businessmen. The old-fashioned businessmen are those using “the old-fashioned method of permanent investment in some one industrial or commercial plan” (Veblen 1904: 16).*

relations” in a systematic manner. In one of his latest works and under the influence of the Russian revolution, he touches the subject with reference to a subgroup of the workers – the engineers – and discusses their potential in America to become the leaders of a fundamental change in the economic organisation. It is worth noting the striking link to Hvelplund’s concept that change demands the existence of a strong alternative to the existing set-up or practice (Hvelplund 2005).

4.4 The dynamic of capitalism and the altered conditions for BMI

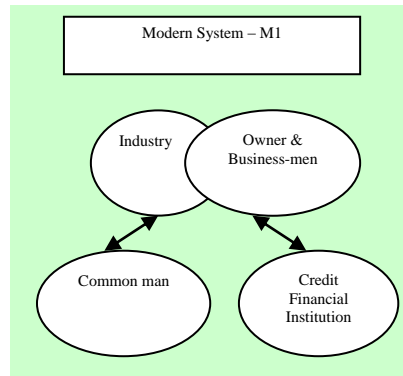
Next step is focus on long-term structural change and transformation. Veblen uses the term “Modern System” in order to understand the real functions in the capitalist system. He is not very precise about “Modern system”. According to Horn Rasmussen (2008) the central reasons may be because, according to his interpretation, there are in fact two modern systems in Veblen’s universe - termed M1 and M2 by Horn Rasmussen (2008). The first modern system replaces “The era of handicraft” and is introduced as a function of the industrial revolution. The time and space is identified as the latter quarter of the 18th century in Britain. However, the evolution of capitalism is a cumulative process. It becomes increasingly complex, and the first modern system is gradually replaced with Modern System II, fully implemented around the last quarter of the 19th century⁷. From then on, absentee ownership and the separation of ownership and management in distinct categories together with a widening of the financial sector *fundamentally changed the rules of the game in capitalism*. Within the context of Horn Rasmussen (2008); Transformation results. The evolutionary process of these changes, which has been implemented over a period of 150 years, is a fundamental pillar in Veblen’s theoretical apparatus. Summing up:

1. First phase – the era of handicrafts and trade – HT
2. Second phase – the first era of modern capitalism – M1
3. Third phase – the second era of capitalism – M2

According to Veblen, Adam Smith’s theoretical considerations caused the creation of an element in what Horn Rasmussen (2008) choses to term “The Institution of Make-believe”. “He [Adam Smith] writes ... of the machine era, but he speaks in terms of the past industrial era” (Veblen 1914 (1964): 237). Horn Rasmussen (2008) at this point

⁷ *The introduction of and shift from Modern System I to Modern System II varies from country to country in the western capitalistic world. The important point is not the exact historic time but the introduction and implementation of the systems all over and with a minor time-lag from country to country.*

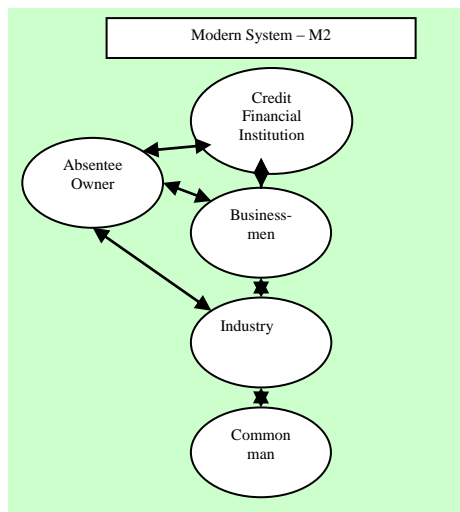
stresses, that Veblen reflects on the cumulative nature of capitalism. His interest is primarily bound up to the difference between M1 and M2 and the links between the common man, industry, management, credit and ownership in M1 and M2 can be illustrated graphically.



Horn Rasmussen (2008)

Figure 3.2: The OHR-Veblen model for structural change - part two M1

Veblen's point is that the function of the modern system has changed, but the institution of make-believe remains unchanged. This means that the society rests on an old-fashioned institutional foundation. The complex modern system can be illustrated graphically:



Horn Rasmussen (2008)

Figure 3.3: The OHR-Veblen Model for structural change - part three M2

In order to understand the content and fundamental difference between HT, M1 and M2, actors must be introduced and the shifts in their respective roles and their interests in the process of structural change must be outlined. The actors at the micro-level of the economy are categorised in groups of people with the same general interest, motives or reasons⁸. The point of departure is the workers, owners of industry and landlords. This reflects a similarity to the classical production function and the existence of wages, profit and rent. Veblen's task is to analyse the dynamic development of the ideas of actors in all the three phases. This ends up in a complex system which Horn Rasmussen (2008) refers to as the "actor cavalry". The cavalry is first fully developed in the third phase: M2. The organization of society in different groups of people has a further reference in Veblen. The different job positions create different institutions playing different roles in the rules of the game named capitalism.

The general point of departure is that the three coordinating factors of production: land, labour and capital is a holdover from the 18th century. In the Veblenian universe, modern capitalism has evolved into a more complex apparatus. He makes a separation of industry and business. In industry, the production of goods and services is the ultimate goal. The only goal in business is money⁹, i.e. the financial end. Consequently, the Veblenian dichotomy consists of two kinds of work: industrial work and pecuniary work. Industrial work is served by labour, while pecuniary work is served by businessmen. This dichotomy was a result of the technological evolution that was the source of further specialisation.

Presently, as the technological situation gradually changed its character through extensions and specialisation in appliances and processes –

⁸ It can be argued whether these three different "words" are identical. Horn Rasmussen (2008) initial claim is that they are different words with the same meaning in Veblen's universe. When the motive for accumulation initiated by businessmen is money, this is their interest within accumulation, their motive for doing what they are doing, as well as their reason for doing so. When the interest of the worker is to acquire goods and services, their motive to work is obtain goods and services; this is why they do what they do. Behind these arguments is the general need to survive.

⁹ Veblen attacks the concept of money and profits as a neutral concept reflecting a firm universal mechanism. This is the reason why Horn Rasmussen (2008) designates "Money" as an institution. Because of the inherent element of "Make-Believe" it is sub-institution to his institution one. In Veblen's theory, money is an institution due to their inherently dynamic character. Money values play a significant role in any arrangements, and there is an implicit concept that monetary values do not vary. However, history has revealed that the value of money has varied. "But in the routine of business throughout the nineteenth century the assumed stability of the money unit has served as an axiomatic principle" (Veblen 1904:45). The importance of this comment relates to the fact that business is about gains and losses. This makes accounting necessary. Accounting requires a measure, and this is the monetary unit. Having made the final transaction, the outcome for the businessmen becomes the value of the money. This is their ownership and, consequently, ownership "runs in terms of money" (Veblen 1904:45). Money is treated as a practical means of payment – a mechanism in Smith's universe, whereas it is an institution in the Veblenian universe.

perhaps especially through changes in the means of communication and in the density of population – the handicraft system with its petty trade outgrew itself and broke down in a new phase of the pecuniary culture. The increasingly wide differentiation between workmanship and salesmanship grew into a “division of labour” between industry and business (Veblen 1914 (1964): 213).

The result was the creation of two parallel systems living side by side: the business community and the industrial community.¹⁰ In addition to these groups, the landowners play a special role. Landowners may consist of a combination of labourer and businessmen. On the other hand, the landowners can be pure businessmen or pure industrial workers. The businessmen are divided in different groups, where the industrial managers or businessmen are compared with real estate people acting as middle men between the increased number of financiers and absentee owners. This represents the dynamics involved in the shift from phase M1 and M2. Absentee ownership becomes the dominating form for economic organisation, and the role of the financial businessmen is to accelerate the credits. The absentee ownership illustrates the distance between ownership and the daily management, which is led by the business managers. The absentee ownership is conservative and wishes to maintain the status quo. The role of the manager is steered by the responsibility to make as much money as possible for the owners. Part of this money is directed towards the financial sector due to the increased credits from this sector to industry. The workers are divided in two groups: those with technological knowledge, on the one side, while on the other side are the rest of the workers who are productive in running and developing the industry. Those with technological knowledge are further divided in two archetypes: “The Old Technicians”, who do not seek to change the steering system, and “The Young Technicians”, who see a potential for changing the steering system due to the enormous lack of employment of the technology and the enormous waste produced by the system. Horn Rasmussen points out this as an illustration for the intention of Veblen in order to search for sources of transformation. The workers are regarded as the uninformed who pay the price due to higher prices, taxes etc. The special position of the landlord as a potential worker – or the

¹⁰ *There is a striking parallel to Chayanov (1924, 1925 – from Shanin 1986) and his theory of the co-existence of different agricultural systems.*

common man – must be stressed. The general public administration, newspapers etc. are perceived as a means of getting the system to work and keeping change off of the agenda.

Another way of drawing a perspective on the cavalry rests on the assumption that there is a hierarchy of types of jobs. Veblen defines four levels of reputability in which access to property determines the position in the ranking (Veblen 1899: 124):

1. Large-scale ownership
2. The professions which are subservient to ownership and financing, e.g. banking and the law
3. Jobs with mercantile pursuits, unless they involve a large element of ownership and a small element of utility
4. Manual labour

Within this cavalry and the habitual hierarchy within the cavalry, the dynamics and evolution of the modern system from HT to M1 – and further again to M2 – are set to debate. The theory becomes a general theory of the modern system and an inquiry for the need for a new steering apparatus or “new rules of the game”. This search reflects the implicit Veblenian solidarity with “the common man” and his wish to make up with the unemployment of plant, resources and human labour.

3.5 The state of industrial art defined as an abstract global eco-system and the general framework condition for releasing IC in the BMI process

Turning the attention to IC and BMI this position represents a central framework condition where the macro perspective is transformed into the practical framework conditions at a business or a micro economic level. The ability to release IC in the BMI process rests upon some general conditions which are defined by Veblen as “The State of Industrial Art”. The state of industrial art is the institution that science and technology are able to produce more goods and services than are actually implemented in society. This indicates the immaterial dimension of the institution. On the other hand, the technology and knowledge actually exists, which indicates the material dimension of the institution. It is a matter of *the rate of exploitation of the technology and knowledge*. By this consideration, the existence of an inherent mismatch between “actual and potential use of the industrial state of art” is established. Veblen’s intention is to demonstrate an inherent opposition between businessmen, on the one side, and “the outcome of the work of those men who are engaged in the industrial employment”, on the other side. The latter

consists of the “inventors, engineers, experts, or whatever name be applied to the comprehensive class that does the intellectual work involved in the modern machine industry” (Veblen 1904: 19-20). We must recall that their position in the cavalry is as workers or the common man. However, these wage-earning intellectuals pave the way for the businessmen. Taken together we suggest that at a global and general level of abstraction “The State of Industrial Art” can be compared with the overall object for BMI – The Global Eco-system”. As a matter of definition: Within a Veblenian perspective “The eco-system represents a potential which is unused”. This interpretation of the economic macro-system is straight in line with the framework we argue is reality within a business model perspective (Lindgren and Horn Rasmussen, 2013, 2014). Consequently, our theoretical and empirical perspective and the Veblenian approach reach the same framework conditions – however from two different viewpoints.

4.6 Veblen, innovation and the dynamic change the framework conditions for IC and BMI

Proceeding further with Veblen and his treatment of innovation, he states that modern technology has roots in workmanship. “The live-stock expert is soberly learning by trial and error what to attempt and how to go about it in his breeding experiments, and he deals as callously as any mechanical engineer with the chemistry of stock foods and the use and abuse of ferments, germs and enzymes” (Veblen 1914 (1964): 198). While this was the typical situation in the HT-era, technological development in the modern era, starting in M1 and further intensified in M2, used science to accelerate the technological opportunities. An effect of the machine process was further demand for education and increased knowledge. This has been a cumulative process.

And here and now, as always and everywhere, invention is the mother of necessity ... Any such innovation that fits workably ... will presently make its way into general and imperative use ... Any technological advantage gained by one competitor forthwith becomes a necessity to all the rest, on pain of defeat (Veblen 1914 (1964): 314-315).

This is Veblen’s position with respect to innovation, technological advance and the competitive system and Horn Rasmussen (2008) remarks that Veblen was ahead the idea about “the treadmill and cannibalism” official outlined by Cochrane in 1958 with theoretical reference to Schumpeter. The special position of the close relations between

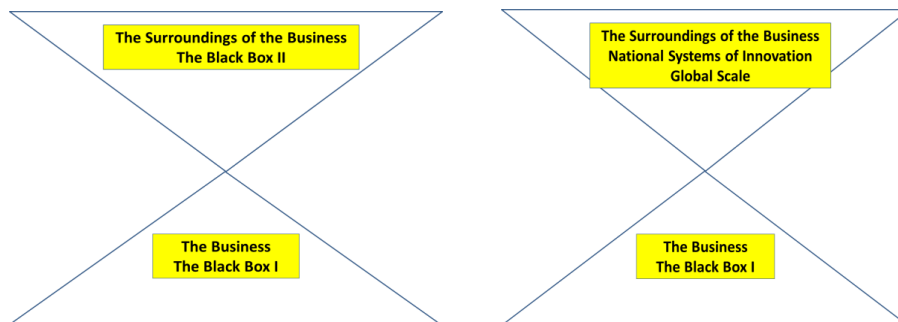
technology and science is crucial. “At no earlier period has the correlation between science and technology been so close ... the relation between current technology and the science is a relation of mutual give and take” (Veblen 1914 (1964): 322-323).

4.7 The idea of Eco-systems as the object for BMI processes – a contribution to the empiric object of Veblen

While the Veblenian approach and connection to IC is characterized as a macro-approach at a high level of abstraction, we need to discuss how this approach can be linked to a more concrete macro and micro object. We find that the idea of eco-systems may contribute to a further understanding of the object for BMI and consequently the question about the framework conditions for releasing IC.

How do we get closer to a more methodological operational approach where theory including the theory of Veblen can be absorbed into the analysis, explanation and understanding of BMI of today? Many researchers have studied the implicit or explicit assumptions about eco systems and business models (Magretta 2002, Afuah 2003, Morris 2003, Osterwalder 2004, Chesbrough 2006, Lindgren 2010, Taran 2013, Zott 2010, Teece 2012, Markides 2013). Eco systems are considered as measurable, objective, and though there are many different definitions and types of Eco systems (e.g., open and closed ecosystems there is still not any acknowledge classification of BM Eco Systems.

In order to qualify the discussion we – as an exercise - go back to “a kind of zero”. It is uncontroversial to claim that a business can be defined as part of its surroundings. However, as a matter of fact much of the ideas about innovation and how innovation activity is suited best could start with the idea of understanding a national system of innovation (e.g. Freeman, Lundvall and Nelson). Because, on a global scale, it is also uncontroversial to argue that in such case the surroundings or “The Black Box II” can be defined as the sum of nations, states etc. or in general the surroundings can be defined as the surroundings defined at a global scale. With our focus on innovation we illustrate the perspective with reference to national systems of innovation. We illustrate this statement in the figure beneath.



We must discuss the idea of this illustration.

First, this is controversial. Can we include e.g. customers, network partners and competitors to a certain business – which obviously must be defined as an important part to a business – as being an automatically part of a certain national system of innovation?

According to Wikipedia “National System of Innovation can be defined as the flow of technology and information among people, enterprises and institutions which is key to the innovative process on the national level. According to innovation system theory, innovation and technology development are results of a complex set of relationships among actors in the system, which includes enterprises, universities and government research institutes. The Term originated when Christopher Freeman and Bengt-Åke Lundvall worked together in the late 1980s. Freeman's research drew heavily on political economy of Friedrich List and historical account of the rise of Japan as an economic superpower. Lundvall's work explored the important social interactions between suppliers and customers and their role in encouraging innovation in Denmark. Apart from a general definition, as above, there is no canonical definition of national innovation systems. A few dominant definitions are listed below (quoted by the OECD publication national Innovation Systems 1997) which overlap quite a bit:

A national system of innovation has e.g. been defined as follows:

- .. *the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies.* Freeman, C. (1995), “The National System of Innovation in Historical Perspective”, Cambridge Journal of Economics, No. 19, pp. 5–24
- .. *the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation state.* Lundvall, B-Å. (ed.) (1992).

National Innovation Systems: Towards a Theory of Innovation and Interactive Learning, Pinter, London.

- ... *a set of institutions whose interactions determine the innovative performance ... of national firms.* Nelson, R. (ed.) (1993), National Innovation Systems. A Comparative Analysis, Oxford University Press, New York/Oxford.
- .. *the national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning (or the volume and composition of change generating activities) in a country.* Patel, P. and K. Pavitt (1994), “The Nature and Economic Importance of National Innovation Systems”, STI Review, No. 14, OECD, Paris.
- .. *that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technologies.* Metcalfe, S. (1995), “The Economic Foundations of Technology Policy: Equilibrium and Evolutionary Perspectives”, in P. Stoneman (ed.), Handbook of the Economics of Innovation and Technological Change, Blackwell Publishers, Oxford (UK)/Cambridge (US).” http://en.wikipedia.org/wiki/National_System_of_Innovation (March, 2013).

What is important for us is not the precisely definition even the idea of definitions belongs to the core within social science. As the different definitions indicate there exist research communities which focus on the link between a nation and its innovative activities. One solution could be to define the Black Box II as National Systems of Innovation as indicated above. From a practical point of view the acknowledgement of the existence of national systems of innovation means that much efforts have been implemented among different stakeholders like governments, ministries, regional authorities, research communities and consultants on a global scale in order to describe the systems and bring forward policy proposals and implement politics. With an increasing tendency during the last decades the area of innovation has been object to much attention. However, much attention among stakeholders has been with point of departure in a macro perspective and consequently such activity has influenced the

dimension of politi - or in a practical language the framework conditions for innovation activities.

What happens if we claim that the idea and focus on a national innovation system seems to represent an old-fashion way of thinking. We assume, that we need to include a more modern eco-system and sub-ecosystem into the idea of where the potential for innovation exist. Besides, because of our theoretical and practical assumptions that the root to successful and strategic innovation must be based upon the existing relations in the business a specific understanding of the business must also be incorporated in our way of thinking (Lindgren & Horn Rasmussen, 2014). The mission is - as mentioned in the ontology section, to expand the idea of the framework conditions and take an exclusive focus on a bottom-up perspective as a supplement to the macro-perspective, which in this context represents a top-down perspective. Taking the different definitions we ask ourselves which definition might work well at both a macro and a micro level? It seems quite reasonable that the Lundvall-definition works well at both levels: *“the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation state”*. Exactly his focus on elements and relations that interact in the process of production is vital. However, as we latter on will present, the question about use of only new knowledge is rather questionable linked to our proposed framework for Business Model Innovation. Our point of departure is the existing knowledge as the fundamental basis for any business model innovation process. Taking a further critical point the explicit focus on technology and new technology seems a bit to narrow related to our understanding. Technology and new technology is only one, however important, part of our business model innovation framework. If we go further into the ideas from Lundvall and his related research communities, we see how they find the research methodology should be dealing with studies around national innovation systems.

Box 8: How to Study National Systems?

Our interest in utilizing the innovation system perspective is not purely academic. We use this concept as a focusing device in order to better understand how innovation affects economic development at the national level. Within this broad view many factors contribute to innovation and it might be seen as a problem that almost all aspects of society need to be brought in to explain the actual pattern of innovation. To structure the analysis it is useful to distinguish between the *core* of the innovation system and *the wider setting*. Both need to be included in the analysis since the aim is to link innovation to economic development.

Firms and the knowledge infrastructure constitute the core of the system. In principle we include all firms in the core since every firm has a potential for developing, absorbing or using new technology.

The wider setting refers to institutions that contribute to competence building and institutions that shape human interaction in relation to innovation. These include, first, family pattern, education system, career patterns in labour markets, inequality and social welfare systems. Second, they include the historical record of macroeconomic stability and the access to finance. Third, they include the final demand from households and public sector organizations. Fourth, they include government and public policy directly aiming at stimulating innovation, including diffusion and efficient use.

This way of setting the scene indicates a marginal role for public policy. What is intended is rather to see public policy mainly as intervening in relation to the core and the wider setting of the national innovation system. Alternatively we could see public policy as endogenous. To some degree we take this perspective in Edquist and Lundvall (1993) where we demonstrate how innovation policy in Sweden and Denmark tends to reproduce rather than renew the strengths of the respective system.

Lundvall (2010)

We see that the research field within the Lundvall innovation paradigm operates with the core including all businesses. Besides, there are the wider settings defined by 4 categories. The definition seems as if anything matters. When we recall our methodological point of departure: Our postulate and consequently also our theoretical hypothesis is that we firstly is able to understand a business model, business model innovation and modulate its business model innovation strategy when we also consider the business models related to its out-out relations. This indicates that we also operate with the idea that anything matters from a potential point of view. Out-out relations are within our framework relations between elements which doesn't have – at least at a first glance – connections to the business models in the business in question. Exactly the out-out relations are important in real life business model innovation activities. It is not the same as to argue that the slipstream from a butterfly (the relation between the elements: a butterfly and the atmosphere) in South-America affects a business model in Scandinavia. However, theoretically we simply can't neglect a possibly relation between the out-out

relation and the business model. Having a global reference it is our claim that the surroundings to a business from a potential point of view can be defined as the national systems of innovation at a global scale. We know that this position challenge a scientific necessity with reference to building up demarcations, but we are going to demonstrate, that a demarcation at this step would ruin the idea of coming into the core of a more precisely understanding of Business Model Innovation and consequently the practical work of implementation of a business BMI-strategy. The reader may agree with us or the readers must accept our definition as an assumption.

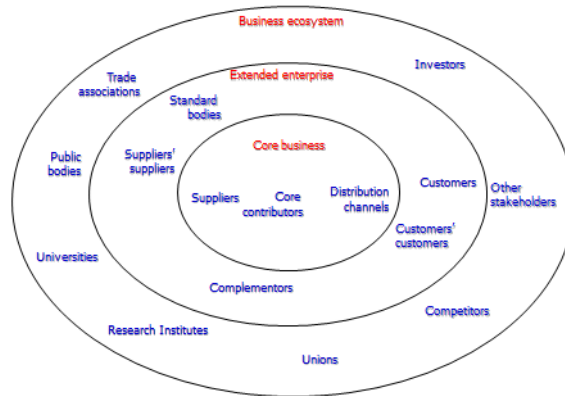
The main point to make an explicit reference to the idea of a national innovation system is that we, from a business point of view, bridge to our concept of the Relation-Axiom and the Business-Model Relation Axiom (Lindgren & Horn Rasmussen, 2014). And even more specific, we qualify the idea of our Out-Out quadrant or square. If a business experiences that much of the national system of innovation is placed in the Out-Out quadrant, the business may have a problem concerning their innovation activity. And surely, if many businesses in a nation experience the same, there is a clear indicator that the national system of innovation doesn't fit to the businesses in the nation. Then the nation has a clear mish-match and consequently a clear problem.

It is our interpretation that the ecosystem perspective contributes to the discussion about global systems of innovation and makes it more operational. Heikkilä and Kuivaniemi (2012) illustrates in their article "Ecosystem under construction: An action Research study on entrepreneurship in a business ecosystem" how the two black boxes can be folded out and how such picture can assist in practice in business model innovation process. The model is inspired by Moore (1993, 1996) and indicates their understanding of a business ecosystem. They operate at three levels of abstraction or "different layers", where their point are that the longer distance we are from the core business level the less commitment we have to business. The three levels are:

- System level
- Extended business level
- Core business level

Related to Lundvall we see that the idea of a core level is important. However, here the wider settings – if we again should compare with Lundvall – is defined by two different levels – extended business level and system level. The three levels consist on different contents which they illustrate in the following model.

The Finnish Business Ecosystem Model



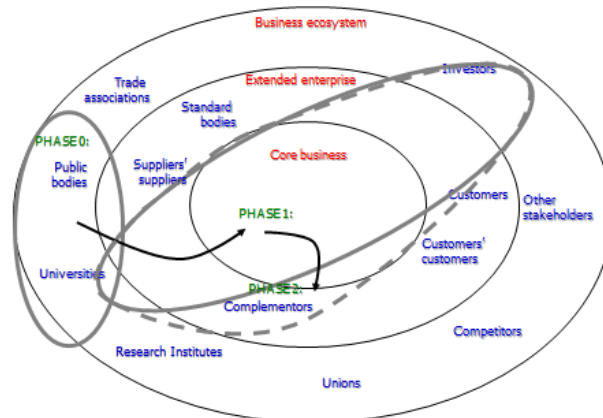
Heikkilä & Kuivaniemi (2012)

The researchers argue: “The core business layer consists of the parties forming the heart of the business. In traditional business, this layer would be run by a single company or the supply chain would be coordinated by the focal company. Alternatively, it can also be formed by a network of several companies each taking care of part of the core business. The next layer, the extended enterprise, widens the view of the business supply chain to include customers, complementors and second-layer suppliers, as well as standard-setting bodies in particular field of business. The outermost layers adds trade associations, unions, universities and stakeholders to the business eco-system”. Such are their definitions of the landscape from which an innovation occurs and becomes an integrated part of the core business. And precisely their description of the landscape forms an active role in the process of construction of an eco-system for innovations.

Their point of departure is similar with our purpose, because they also have observed how practitioners point out that “it is rather easy to come up with new ideas, but the real challenge is to put them into practice” (p.18). A major reason for this has a reference to the complexity of the surroundings. In their perspective the task is to concentrate the efforts around the innovation. “Instead, an ecosystem consisting of multiple expertises, capabilities and resources should be created around the innovation”----- where ”The aim

is to recognize the different domains of players that are or should be involved in the ecosystem under construction”(p.18).

The Finnish Business Ecosystem Model – From Phase 0 to Phase 2

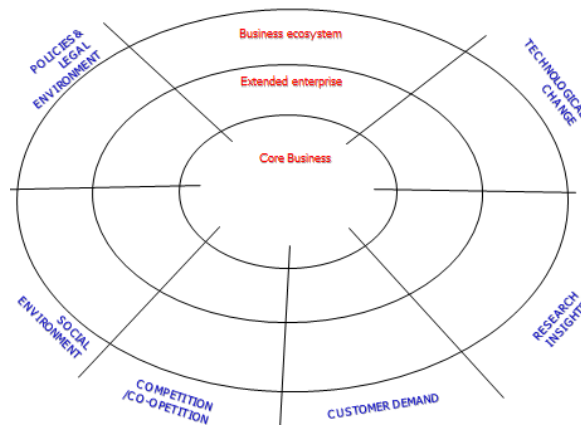


Heikkilä & Kuivaniemi (2012)

Based upon a concrete case – Physical Activity Prescription, a service innovation in preventive healthcare - they demonstrates why earlier efforts with the concrete case failed and how another perspective. This is illustrated in the next model. Phase 0 is the earlier efforts which had focus around the public sector and research institutions. Institutions placed in the outer layer compared with the core of the innovation. Phase 0 was public financed and the efforts to innovate stopped after funding stopped. Phase 1 is the situation when an entrepreneur took over. Point of departure was identification of actors who had a commercial interest in the new innovation. The key players identified by the entrepreneur were private medical clinics, pharmacies and the entrepreneurs own company. The value add in the new model comes from “an entirely new process consisting of tasks carried out in multiple organizations” (p.22). However, phase 2 is where the project is now (June 2012), because the question of the implementation of the innovation rest upon how to use new information technology and there is a need to build a prototype – proof of concept. This involves different business negotiation with information systems providers and health monitoring equipment suppliers.

As indicated much efforts and the starting point in the innovation strategy was concentrated far from the core of the core business. Based upon their research, literature and different workshops the researchers identified actual names on the potential players related to the innovation. Then they rearranged their former models and organized it with respect to sub-ecosystems. Their claim is that this model has a generic character (Heikkilä, 2013). We shortly present and comment on this model, which present a new kind of seeing the landscape for innovation activities.

The Finnish Generic Sub-ecosystems within the business ecosystem



Heikkilä & Kuivaniemi (2012)

Their model calls for two main points. First we have 6 different areas where the innovation activity must put attention. However, they don't comment whether we have potential actors at all the three levels in the different sub-systems. However and second, a main argument and point in their model is that they incorporate the notion of time – or as they pronounce it: clock-speed – in their model. They have arranged the sub-ecosystems with those systems with the highest velocity to the right – technological change – and the slowest to the left – policies and legal environment. According to their recommendations any innovation activity must pay attention to any of the sub-systems its planning. While most of the sub-systems doesn't need further introduction we briefly explain their idea about co-opetition. This notion covers the situation where competitors become a collaborator. The reasons can be many.

These models do in many ways enrich the idea of a national innovation system, because we find it goes a bit deeper into the concrete context from a microeconomic point of view. However, and we will argue for it, the models are still mostly inspired of the top-down or macroeconomic perspective. Even focus is the entrepreneur. This means that the models most of all call attention on what we initially named “The Black Box II” or the surroundings of the business. We are going to go more deeply and the task has reference to “The Black Box I”. One might say that the work of Heikkilä and Kuivaniemi contribute to a broader understanding of the innovations landscape, on the importance of different sub-areas and maybe most important the need to incorporate the idea of time and the different velocity or clock-speed that the different sub-systems represents, because all this influences if or if not the innovation becomes a reality and a successful or an unsuccessful innovation.

4.8 The Vertical butterfly as a hard core in the theoretical framework

Our mission is in many ways similar to the Finnish researchers. Theoretically we also work with the combination of an inductive and deductive methodology. However, our point of departure is the ideas about definitions formulated by Schumpeter. First of all we will abstract from the fact that Schumpeter only pronounce the idea of products, while his followers also speak about the idea of e.g. service. Within Schumpeter theoretical world also service can be argue to be a product. However and this is import we have to see at a central distinction in his framework.

“To produce means to combine materials and forces within our reach. To produce other things, or the same things by a different method, means to combine these materials and forces differently. In so far as the “new combination” may in time grow out of the old by continuous adjustment in small steps, there is certainly change, possibly growth, but neither a new phenomenon nor development in our sense. In so far as this is not the case, and the new combinations appear discontinuously, then the phenomenon characterizing development emerges. For reasons of expository convenience, henceforth, we shall only mean the latter case when we speak of new combinations of productive means. Development in our sense is then defined by the carrying out of new combinations” (Schumpeter 1983 (1934): 65-66).

This concept he argues covers 5 cases or as Casadesus-Manasell et. Al. (2010) name as five types of innovations: new products, new methods of production, new sources of

supply, exploitation of new markets, and new ways to organize business. With reference to Schumpeter Casadesus-Manasell et. Al. (2010) argues that much of the literature so far has focused on the first two types of innovation (e.g., Shan, Walker, and Kogut 1994; Banbury and Mitchell 1995; Eisenhardt and Tabrizi 1995; Schroeder 2006; Katila and Chen 2008; Leiblein and Madsen 2009; Roberts 1999; Adner and Kapoor 2010; Leiponen and Helfat 2010; Zhou and Wu 2010). Their study focuses on the last type of innovation, which they claim often is referred to as business model innovation. They further state that Business model innovation has become increasingly important both in academic literature and in practice given the increasing number of opportunities for business model configurations enabled by technological progress, new customer preferences, and deregulation. They further argue that BMI, at root, refers to the search for new logics of the firm, new ways to create and capture value for its stakeholders, and focuses primarily on finding new ways to generate revenues and define value propositions for customers, suppliers, and partners (e.g., Amit and Zott 2001; Magretta 2002; Zott and Amit 2007, 2008; Baden-Fuller et al. 2008; Casadesus-Masanell and Ricart 2010; Gambardella and McGahan 2010; Teece 2010). Further they state that business model innovation often affects the whole enterprise (Amit and Zott 2001) (Casadesus-Manasell et. Al. p.).

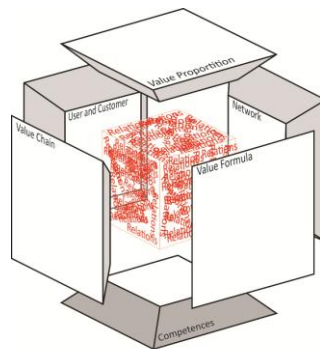
Our interpretation of Schumpeter challenge Casadesus-Manasell et. Al. (2010). Based upon our research we claim that:

1. Business model innovation is about any kind of innovation – process, service, product, market etc..
2. Business model innovation – at root and in accordance to e.g. Casadesus-Masanell and Ricart – refers to how to organize the different business models in a business.
3. Business model innovation – at root – refers to economic reorganization of the different business models in the business with reference to both a monetary and a non-monetary value formula in the business.
4. Business model innovation must have assistance from different tools in order to reach optimal results in the process.
5. Downloading – Seeing – and Sensing represent the main techniques in such process
6. The Cube organizes the process and secure a certain order
7. The relation axiom represents a tool which organizes the certain order into different perspectives

We now present our content of the Black Boxes – starting looking from a microeconomic and business point of view – *we go down – top.*

Much confusion occurs when we research upon the idea of business models or simply a business model. Among the research community the last decades have brought many contributions to increase both theoretical and practical research into the framework which to date has been unable to establish as a firm and scientific based paradigm. Our point of departure to contribute to the research community is the cube (Lindgren & Horn Rasmussen 2013).

The Cube is characterized by its 7 dimension – where the relations so to speak - kits the other six dimensions. By this procedure we get our CUBE.



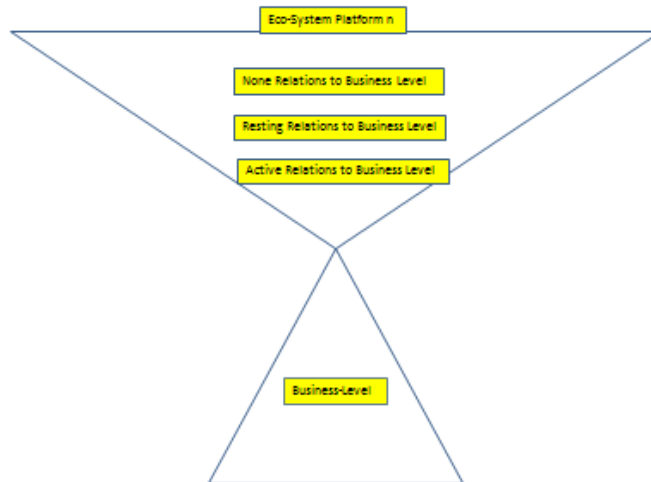
The Cube

The Cube is a definition. Most simple it is a definition of a business. However, the Cube as definition operates at different levels of abstraction. Technically, The CUBE's can be dis-aggregated into 6 specific dimension and the seventh dimension, the relations, which kit the blocks together. The dimensions can be further divided into different components. Turning the attention to the eco-system of the business – we go down-top - we define different levels of abstraction.

1. Active Relations to Business Level
2. Resting Relations to Business Level¹¹
3. None Relations to Business Level

¹¹ Based upon our research we have found that it make sense – gives meaning – for a business to sub-divide this into resting relations to business level with a future potential and resting relation to business level which the business actively have chosen not to be potential for their BMI. The business knows the relation but has excluded the relation.

This can be illustrated as follows:



The first two levels of abstraction already is part of the business (and one may argue exist at another level of abstraction too). However, the two levels are characterized by having two fundamental different positions – an active and an inactive position. The third position reflects elements, which is un-related to the business level. In order to bridge to the “normal” understanding of the interplay between a business and its surroundings, we define the sum of all the three levels as the eco-system of the business. We could also name it as an eco-system platform. If we connect the above model to the idea of Business Model Innovation, it is obviously that it becomes very important that the business is very aware of which level they are investigating and which level they so to speak build and model. Exactly the existence of the different levels is the first indicator for how wide a potential any business has with respect to its innovation activities. Besides, it is a clear indication that in order to exploit the potential there need to be implemented much mapping time and consequently much analytic time as well. The second indicator for the wide innovation potential in any business has reference to the fact, that any business may or may not interact with more than one eco-system.

Any attempt to qualify the discussion of the idea of business model may as a point of departure take into account the idea of using the term “business model” at different levels

of abstraction. So far we have identified at least 3 archetypes – two microeconomic and one macroeconomic archetype:

1. A macroeconomic archetype: Business model as a long term reflection about how the economy is organized at a macro-level, among nations and among group of nations.

Lazonick (2010) point it out this way:

*“As Alfred Chandler documented in *The Visible Hand* (1977), by the 1920s the managerial revolution in American capitalism had transformed the organization of the economy.⁵ Over the next half-century, the “Chandlerian” corporation put in place what I have called the “old-economy business model,” characterized by oligopolistic competition, career employment with one company, and regulated financial markets. From the 1980s, however, this model began to break down, in part because of its own “financialization,” which began with the conglomerate movement of the 1960s, and in part because of the rise of Japanese competition, starting in the 1970s. The Japanese competed successfully against the Americans in automobiles, consumer electronics, microelectronics, machine tools, and steel, industries in which the U.S. companies had been the world’s leading mass producers. In effect, as I will argue in this essay, Japan outperformed the United States by perfecting the old-economy model”. Led by Intel and its microprocessor for the IBM personal computer (PC) and its clones, U.S. companies became world leaders in chip design. Indeed, the IBM PC and its “Wintel” architecture laid the basis for the rise of what I have called the “new-economy business model,” which by the year 2000 had relegated the old-economy model to history..... A particular business model is defined by its strategy, organization, and finance. The contrasting strategic, organizational, and financial characteristics of the new- and old-economy models developed initially in the information and communication technology industries, as laid out in Table 1. Of particular importance to the rise of the new-economy model was the change in employment relations within high-tech sectors.....the rise of the new-economy business model elevated the stock market to a position of far greater influence over the allocation of resources to innovative enterprise than it had occupied before..... The separation of ownership from control¹² occurs to some extent*

¹² As documented in Horn Rasmussen (2008) separation of ownership and control is far from a new event and far from a new paradigm. Horn Rasmussen describes how the American economist Thorstein Veblen 100 years ago introduced the change in how the organization of the economic operates – and in this context we may refer to this as a fundamental change in the business model - both with reference to the single business and the

under the new-economy business model when companies list on the stock market. Under this more recent paradigm, however, the stock market also performs compensation and combination functions. Through the offer of what came to be known as “broad-based” stock-option plans, the rise of the new-economy model relied for its success on prospective stockmarket gains to induce professional, technical, and administrative labor to leave secure employment at established companies for insecure employment at startups..”

2. Microeconomic archetype I: Business model as a term which is most adequate and analogue to a business

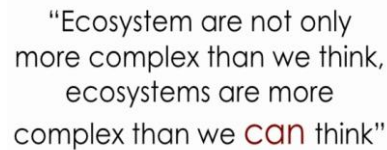
3. Microeconomic archetype II: Business model as a part of a business, which per definition contains of more than one Business Model

In our terminology we most of all concentrates on type 3. Type 2 is hardly a new issue and we use type 2 in order to define type 3. However, and this is important, the inclusion of type 1 is necessary, because this is here we get a reference to the idea of an eco-system which is a concept we from a macroeconomic perspective know from ecological economics and e.g. launched by Costanza et.al. (1997). From a business perspective we find the idea of an ecosystem e.g. within marketing theory. The relevance of the concept is e.g. expressed by John G. Singer, founder and principal of Blue Spoon Consulting Group, LLC, Minneapolis, USA. Singer (2006: 50) states:

“Advantage goes to those marketers who do the better job of designing ecosystems with mutually-reinforcing effects from internal and external assets, and managing the ecosystems for growth, innovation, and continual improvement”.

With other words: The idea of ecosystems is rather crucial for any business and we are going to contribute on how a business can exploit the concrete ecosystems within the process of Business Model Innovation. However, dealing with ecosystems and the theory behind it, we are moving into a really cross disciplinary arena where e.g. theory of biological systems, theory of ecology, evolutionary and co-evolutionary theory, network theory and marketing theory creates its own not well defined framework for a complex, ever changing system which are irreversible. As it turns out the demands to management and leadership in any business becomes both complex and challenging.

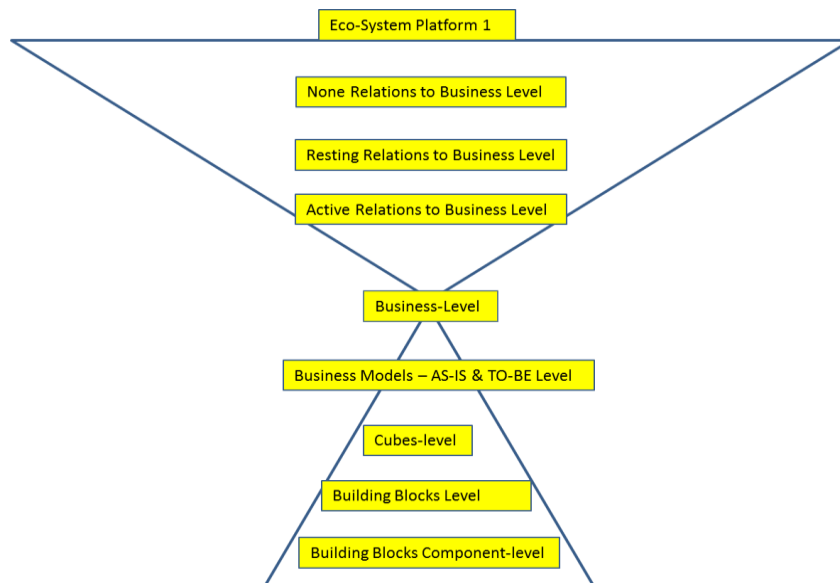
economy as a whole. However, we find that the analysis of Lazonick is a well capable description of how to operate with the idea of business model at a macroeconomic level.



"Ecosystem are not only
more complex than we think,
ecosystems are more
complex than we **can** think"

- PB Goley, 1993

As demonstrated we can talk about business models and business model innovation at different levels of abstraction. In order to be sure that we all are talking about the same, the model beneath may act as a guide. Originally we have got the inspiration from microeconomics and the discussion of the difference between transaction marketing and relationship marketing. While the first marketing concept focuses on the 4 P (product, price, place and promotion), the latter is focused on product benefits with high emphasis on customer service, communication and personalized relationship. Graphically it is illustrated with a butterfly and an inverse butterfly (Lindgreen, Davis, Brodie, Buchanan-Oliver, 2000). Inspired by the discussion, we name our model for "The Vertical Butterfly". However, contrary to the distinction in the marketing concept between a butterfly and an inverse butterfly, our model doesn't have any distinctions and doesn't chooses any concept. The model is just a description of how we want to organize ourselves before we start the business model innovation process. This means that the model act as a kind of theoretical memory card in order to keep us right on the road, driving in the right direction both in the mapping and the business model innovation modeling process.



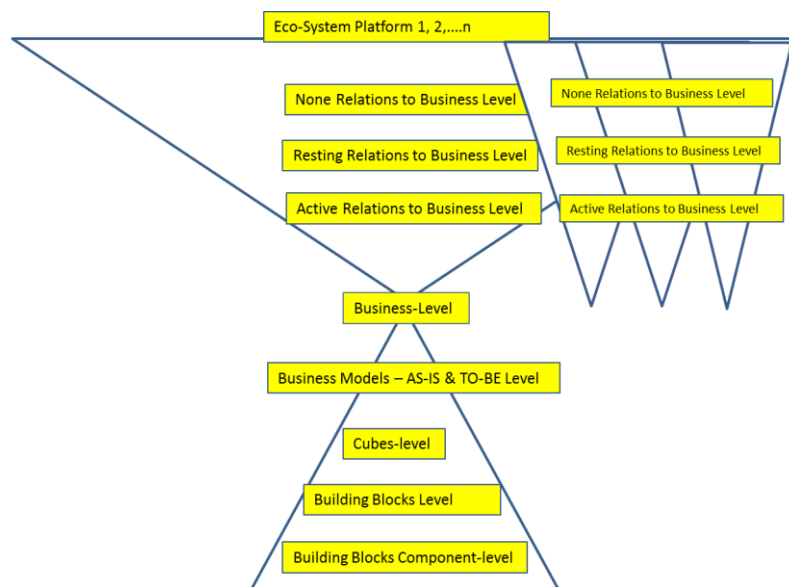
“The Vertical Butterfly – Eco-System Platform 1”

The general reflection and the rationale in the model tell that we can look upon a business from different perspectives of aggregation. In explanation of the model point of departure is the intersection point between the two triangles. We define the point as the level of a business. Going down from the point we disaggregate the business. When we go up into the eco-system we aggregate¹³. As a matter of logic we are able to disaggregate and aggregate into different levels. In our context it make sense at least to disaggregate first into the portfolio of the business. Within our framework the portfolio is defined as the existing TO-BE and AS-IS Business Models. Some would argue that we are at the level of business. However, within our context it makes sense to argue that our concept of AS-IS and TO-BE business models must be placed beyond the level of business, because this level simply is characterized by different business models which put together are an expression of the business.

We must imagine that we have different “Standing Butterflies” side by side. The point is that management who has such overview gets a lot richer, however also a more complex, picture of the business and consequently the business has a lot richer potential

¹³ In this discussion we abstract from the theoretical discussion about the atomic fallacy even we find the arguments for the problematic issue of summing all the micro and claim we have macro for quite convincing. However, we find that in this context the discussion is non-relevant because of our heuristic, theoretical purpose of making an attempt to contribute to a theory of business models and business model innovation.

position for the business model innovation process. We claim that the potential for the business model innovation process strongly increases. Potentially, we in practice can operate at different levels of the vertical level of dis-aggregation but now also from a horizontal perspective – We so to speak will argue that a further horizontal dis-aggregation will open up for an inherent potential of business innovation. While the dis-aggregation from a business level to the level of business models and further down to components is characterized as a vertical dis-aggregation this dis-aggregation is characterized as a horizontal dis-aggregation. The model beneath illustrate the new situation.



The Vertical Butterflies - Eco-System Platform 1,2,...,n and the Business

The model illustrates, that the business – at a business level – may or may not be bound together with different eco-system platforms. We will argue that such perspective opens for new definitions of any current business or any business on its way into a market. The challenge is how to put a business into a position, where the different levels and perspectives have been mapped and the situation for management becomes concrete for the business in question.

The idea is that there exist many eco-systems and the relevance from the business may alter as times go by. The potential is from a logical point of view the global economy and

consequently the total amount of eco-systems. This is the model around which everything revolves around.

A BM that is able to create and capture relations but not deliver, receive and consume value through relations to different BM Eco systems will not have the potential to be sustainable. Any model must consume in order to survive. A BM that is not able to receive and consume tangible and intangible values from its relations from different BM Eco system will only be able to develop its BM's competences and thereby eventually its BM's within the demands of the specific BM Ecosystem. Creation and capturing innovation of values will simply turn incremental and eventually not achieve a sustainable business model because the BM Eco system will turn into a BM Ecosystem with a red ocean character.

4.9 Releasing of IC in the BMI process in Eco-systems

So far we haven't defined IC. However, in order to link the idea of IC we must deliver our approach to IC and a definition of IC. We have two points of reference:

First of all we stress that IC is part of the Cube. Most obvious is the statement that IC is part of the component Human resource which is part of the competence dimension. However, our framework operates more open, because as a matter of fact, it is potentially possible to identify the idea of IC in all the seven dimension of the cube. This also indicates, that a specific focus on IC, from a theoretical point of view, doesn't represent an issue in itself. IC must be linked to a specific context and a specific BMI process. More precisely we use our strategy concept in order to make the focus on releasing IC or not. Our concept operates with an assumption and this assumption represents at the same time as a theory and a definition of strategy.

Our concept does not focus alone on the first part of BMI and IC release – the creative and creating part of BMI – related to different BM Eco systems. We also try to give answers to how business can capture, deliver, receive and consume relations and values of relations to different BM Eco Systems. Exactly the idea of create, capture, deliver, receive and consume is a main element in our theoretical approach which differs the approach from others dealing with BM, BMI and BMIL – Business model Innovation Leadership (e.g. Teese, Chesborough, Zott). Thus we propose business - although

managers typically regard BM Ecosystems and their relations to these as something that is constantly changing - to analyze and optimize their BM's relations to especially different BM Eco systems via the lenses of a BM Eco system relationship axiom. They could hereby reach IC and seek BM relations that continuously can take them to valuable IC – that could prevent them from being dragged into “red ocean BM Ecosystems” with rivalising industry characteristics (Porter 1985). The questions are - Which methods? and How to do this? This is not part of this paper but represents the practical challenges in a concrete BMI process.

5 Empiric illustrations and data analysis

The empiric research methodology is primarily an action research approach carried out in the time frame of 2010 to 2014. The findings represent learning and characteristic of BM's and BM Eco systems related to IC with reference to the multi business model approach (e.g. Lindgren & Saghaug, 2011, Lindgren & Horn Rasmussen, 2013). Mapping our findings with a theoretical reference to Veblen putting it into a BM ecosystem perspective enabled us – and the business - to get indications and elements to another and more complex picture of the framework conditions for BMI processes and consequently: - What is the business BM Ecosystems relations to IC?

We have chosen to illustrate from different research project where some of the projects are further elaborated in the “sister-paper” to this paper (Lindgren et.al. 2014). Consequently, we have been going from theory to the different case in order to identify potential links which makes sense. Such methodology doesn't verify any theory. However, the indications tell us that we might have some results which give meaning for the search for a research programme in the Lakatos sense. We are aware of our verifying focussed methodology must go close in hand with the proposed ontology and we are aware of a need to try to “shot our hypothesis down”. However, this is not part of the mission of this paper.

6. Discussion and practical implications

We have chosen different elements from different cases in order to discuss the theoretical approaches outlined so far. The first case is *the case of climatic change* and is

based upon articles in the Danish newspaper “Information” start of April to mid May 2014. Very briefly and with our theoretical context, the question is why the international community at a global scale has been placed in a situation, where 97% of all scientist who are actively involved are convinced that climatic change is a result of human activity. The UN Climate panel presented in April 2014 a new estimate where their prognosis launched a 4 degree increase instead of a 2 degree increase. The UN Chairman came with the most serious warning to the international community and appealed to global action now because of the fear for e.g. coming migrations, wars, food production troubles, increase in the level of the sea, destruction of cities and even countries etc.etc. Why are we still in such position where human life is threaten for survival? What are the theoretical explanation(s) from a Veblenian perspective?

Information (2014) quotes a new report from the leading European Stock company “Kepler Cheuvreux” with the title “Stranded assets, fossilised revenues”. The main conclusion is that the fossil industry is in a position, where they will lose 28 trillion dollars in the next 20 years if the international community intensifies efforts to protect the environment and tune to greener energy sources. 70% of the loss will come in the oil industry, 14% in gas companies and 15% in the coal industry.

A Veblenian position would argue that the fossil industry is the captain of industry, who will experience that their wish for stability is threatened by the green industry, which seeks for instsability to the dominating rules of the game. They want to be captains. They want to give direction. However, up to now there has not been – as Hvelplund (2005) would argue “A Clear and Strong Alternative”. Veblen would further argue that the absentee ownership in the fossil industry – we recall that we are in the modern system M2 – is a situation with only pecuniary goals. There exist not any alternatively way of rationality among the captains of industry¹⁴.

Veblen would further point at the mechanism that all politics is business. Consequently, this is an explanation that underpins why the process of climatic change has evolved. Up to now the institution of politics has supported the captains. If we look upon the other dimension – and politics as an institution – this institution might change

¹⁴ Remark that if the green industry becomes the captain of industry, the principles will not change according the rules of the game – also the green industry is characterized by its absentee ownership, which is the reason for pecuniary focus as the aim of business.

due to pressure from the outside (external pressure from the outside e.g. people, organization and businesses with other than fossil interests). In general and from a high level of abstraction Veblen makes sense to the case and the documentation could be much further expanded. However, finally we must stress the existence of “Make Believe” with reference to the evolution of the climatic change. The institution may be claimed to be very strong, when it is able explain that what is obviously bad and wrong is good and right.

The next case is the project Women in business. We had workshop with a group of Scandinavian women who owned their own business and the public support system which role – among other – was to support such entrepreneurs. From a Veblenian perspective the project indicated that there was co-existing of different rationality among the participants. Saghaug et. Al (2013) have further elaborated upon this and here we only make a few empiric illustrations. First of all, the women represent what Veblen calls “The Young Technicians. They want to change the way of doing business but they meet resistance among the old Technicians (The public system). Second, the young technicians believe that they are part of a M1 system. According to Veblen it is wrong. Whatever they believe they are part of M2 and the framework conditions of M2. Consequently, they becomes frustrated when the public support system (and here the public support system represent the mechanism politics and the institution politics) demands schedules for, how e.g. many new employees they can create (pecuniary aims in the optic of Veblen)? Job creation is one of the public systems mile stones for giving e.g. a project economic support. Turning the attention to the concrete BMI-processes in the WiB project the idea of working with different eco-systems instead of only one eco-system was implemented among some of the participating businesses. That illustrated for us as researchers that the idea of being explicit and concrete in the mapping, seeing and sensing process and involving more than one eco-system in the BMI process can lead to unexpected results in order to create a more sustainable business model.

The third illustration is rooted in a Swedish capital fond and their investment in 4 different businesses in Denmark – all with reference to the wind industry. For the first years after the investment the capital fond was an absentee owner. The idea was that the four businesses should be part of the same business. However, the results were not as expected because in reality one of the four financed the other three. The capital fond

decided to change position from absentee owner and took over the control. Their conclusion was – with reference to the context of this paper – that absentee ownership was not the solution to create a sustainable business and sustainable business models. Time must show if they are able to release the IC in the new position, or the case is another – e.g. that the IC in this specific business simply are positioned in a red ocean and has not shown the ability to move away. In that matter it is a question of need for another BMI strategy.

During a half year we have organized a kind of simulation with point of departure in circular economy. The idea was to create new business models for demolition of old houses and reuse of all the materials. Represents from the old industry and the new industry participated side by side with public official and a group of students who were the target group of the project. After 4 workshops the result was that all the good business models, the good intentions and the wish for a circular economy meet some crucial barriers. The most common was that the lack of common language in the beginning evolved into a kind of common language in the end – however at a very primitive and “pocket philosophical” level. They build an new local eco-system where – in principle – all the needed participant was rooted. That was what the participant thought. However, as a matter of fact at the last workshop it turned out that the most important actor – the local recirculation station owned by the municipality – was not present. And exactly this institution must be involved if any action shall be implemented. They are the local captains of industry from a Veblenian perspective. The other actor who was not present was Politicians. The institution of politics was represented by a up to 8 different public officials representing each own silo in the institution¹⁵. So, even if there exist wishes for releasing IC in this case, many barriers exist, which have more to do with the economic organization than the qualities of the IC. The project – even we are talking about a simulation – confirms that the general framework conditions for BMI-processes matters. Besides, the captain of industry – with reference to the relevant eco-systems within the construction sector, will from a Veblenian perspective still dictate the direction of the economic evolution. In this optic circular economy still is a niche and doesn't represent a clear and strong alternative.

¹⁵ *The institution politics are in this specific context quite complex because there are three different steering systems represented – each with their own autonomy.*

Generally, from the position of Veblen, the above illustration points at the institution of *politics* as important. There has certainly been an ongoing evolution of both policy and politics; but it is difficult to argue that a fundamental new order or any new fundamental rules of the game have been implemented. Similarly, the element of polity has shifted from a more local and national framework to an increasingly transnational and international framework. However, this is included in and how Veblen perceived this institution. As a theoretical point of departure, it seems most adequate to conclude that from a Veblenian perspective, the institution of *politics* is a stable institution. Taken as a whole the rules of the game have not changed radically, which leads us to conclude that, from a Veblenian point of view, we have an experienced structural change without transformation. The discussion of economic organizational change becomes a discussion of effects or consequences. Any of the indications demonstrated in the above are a logical effect due to the interplay between the mechanisms, the actors and the institutions. However, Veblen operates with an actor cavalry who acts teleological. This makes especially the institution of politics interesting because it implies that transformation can be decided from a Veblen point of view. Consequently, the framework conditions for BMI does have a potential to change if politicians decide it.

Within the general rules we ought to keep our attention on a dynamic actor cavalry and the immaterial change in values based upon changes in the idea of rationality. Within these rules, we have a theoretical argumentation for how it “ought to be”.

7. Conclusion

Trying to have a holistic approach we are forced to investigate if and how different approaches are able to work together. Our hypothesis is that point of departure is the idea of combining the approaches built on a top-down and down-up thinking, respectively. What we ask for is a need to establish a holistic approach in order to optimize the business model innovation work in a business. We must establish an overview that reflects the whole “battlefield” for a business. Our hypothesis for a contribution to a solution is to combine different perspectives of abstraction and then link these perspectives to the idea of a business and how a business is organized into a number of different business models operating in what we call the relation-axiom of business models. The hypothesis is that the relation-axiom of business models assists us in getting

an overview of the business. This is crucial before any attempts to do BMI strategically are taken by the business. Explain and understand BMI and the process of releasing IC may profit by integration of different perspectives of the economic system because taken together the perspectives reflect the framework conditions for the implementation of BMI. Summed up we have pointed on:

1. The Veblenian general theory which put the evolutionary economic business process into an institutional and actor teleological context contributes to enrich explanation and understanding of the economic process including the BMI process.
2. We have indications that The Veblenian General Theory enriches the explanatory power and understanding of the BMI framework condition at a macro level.
3. We have indications that The Veblenian General Theory enriches the explanatory power and understanding of the BMI framework condition at a micro level within specific fragments.
4. The hypothesis is that the idea of a national system of innovation is too narrow in order to explain and understand the economic process
5. The idea of a global system of eco-systems seems to enrich the discussion of framework conditions for releasing intellectual capital in the BMI process
6. Point of departure and a contribution could as a hypothesis be, that the idea of a business must be defined differently, where the idea of a business consisting of a number of different business models representing the portfolio of the business' "AS-IS" and "To-Be" business models seems adequate as a starting point.
7. The idea of a business-model as a cube has in our action research worked in practice. However, the idea of the need to break down the business not only into different business models but to break down each business model into different components seems interesting, and the hypothesis is that it enriches the explanation and understanding of the actual releasing of IC in the BMI process.

In the paper we presented what we as a hypothesis see as the research field for any business working and implementing business model innovation. The idea of defining and understand a research field at a general level of abstraction is the first demand to the business. When we talk about a general level of abstraction it is important to underline,

that the empirical feed-back up to now has been fragmentary. However, exactly this abstract world becomes concrete when any business goes through a BMI process. Any business is unique. The consequence will be that every business will have its own, specific and context dependent research field or what we have termed eco-systems. Of course different businesses will have a research field, which at first glance seems identical. However, our hypothesis is that such situation is by definition never existing.

8 Further Research

The Veblenian approach must be further integrated into the concrete modelling work if the usefulness shall be folded out. The macro focus is obvious. However, further action research may show if the fragmentary indications for explanatory power can be further elaborated.

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Appendix 1: The Multi Business Model Approach

The Multi Business Model Approach has as a matter of definition that any business must be considered as having more than one business model.

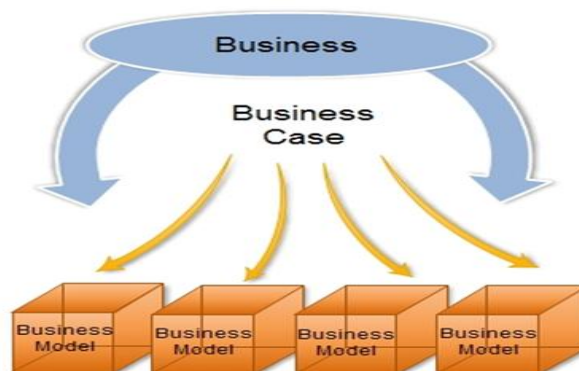


Figure 12 The Multi Business Model Approach (Lindgren et al 2012)

Model of a Multi-Agent System to Simulate an Environment in Virtual Worlds for the Globalized Productive Training of Women with Disabilities

Max Ugaz *, Augusto Bernuy Alva

Department of PhD Information System Engineering

University of San Martín de Porres

University Address: Av. La Fontana 1250, Urb. Sta. Patricia 2da Etapa, La Molina, Lima, Perú

Structured Abstract

Purpose – The purpose of this research is to develop a learning system architecture, based on the knowledge management supported into a valid platform, for a globalized production training for disabled women, based on their capabilities, skills, and feelings as a tacit knowledge. In this context it is necessary to identify a profile which needs interaction with the virtual worlds. The process is completed through the developing of a model based on the interaction of the participants with intelligent agents, using the MPML3D language and which works through a collaborative learning process. The results are validated in a prototype for being tested and discussed.

Design/methodology/approach – Virtual worlds are part of the extensive field of "shared space" technologies, as are Augmented Reality, Telepresence and Virtual Reality, all discrete spaces represented and executed by computers and accessed exclusively through the Internet . Virtual worlds have technological capabilities to support the generation of knowledge and collaborative learning through the interaction of avatars (human-controlled avatar) and these ones with intelligent agents (avatars controlled by a machine), developing a collaborative information and training system, which in turn may support a platform for training and production of women with physical disabilities.

Originality/value – This research presents a model that allows women with physical disabilities to overcome their limitations due to physical constraints of the real world so they can become into productive and globalized persons, taking advantage from the economy of virtual worlds as Second Life.

The State of the Art of the above mentioned technologies, the specific characteristics of women with physical disabilities and the characteristics of virtual worlds, can generate capabilities that enable a collaborative learning through the interaction with intelligent agents (avatars controlled by a machine), which are able to answer frequently asked questions to avatars (human-controlled avatar), who in turn can generate actions from the agents within the virtual world. These agents allow a permanent support without the limitations of fixed schedules, personalizing the training without the barriers of the traditional process of education.

Practical implications – The practical implications of the model proposed lies in three main areas:

Productive women who overcome physical limitations due to their disability.

Learning environments, based on low-cost emerging technologies.

Globalization of people with mobility problems even from developing countries.

Keywords – Virtual Worlds, Intelligent Agents, MPML3D, Collaborative learning, Disable Women

Paper type – Academic Research Paper / Research in progress

1 Introduction

Virtual worlds are part of the extensive field of technology "shared spaces" as are Augmented Reality, Telepresence and Virtual Reality, all discrete spaces represented and executed by computers and accessed exclusively via the Internet. Virtual worlds have technological capabilities to support the generation of knowledge and collaborative learning through the interaction of avatars (residents) with intelligent agent avatars that can develop Information and training collaborative system, which in addition supports a production platform for women with physical disabilities.

This research proposes a model that shows how the characteristics of virtual worlds generate capabilities that allow effective collaborative learning experience and interaction with an agent avatar that can answer frequently asked questions to participant's avatars (residents) within the virtual world Second Life.

2 State of the Art

The state of the art shows the different aspects that provide with a logical context to the proposed model, such as women with physical disabilities, technological capabilities and the behavior of three-dimensional virtual worlds avatars (residents), involving intelligent agents as entities with interaction capabilities, intellectual capital management, collaborative knowledge management and collaborative work with emphasis on the environment and interactivity.

2.1 Disabled Person

Disabled people is a person with one or more physical, sensory, mental or intellectual

disability of a permanent nature which in interaction with various attitudinal and environmental barriers, do no exercises or may be impeded in the exercise of their rights and their full inclusion and effective in society on an equal basis with others. (General Law of People with Disabilities - CONADIS No. 29973- Peru). For a better understanding of this definition are two concepts linked with it offered by, Gonzalez, P. (2010).

a) Impairment: any loss or abnormality of structure or anatomical, physiological or psychological function. The deficiencies are a result of developing diseases, injuries or conditions of any kind, whether congenital or perinatal, but only part of the disease result in persistent deficiencies. In principal, deficiencies disorders represent organic levels."

b) Disability: Any restriction or lack of ability to perform daily functional activities in the manner or within the range considered normal for a human being. Disabilities are always the result of some deficiency, but they sometimes do not produce disability, so we could say that there are more deficiencies than disabilities. Disabilities represent functional disorders on the level of the individual."

We will not delve into this part of the gender-disability relationship but we offer some concepts that enable a better understanding about the need of building a model that places the PDW within a global production system.

According to the conclusions of the "First International Conference on Women and Disability" Valencia - 2003, "...gender and disability interacts placing disabled women in an unequal position compared to men and people without disabilities. Exist several types of barriers which stand between the physical, the communication and attitudinal. The latter are significantly affecting disabled women, resulting in a mayor invisibility, overprotection, lameness and performance of traditional female roles (mother, wife and caregiver)."

"Disability should not be assumed from the vulnerability but from the need to establish a new order through social participation, the visualization of women with disabilities, and the ability to actively participate in decision making in vital areas such the following:"

- Social and labor integration
- Health
- Leisure
- New technologies

- Women and Mental Health
- Justice
- Communication and Performing Arts
- Motherhood
- Sexuality

2.2 Virtual Worlds

We can use different approaches to achieve the definition of virtual worlds. From a technical perspective, Zapata said that a virtual world is a “discrete space, populated by a set of independent actors, which can be represented by a software program running on a computer“ (Montoya and Zapata, 2005). It is a computer-generated space in three dimensions, but it is not a continuous space as we experience in the physical world but discrete, consisting of virtual territories logically intertwined. The actors are independent because they determine their participation is autonomous without being subject to the other participants.

From a semantic perspective, López-Barajas indicates that it is right to refer to virtual worlds as Multi User Virtual Environments (MUVes), which are accessed through the Internet and where the interaction and communication is facilitated with themselves through an isometric polygons environment", with them the illusion of three-dimensional space (López –Barajas, 2009) is constructed. Strictly a virtual world is not a world but rather an environment, which in this case is generated by the computer using a web-based polygon structure properly integrated that produce the illusion of three dimensions that are accessed via the Internet.

These virtual environments simulated by computer may try to represent fantastic and unrealistic scenarios in some cases, while in others it can represent any kind of real world environment, including simulating real, such as gravity or the physical properties of objects physical behaviors, among others. People interact in these virtual environments using virtual representations of them called avatars, which in turn can be fantastic or similar to their physiognomies in the real world (Barreiro and Casado, 2009).

Zapata presents a philosophical perspective whereby MUVes design seeks to implement methods of distributed artificial intelligence, through a collection of autonomous agents that want to solve a given problem." The main idea of philosophy is to maintain a consistent world in which every action is justified by an effect, on either the

environment of the actor who performs or other pertinent actors" (Zapata and Montoya, 2005).

As seen in the definitions presented, virtual worlds are understood as computer-simulated environments in which avatars or software agents interact. However, they can also be considered as a new class of information system, one that combines the structural aspects of traditional systems modeling and simulation, with support systems for emerging knowledge processes that require knowledge of other disciplines as engineering design, computer graphics and computer simulation. (Chaturvedi, Dolk and Drnevich, 2011). To consider virtual worlds and applications developed within them as information systems opens up new opportunities to leverage the contributions of the methodologies of the discipline of information systems.

2.3 Technological capabilities and behavior of Avatars

The literature shows that the capabilities of virtual worlds to support team collaboration is based on only two of these characteristics, namely (1) the 3D environment itself in which participants are immersed and (2) the interaction based on avatars through which all communication in virtual environments are carried out. On the other hand, it also shows that there are different approaches to exploit the collaborative possibilities of virtual worlds in e- learning.

Learning through collaboration is one of them, and is what occurs when people work in teams, for example, solving problem or researching. The proposal is that the capabilities of virtual worlds for collaborative teams can effectively support collaborative learning.

The Effective Model for Collaborative Learning in Virtual World (Figure 1), based on the theoretical model of (Van der Land, Schouten, van den Hooff and Feldberg, 2011) about how capabilities of 3D virtual environments affect the processing of information and communication processes, leading to a shared understanding, proposes that the capabilities of the 3D environment and interaction based avatars have a proven influence on the two fundamental supports shared understanding: to support information processing and communication support, if these capabilities of 3D environments have a positive impact on teamwork. The study argues that effective group collaboration can have a positive impact on collaborative learning.

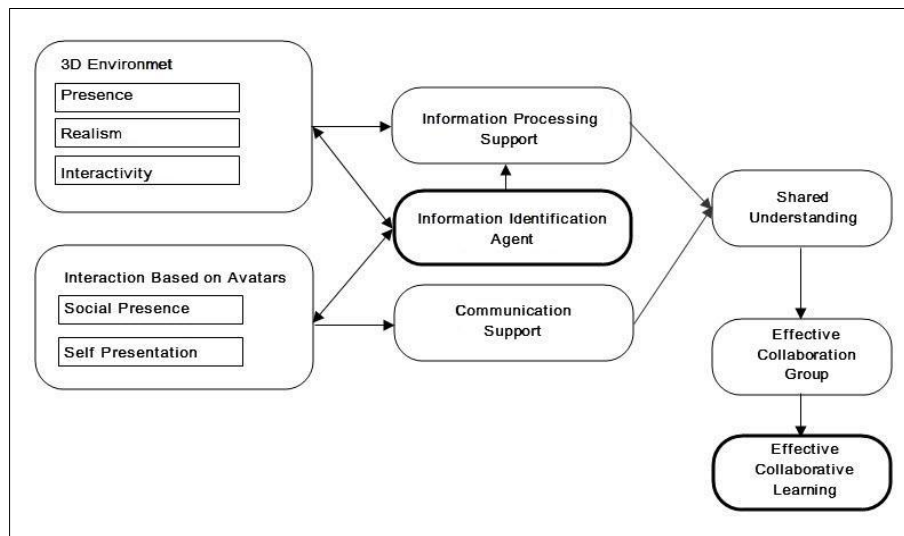


Figure 1. *Effective Model for Collaborative Learning in Virtual Worlds. Based on the theoretical model that shows how the capabilities of 3D virtual environments affect the processing of information and communication processes, leading to a shared understanding (Van der Land, Schouten, van den Hooff and Feldberg, 2011)*

They are precisely the technological capabilities of virtual worlds that allow this investigation to consider them as interactive spaces with potential for the development of people with physical disabilities, as have been manifested on these experiences in virtual world's users with disabilities or physical impairment.

For further reference you can view the video made by the Telemedicine Advanced Technology Research Center that offers a vision of what virtual worlds can bring to the lives of people with disabilities and how virtual worlds may provide an alternative learning interaction, work and socialization tool developed as a virtual support system for military amputees, the AVESS or the Amputee virtual Environment Support Space within the virtual world Second Life, https://www.youtube.com/watch?v=oUt2_C3SKIg

2.4 Intelligent Agents

An intelligent agent is a software entity that assists clients, based on their own knowledge, performs a set of operations to meet the needs of a user or another program, whether own initiative or any of these are required, as computer programs are capable of performing a task without direct manipulation of a human avatar. Agents have to learn the

essential characteristic of different ways: 1) by observing and imitating the behavior of the user, 2) Receiving positive or negative feedback from the user, 3) user receiving explicit instructions, 4) Asking advice to other agents (Lara and Martinez, 200).

According to (Bernuy and Lombardo, 2005) among the features that agents have, highlight be endless processes that run continuously, be able to act based on their experience and be able to move through a telematics net.

For us agents have new challenges in the design of an environment that includes the proper characteristics of the people environment and their personal characteristics and cultural patterns. This research analyzes the classifications available in table 1.

Table 1. Available Classifications.

Domain	Classifications
Field of Action	1) Desktop Agents (OS agents, application agents, etc.). 2) Internet Agents (search agents, filtering, information retrieval, reporting agents, mobile agents, etc.). 3) Intranet Agents (Customization cooperative agents, database agents, process automation agents, etc.)
Function	1) System Agents, 2) Filtering agents, 3) Profiles Agents; 4) Monitoring Agents, 5) Recommendation Agents, among others

From these intelligent agents we point up, three of them that relate to the topic: 1) Recovery agents: Looking, recover and provide information as authentic information managers and documents ("information brokers"), 2) Monitoring agents: give information to the user when a certain event occurs, and 3) Recommendation agents: helps users in three dimensions: information filtering method (demographic, content-based and collaborative), profile correspondence (when are based on the content) and the user profile matching collaboration techniques (Lara and Martinez, 2006).

2.5 Intellectual Capital

Intellectual capital, according to Benavides (2012), "is everything that cannot be touched but it can make money for the company. (...) the search for effective use of

knowledge, (...) the set of company assets, although not reflected in the financial statements, generate or will generate value for it in the future, as result of aspects related to human capital and with other structural as the innovation ability, customer relations, quality of processes, products and services, cultural capital and communications that allow to a company to take a better advantage of the opportunities than other, resulting in the generation of future benefits."

"Intellectual capital is the product of the interplay of human capital (knowledge workers, the ability to learn and adapt, etc.), Structural Capital (trademarks, patents, copyrights, product names and other assets intangible internal processes and research and development, etc..) and Relational Capital (business relationships with customers, suppliers, distributors, investors and other stakeholders: government and society in general), which is reflected on the ability of the human talent to add value not only to tangible assets but also intangible assets of an organization and generate or will generate future value on which you can consolidate a sustainable competitive advantage over time." (Benavides, 2012).

Furthermore we analyze the model DirCCI, "Collaborative Management of Intellectual Capital" where from the perspective of intellectual capital a way of integrating collaborative business rules is presented.(Bernuy and Joyanes, 2007).

Bernuy (2007) presents: (1) the address as an entity, (2) indicators of intellectual capital as a result of learning, (3) the environment that always releases changes or delivers rules of play, a collaborative system as the main component that instructs, shares and supports the decisions.

This new system is based on agents, and processes of transformation from human resources to structural capital and relational capital. This is when the organization creates knowledge and the most important elements are the innovation, competitive skills and human development ". Transformation processes are studied in other research called "intellectual Capital navigator" (Bontis, 1998). The transformation is based on rules we call "workflow" (Bernuy, 2007).

2.6 Collaborative Knowledge Management

Collaborative knowledge management requires "create synergy in organizations, in order to capture the knowledge in the people; the user needs to implement the effective collaboration between them." (Bernuy and Lombardo, 2005). Intelligent Agents and Multi

Agent Systems (MAS) are aligned to distributed systems that enable interoperability, communication, security, migration, and proper management of the environment and the necessary dialogues in virtual worlds.

The "Intelligent Distributed Control Systems based on Agents (SCDIA) allow collaborate: 1) Measurement Agent: collects the information needed to get the status of the process, 2) Controller Agent: take actions based on the state of the system, 3) Coordinator Agent: modified control agent decisions and sets new goals and services. Coordinates the agent community, 4) Actuator Agent: implements the decisions taken by the controlling agent, a coordinator, and / or specialized agents, and 5) Specialized Agents: they perform special tasks of the community of agents.

On the other hand the "Multi-User Virtual Environments" (MUVES) such as Second Life can be a great tool to educate people and to do research in a way that people learn. The use of automated agent's conversation with artificial intelligence capabilities can develop more interaction with people from identifying their human and emotional profiles.

3 The Proposed Model

The model presented (Figure 2) integrates the physical components and platforms in phases that involves, processes in some cases (e.g. Training in virtual worlds) and in other cases, microsystems (e.g. Opportunities Generation). The model is composed by three interfaces: input interface, transformation interface and output interface. It uses the Intellectual Capital as a generator of knowledge and the Collaborative Knowledge Management to generate a synergy between human avatars and intelligent agents. Interact into the model the Physically Disabled Women (PDW) as users, the virtual world itself and different gender of intelligent agents.

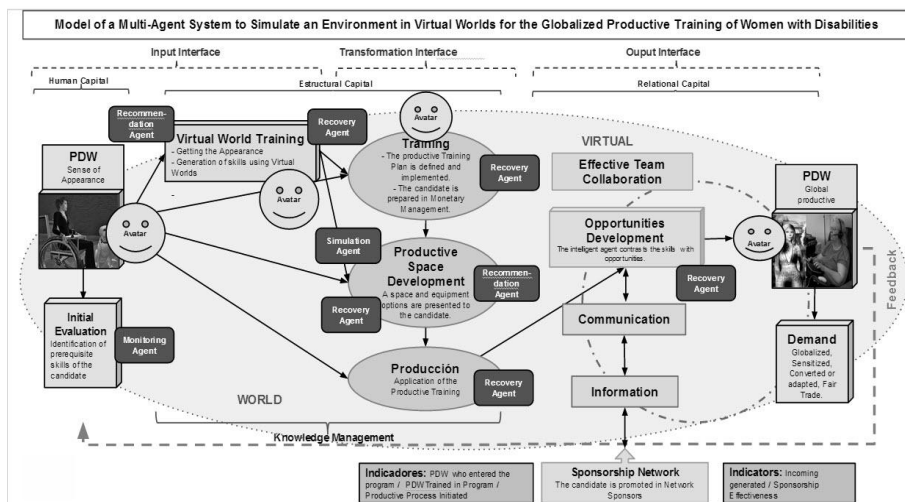


Figure 2. Model of Multi-agent System to Simulate an Environment in Virtual Worlds for a Globalized Productive Training of Women with Disabilities.

3.1 Input Interface

The model objective is the simulation of a virtual world environment for the productive training for women with physical disabilities, oriented to a global demand, and starts from an initial profile of women with physical disabilities, that considers within the tacit knowledge about this group, aspects such as the sense of appearance, degree of collaboration, confidence and the psychological and emotional condition of Physically Disabled Women (PDW).

3.1.1 Disabled Physics Women Profile

The term disabled women or disabled is a broad term, which includes women who have significant physical, sensory and/or intellectual deterioration, whether visible or not (...) which limits their performance in daily life activities (fend for their self, walking, seeing, hearing, speaking, learning, working, performing manual tasks, events and participate in community activities or breathing). Gonzalez, P. (2010)

The gender and disability interact to place women with disabilities in an unequal position compared to men and people without disabilities. Therefore, PDW suffer higher rates of marginalization and social exclusion that leads to a violation of the most basic human rights. Gonzalez, P. (2010)

"...This inequality is reflected globally for women with disabilities in higher rates of illiteracy; lower educational levels; lower labor activity and less paid and responsibility jobs; greater social isolation; lower self-esteem; greater economic and emotional dependence; greatest potential for all kinds of gender violence; less personal and social development; great ignorance of sexuality; low body self-appearance and many more situations that reflect this unevenness. Gonzalez, P. (2010)

The physical image of a woman in a wheelchair is an added element of vulnerability, however you can take advantage of other personal resources to succeed, though, without neglecting the care of personal appearance, because to forget the appearance accentuate the loss of self-esteem. Allué, M. (2003)

The binomial woman-disability suggests issues as employment and educational discrimination, violence and abuse, social isolation, low self-esteem and sometimes even lack of identity with the stereotypes of women. It could mean that gender and disability provided twice discrimination. Allué, M. (2003)

Maybe we should talk about vulnerability, more than double discrimination. Because after all, does not determine disability. (...) Is diverse and varies by grade; type of disability; the social, cultural and economic environment in which the woman moves, ie the binomial disabled- woman should not always and necessarily be associated with the idea of discrimination. Now, it is clear that the woman who lives in an environment where gender discrimination prevails, disability is an added burden. Because, in general, who usually discriminates by gender, also discriminate in other areas such as ethnic minorities or the same disability. Allué, M. (2003).

Contrary to what happens among people without disabilities in general employment services, there are not more women than men applying for employment in the offices of labor integration. Allué, M. (2003).

The profile of the woman who could apply for a job in such offices is that woman who worked before the deficiency or disease in a non-formal employment, usually without a contract, and low educational attainment. By acquiring deficiency, this woman definitely doubts about looking for a job with the added burden of limitation because maybe, in her case, that job would offer remuneration not identical but similar income. Allué, M. (2003)

There is a specific problem of cultural nature linked to social background and educational level of the actors that would explain the added vulnerability rather than

discrimination. Sociocultural constraints imposed even before the women arrive at the place of employment. But it is often not the case among women who return to previous employment after acquiring deficiency. (...) It is assumed in advance that work performance is now lower and that casualties will occur. Allué, M. (2003)

Sexual life is another doubt after the acquisition of a chronic disorder. The same people with disabilities explained that, at first, they feel desexualized; and women, for example, tell they are treated as 'friends' as possible but less than a companion. People with disability resulting from an accident, report that hospitals take too long to explaining how it will be their sexual lives when they leave, receiving as an answer when they ask: "not to worry about it now". Allué, M. (2003).

The physical improvement is encouraged but little the emotional: the sexual life has a secondary status. Experts add that the second concern is the request for permission, it means, some disabled women wonder if considering their new condition, is right to be interested in sex?, like if sexuality and emotional life would have been vetoed to them because of their condition. Allué, M. (2003).

Harris and Wideman cited by Gonzalez, P. (2010) suggests that women with disabilities, even they are subject to the laws of patriarchy, are excluded from their representations and symbolic order. Their explanation suggests that the position of women with disabilities in the sex-gender parent is absolute negation. Women with disabilities, according to their analysis, face a double invisibility, since neither fit the rigid stereotype of the "perfect body" or are left to exercise the traditional female role of motherhood.

3.1.2 Initial Evaluation

The candidate PDW responds a survey receiving the support of a Recommendation Intelligent Agent which helps users under three dimensions: the filtering information method (demographic, based on content and collaboration), the correspondence of the profile (when based on content) and the user profile matching with the collaboration techniques (Lara and Martinez, 2006). In the Initial Evaluation is where previous skill identification is effected of the candidate through the intervention of a Monitoring Intelligent Agent. The process is shown in table 2.

Table 2. Process of the Initial Evaluation

<p>a). The agent is fed into the virtual world server with an identification form (survey) of skills that includes:</p> <p>Skills acquired in the phase of training in Virtual Worlds.</p> <p>Previous skills acquired.</p> <p>Ability to identify situations of social interaction.</p> <p>Ability to generate alternatives that constitute a solution to the candidate’s training problem.</p> <p>Ability to make decisions, choosing the best alternative of all possible</p>
<p>b). The intelligent agent identifies the candidate by the avatar name and informs that will start the survey to identify the skills</p>
<p>c). The intelligent agent feeds a database with the results of the surveys.</p>

3.1.3 Training on Virtual Worlds

This is the first training node where the candidate PDW receives a base training in virtual worlds, which aims to build skills for the use of virtual world and interact within it.

At this point is included an external information, monitoring and evaluation management platform. The PDW candidate uses the external platform with the support a Recovery Intelligent agent (Training), which seek, retrieve and provide the information as authentic managers of information and documents ("information brokers"). (Lara and Martinez, 2006). This process is shown in table 3.

Table 3. Process of the Training on Virtual Worlds.

<p>a) The agent is fed into the virtual world server. In It the agent and the location where it should appear in Second Life is declared, the property of "listening" and the actions to be followed by the agent when "hear" the user in the virtual world are defined. The avatar agent is loaded by running the service SL_Frontend.exe (Second Life) and the agent appears in its position within the virtual world.</p>
<p>b) The intelligent agent “perceives” the presence of the user and provides information for access to the external platform and its usage.</p>
<p>c) The user PDW executes commands (questions) through the text chat, in this way the intelligent agent knows what to response and action to run on the interface. The agent will "listen" by chat commands that are sent by the avatars users that are in the position where the agent appears.</p>
<p>d) When the candidate PDW enters the external platform, can continue to interacting with the intelligent agent from the external platform through the server agent.</p>

The training in virtual worlds is developed in three stages:

a) Information Management. The PDW candidate receives information within the virtual world for accessing the platform. Log in and execute the training activities with the support of a Recovery Intelligent Agent.

b) Activities. The candidate performs the training practice activities development within the virtual world being supported by a Recovery and a Monitoring Intelligent agent

c) Evaluation. The candidate receives information within the virtual world to perform the training evaluation activities supported by a Recovery Intelligent Agent.

3.1.3.1 Training Prototype in Virtual Worlds.

The training in virtual worlds and as the productive training platform includes the participation and usage of an environment that comply with fundamental characteristics:

a) Adaptability: Responds to women with physical disabilities needs

b) Ubiquity: Can be used from non-traditional areas of training, i.e., outside of an educational institution (home, office, cabins, etc.).

External training platform and virtual worlds can be used by women with disabilities based on the fundamental characteristics mentioned above.

Montoya Sanchez, (2006) cited by Zappalá says that to establish the use of new technologies as a promoter element of inclusive education, some proposed criteria should be considered from the ideas of universal design, which considers the needs of all potential users (Montoya Sánchez , 2006), because they are not always necessary or desirable special programs for people with motor disabilities. (Zappalá, Köppel and Suchodolski, 2011).

The phase of training in virtual worlds is designed to provide basic training that should be received by each female candidate with physical disabilities through information, practice and evaluation in order to develop skills that allow them to function within the virtual world and therefore get closer to the goal of productive training. These basic skills are concentrated in a setting that involves issues such as:

- Movement in the 3D environment
- Voice and text communication
- Basic management of appearance

Once received this training the PDW candidate will be suitable to receive and develop specialized training in the designed productive activity for each candidate according to their previous skills and the skills developed at this stage, so this step not only instructs them to function acceptable within a 3D space, but also provides information to continue the transformation interface, specifically in the phase of productive training.

Programming the training in virtual worlds is divided into units, which are interrelated and each is composed of lessons. The methodology considers two fundamental aspects inherent to women with physical disabilities, which are runtime in each lesson and the degree of disability as a response resource, which makes necessary that this training in addition to be well supported by the technology of virtual worlds, combine the use of other technology support as the external training platform, which includes the use of audiovisual material such as presentations and videos, to facilitate the learning process for the PDW. A prototype of this training program is shown in table 4.

Table 4. Virtual World training Prototype.

<p>Unit 1 - Immersion en Second Life</p> <p>Synopsis: Support for creating a first Second Life account and logging. Learning of basic movements (walking, sitting, fly), and the use of camera control (zoom).</p> <ul style="list-style-type: none"> 1.1 Introduction 1.2 Creating an Account on SL 1.3 Logging in Second Life 1.4 Basic Principles of Communication 1.5 Displacement and Teleportation 1.6 Camera Controls
<p>Unit 2 - Communication: Voice and Text Chat</p> <p>Synopsis: Communication through text chat for individuals and groups, saving the chat logs for a later review. Setting and use of the voice chat in all it ways (public, private and group). The aim of this unit is to provide the necessary communication resources.</p> <ul style="list-style-type: none"> 2.1 Introduction 2.2 Public and Private Text Chat 2.3 Chat Log 2.4 Public Voice Chat 2.5 Private Voice Chat 2.6 Group Voice Chat

Unit 3 - Avatar Appearance

Synopsis: Understanding the relevance of the identification of the avatar, this unit covers the process of recognition of the appearance, change and modification thereof as a tuning tool and finally addresses the organization of the elements containing the appearance to the proper administration of items.

- 3.1 Introduction
- 3.2 Discovering Avatar Appearance
- 3.3 Changing the Appearance
- 3.4 Modifying the Shape Appearance
- 3.5 Modifying the Skin Appearance
- 3.6 Organizing the elements of Appearance

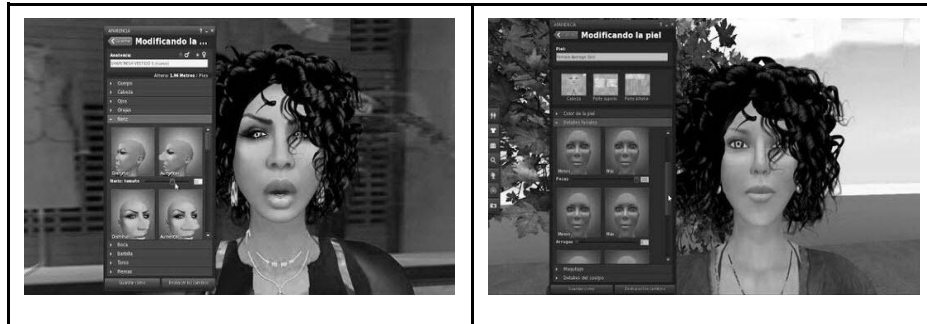
3.1.4 Getting the Appearance

In this phase, as we can see in table 5 and table 6, and in addition to the corresponding intelligent agent, the PDW candidate will be supported by avatar appearance software, a tool inherent to the virtual world Second Life. The PDW candidates generate an avatar image similar to their real appearance, with the support of and Monitoring Intelligent Agent, which "provides information to the user when a particular event occurs" (Lara and Martínez, 2006).

Table 5. Process of Getting the Appearance

a) Monitoring Intelligent Agent "answer" to the PDW candidate to the request for modifying the appearance, through a keyword given as a command to the agent in the virtual world by the candidate.
b) The avatar appearance software within the virtual world allows editing personalized avatar shape.
c) The candidates are assisted by the Monitoring Intelligent Agent, this will indicate to the candidates the use of this tool, step by step to achieve a change in the original appearance, approaching to their real appearance.
d) The intelligent agent is programmed to identify keywords on the modification appearance process of, so that the candidate can ask for information during the process.
e). Once the candidate inform to the intelligent agent, the process has been "completed", it is registered into a database by the intelligent agent indicating the candidate is ready to continue to Virtual Worlds training.

Tablet 6. Appearance Tool in Second Life.



3.2 Transformation Interface

In this interface, structural capital is involved, it is defined, designed and implemented the Productive Training Plan and it is involved the management external platform of information, monitoring and evaluation, such that it is generated the productive equipment and space, and the PDW candidate is formed in virtual currency management with the support of Simulation, Recommendation and Recovery Intelligent Agents.

3.2.1 Training

The training platform aims to develop abilities, skills, habits and behaviors related to employment of women with physical disabilities. Therefore, seeks the empowerment employment of women physical disabilities to enable their integration into the world of work.

3.2.1.1 Training Plan

a) Evaluation phase. At this Phase it is evaluated the degree of disability and the specific conditions of women with physical disabilities as well as their degree of access to technology resources to be used in training, from their own condition.

b) Content and Programming Phase. Based on the evaluation of automated Input Interface and stage of evaluation mentioned before, it is defined the activity on which will train the PDW candidate, developing the content and schedule training.

c). Productive Training Phase. At this step is carried out the training in the elected activity, supported by an external platform, intelligent agents and within the virtual world.

These phases are carried out supported by Simulation, Recommendation and Recovery intelligent agents. The productive activities in which the candidates will be

trained can be both traditional production of goods or services; or virtual goods and services as is shown in table 7.

Table 7. Type of Services or Products involved on Second Life Training.

<ul style="list-style-type: none">- Handicrafts: Wool Fabric, Objects Straw, Textile in loom, Fabric Dolls, embroidery, patchwork, pottery, etc.- Digital items: Cloth, and Accessories.- 3D Building: 3D virtual Environments and items, etc.- Streaming: Video and Music.- Programming: Scripting in Second Life, Softwares.- Design: Clothes, Spaces, Items.- Translations: Documents, events in world, etc.- 3D Modeling: Real and virtual items.- Digitizing: Documents, items.
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Training should continue with the labor incorporation into a competitive or protected job for a disabled person.

3.2.1.2 Monetary management

The Recovery intelligent agent supports the PDW candidate on monetary management. Into the Transformation Interface it is necessary to complete the process providing the necessary knowledge to the PDW candidate for the monetization of the income obtained, i.e., to have access to it. This orientation will depend on the activity and type of product or service.

a) Goods and/or traditional services: There are included in this definition the tangible goods or services consumed by virtual or physical way but not within the 3D environment (crafts, design, etc.). In this case the orientation is based on basic financial information, accounts management in national or international currency, exchange process, deposits and transfers, payment and transfers information for customers, shipping charges and receiving transfers.

For this case, it would be made an agreement with a local financial institution for providing access and information to this new group of producers (PDW), to grant the necessary facilities on the monetization process and the control of the acquired finances, with non-complex process.

b) Goods and / or virtual services: There are included within this definition intangible goods or services virtually consumed in the 3D environment (digital objects, modeling, streaming, etc.). In case the orientation is based on basic financial information, which allows the PDW to monetize their gains, being able to convert the virtual currency into international currency and transfer their incomes from the virtual world to an account into a local financial institution, in addition to all previously mentioned in the case of goods and/or traditional services.

It must be noted that the currency used within the environment Second Life is the Linden Dollar (L\$), which has a market value approximately of L\$ 270 Linden Dollar per U.S. \$ 1.00 at the time of writing this article.

This means that any transaction of purchase and sale of products and/or services within the environment or through the website of Second Life takes place in L\$, i.e., after the sale by the PDW producer, it is necessary to conduct a L\$ sale process, plus a international currency conversion from U.S. \$ to local currency, and finally the transfer of profits. For this purpose, there is a complete protocol provided by the monetization platform of Second Life that involves several aspects and threads as:

a) Buy Linden Dollars (L\$): This process is necessary in order the PDW producer to be able buy items needed for the productive work. To perform this transaction it is essential to register a payment method which can be electronic debit or credit card or even through a payment account. in order the PDW can perform this type of operations is that the agreement with a financial institution would be sought. Relying on the above requirement the process of buying L\$ is very simple, consisting only of defining the desired amount and purchase through the website of Second Life. (Figure 3,4).

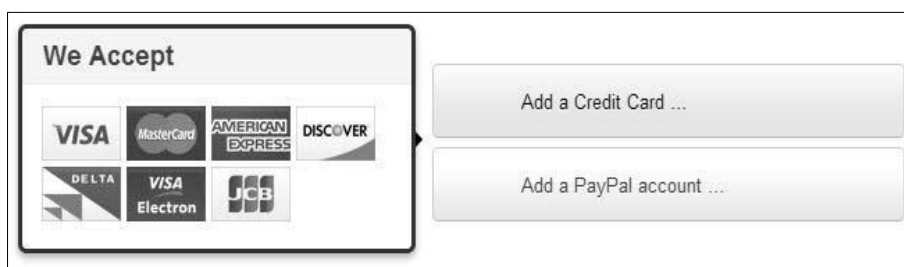


Figure 3. Alternatives to purchase the virtual currency (\$L) in Second Life



Figure 4. Lindens Dollar purchasing process in Second Life web site

The lindens paid by customers who buy the products and/or virtual services within Second Life are credited to the supplier account in dollars Lindens, through a sale platform also provided by this virtual world and also serves to promote and market the products available to customers. <https://marketplace.secondlife.com>. (Figure 5).

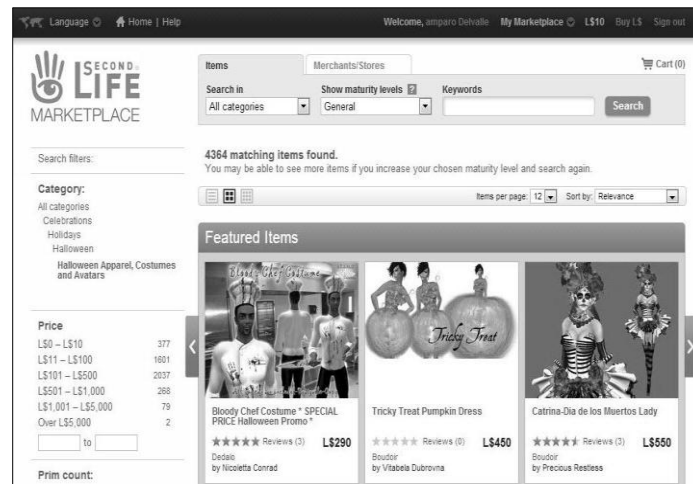


Figure 5. Marketplace. Second Life sales products platform

This platform allows the product inventory management, transaction tracking, updating and removing products, define segments for each product based on its category and/or type, etc. Once made the sale the Monetary Counseling allows to the PDW provider to submit the monetization process.

b) Sale Linden Dollars (L\$): LindeX™ is a unit of exchange which offers to Second Life residents the ability to purchase or sell Linden dollars. When a producer sells lindens that have gained from the sale of goods or services within Second Life, deposits or payments will be made using the same method registered for purchases, that is, a debit or credit card, or payments account (e.g. Paypal). There is a fee for both purchase and sell Linden Dollars, prices on this site are set by the market price. (Figure 6).

LindeX™ Exchange: Sell L\$

Just tell us how many Linden dollars you'd like to sell, and the LindeX™ exchange will automatically match you with buyers.

Sell Orders may be partially filled: Your Linden Dollars might sell to multiple buyers, and not all at the same time, and will remain open until they're sold or you cancel the order. Proceeds are paid at the time of sale, less transaction fees.

For limit sells and detailed market information, visit the Linden Dollar Exchange Settings for your account and set it to "Advanced".

After clicking the "Offer to Sell" button you will be presented with the login page and will need to resubmit your login information to confirm this transaction.

Sell Linden Dollars (Market Sell)

Quantity of L\$:

Estimated Value:

Estimated Proceeds:

The amount of L\$ must be a whole, positive, non-zero number.

Your Balances

L\$10	US\$0.00
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Your Remaining LindeX™ Trading Limits

	per 24 hours	per 30 days
Buy	US\$2,489.62	US\$2,489.62
Sell	US\$2,500.00	US\$2,500.00

Your Remaining Account Billing Limits

	per 24 hours	per 30 days
Purchase	US\$4,989.64	US\$4,989.64

Figura 6. LindeX™ Currency Change Unit from Lindens Dollars to U.S. Dollars

Second Life keeps residents and suppliers generally informed about the movement and fluctuations of its currency respect to the U.S. Dollar \$, in order to provide the best options at the time of purchase or sell Linden Dollars L\$. Besides this monetization platform allows residents to track transactions for both, buy and sell.

3.2.2 Productive Space Development

It is presented to the PDW candidate simulated space options and equipment. In this phase an internal tool to “materialize” (Rez) spaces is used with the support of Simulation Intelligent Agent, which replicates items and group of items (offices, factories, rooms, etc.) through a spaces script. This phase also involved Recovery and Recommendation intelligent agents.

To generate a Productive Space comprise the creation of a tool called Holodeck, which is a product used to store different forms of content (either the furniture or even setup a complete environment), similar to the holodeck term used in science fiction programs and movies. Within Second Life, a holodeck allows to materialize (rez: to place

within the virtual world) a variety of scenarios in a room or defined space.

Some systems even allow the scene to be away from your control panel, offering the convenience of rez-on-demand structures without taking a great big space in a region.

The specific use of the engine Holodeck on the generation of productive space provides to the PDW candidates a production and learning space that will enhance the service or product for the selected activity, that space also constitutes the representation of equipment that can be used for productive activity.

3.2.3 Production

The producing formation or training in the virtual world is applied, ie, production runs depending on the type of product or good and the selected activity since the start of the whole process. In this phase it is a Recovery Intelligent Agent involved

3.3 Output Interface

This interface is contained in the framework of effective team collaboration, receiving environmental intervention of a sponsorship Network, through the process of supporting information and communication. It promotes the PDW candidate into the sponsorship network.

3.3.1 Sponsorship Network

This phase involves a series of activities to achieve support from companies or institutions for the PDW candidate to carry out the production and marketing on the activity the candidate was trained.

To promote on the sponsor web site the products or services provided by the DPW candidate, use the institutional sponsor logo for the promotion and/or marketing of goods or services produced by the PDW candidate and the sponsor participation or representation in the sponsored activity.

Sponsorship is given when actions are aimed at:

Commercialize the developed product; promote the program carried out by the PDW candidate and to encourage other beneficiaries to carry out the program.

The beneficiaries of the sponsorship would be of women with physical disabilities who have completed the process, it means the three interfaces of the model presented, which will constitute the only required condition.

The sponsorship is awarded to each PDW candidate and its validity corresponds to the agreement between the candidate and the sponsor, with a minimum pre-agreed defined time.

3.3.2 Opportunities Development

This part of the model is framed within the relational capital and is supported by an Recovery Intelligent Agent. The intelligent agent contrasts the skills developed by the PDW with opportunities identified, based on the information derived from the automated evaluation. The process is shown in table 8.

Table 8. Process of Opportunities Development

a) The agent is previously fed within the virtual world server with a database of training and development opportunities for women with disabilities.
b) The Intelligent agent Contrast the database opportunities with skills database generated through the automated evaluation and generates a report that reflects that contrast into a opportunities diagnostic.
c) The opportunities diagnosis is the basis for the development of the productive space and the production equipment, and also for the productive training platform, because depending on the PDW candidate skills a specialized training will be designed.

The PDW finally become into a globalized productive unit, set as a Global provider for a sensitized, converted or adapted demand, based on the principles of fair trade.

4 Conclusiones

Virtual worlds have unique abilities that set them apart from other forms of interaction. Among them, the 3D environment and avatar-based interaction can support the processes required for effective team collaboration, enhanced with the support of intelligent agents that impulse the collaborative interaction among other reasons, because the intelligent agent can simulate the behavior of the user and they can adapt to their environment .

Effective team collaboration in virtual worlds, through knowledge management in collaboration, can lead to an effective collaborative learning.

Through MPML3D platform can be easily achieved in the form of intelligent agents

within Second Life avatar that can enhance learning in virtual worlds with avatars interacting handled by people.

The convergence of knowledge management, intellectual capital, intelligent agents and virtual worlds allow effective collaboration, fostering knowledge transfer and effective learning.

The possibility of interacting with intelligent agent provide to the Women with Physical Disabilities the opportunity to be trained on different issues of the labor context, which can introduce the into the a functional work, in that way they can have a mayor benefit which is to overcome their physical limitations.

The cost of simulate a learning environment within the virtual world Second Life is low in comparison with to the cost of building and implementing environments in real world. In addition to this, being able to access to the virtual world from anywhere and at any time (cause it is a persistent environment) make this 3D platform ideal for people whit physical disabilities.

Virtual worlds as Second Life are inhabited by people from around the real world which extends its globalizing feature, due to it allows to any person, but specially to people with mobility problems, to emphasize their acquisition of knowledge from other residents and in other wise to attract more and diverse segments to sale their products or provide their services, such as handicrafts or digital modeling.

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Innovation networks in healthcare as mean of knowledge transfer

Oscar Tamburis ¹ *

University of Naples Federico II
Department of Veterinary Medicine and Animal Productions
Via Delpino 1, 80137, Naples, Italy

Isabella Bonacci ²

University of Naples Federico II
Department of Economics
Via Cinthia, 80126, Naples, Italy

* *Corresponding author*

Structured Abstract

Purpose – The present work focuses on the study of healthcare networks as key tool for innovation creation and spreading, by deploying the emergent paradigm of *open innovation*. During the early development of a technology, when the interactions among component types are unclear (in a state of flux) and, therefore, difficult to codify and freeze, organizations build connections with research centres and universities to explore alternative technological solutions. Once such interactions are better understood, codified, modularized and shared, then more exploitative networks (e.g. with suppliers and customers) may be better suited to exploit the current technology.

Design/methodology/approach – The explorative analysis conducted refers to the healthcare sector, since its complexities and singularities are called to deal with new organizational issues. To this purpose, a preparatory desk analysis was determinant in order to find out the existence, within healthcare facilities, of organizational forms similar but not exhaustively matching with the main features of open innovation..

Originality/value – This methodology puts in evidence how evolved policies of open innovation lead to a systematic realization of process of knowledge exploration, exploitation e retention, both inside and outside organizational bounds; it becomes so necessary for the involved actors, to develop relevant networking skills, in order to properly handle the whole set of innovation process.

Practical implications – In the transition from the early development phase to the more mature phase, firms must build ties to startups and new entrants, and/or connect to third-

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² § @@

party firms, since the supporting investments made by these firms may determine which of the alternative configurations will become ‘the standard’. During this stage, the relationships across firms are defined and governed by modular interfaces that are, in turn, dictated by product interfaces. The outcomes of the present analysis mean to highlight a comprehensive perspective for understanding the dynamics of modularity and their implications for innovation networks. The main goal of the paper is therefore to show the ways through which the dynamics of technology development should reflect the dynamics of knowledge transfer of a healthcare firms network.

Keywords – HCOs, Informative Intellectual Capital, ICT Healthcare, Open Innovation, Knowledge Management, Paradigm shift

Paper type – Academic Research Paper

1 *The open innovation: a theoretical framework*

The *open innovation* paradigm was born in opposition to the pre-existing *closed innovation* one³, deployed in many cases with extreme difficulty because of factors like the increasing of qualified subjects, as well as multiplied external options for innovation development (such as *venture-capital* and *start-ups*), the presence of highly qualified third parties, up to a much more rapid *time-to-market* (Chesbrough, 2003). The recent organizational literature focused on a particular feature of the open innovation, meant as a “*a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology*” (Cfr. Chesbrough, 2003, p. xxiv)⁴.

Further developments brought to shed light to a more evolved framework that provides an integrated perspective to the knowledge management issues within the open innovation (Lichtenthaler, 2007), and articulates in three critical processes:

- *Knowledge exploration*: the *outside-in* process (*inbound innovation*) means either the opening of any corporation innovative initiative to a process of generation of new knowledge from the inside, or the acquisition of new knowledge from outside subjects and sources;

³ It requires a strong control activity on all the innovation phases (ideas generation, development, marketing, financing and support), that need to be performed within company bounds and exploiting internal assets and resources.

⁴ “Open innovation means that valuable ideas can come from inside or outside the company and can go to market from inside of outside the company as well”.

- *Knowledge exploitation*: the *inside-out* process (*outbound innovation*) means either the internal deployment of knowledge (*intensive capacity*), or the process of external transfer and commercialization of corporation knowledge (*absorptive capacity*) (Cohen, Levinthal, 1990);
- *Knowledge retention*: resulting from the combination of the mentioned *inside-out* and *outside-in* processes, if deployed inside the corporation, allows to store the produced knowledge inside organizational bounds during time (*transformative capacity*); conversely, knowledge is kept outside the organization (*connective capacity*) (Lichtenthaler, 2007) through the implementation of inter-organizational relations, that feature as sort of extension of the original internal corporation knowledge (Grant, Baden-Fuller, 2004).

An actual open innovation action systematically affects each knowledge exploration, exploitation and retention process, both inside and outside the organizational bounds, marking thus out the innovation process as a whole. As showed by many scholars (e.g. Gupta, Tesluk, Taylor, 2007) innovation is a multilevel phenomenon: management issues at a certain level may not lead to positive effects, depending on not suitable factors from other levels – such as bad attitudes at organizational level for one or more individuals. It becomes so necessary for the organizational actors involved to acquire huge capabilities to deal with the innovation: people's attitudes, as said, may in fact as allow to help to achieve high levels of organizational capabilities within the corporation, as hardly hinder a proper implementation of the open innovation dynamics – including the decisions needed at project level (Lichtenthaler, 2007). As for the *knowledge exploration* processes, the *not-invented here* concept is particularly relevant, since it refers to a negative consideration, from corporation employees, towards the knowledge explored outside: this can origin from limited (or negative) experiences related to outside-in knowledge transfer processes, as well as from inappropriate incentives systems for figuring out and implementing external knowledge (Chesbrough, 2003). The *knowledge retention* field brings with it the *not-connected-here* idea, that means the disagreement, from corporation employees, as to the external retention of corporate knowledge. As for the *knowledge exploitation*, instead, the *not-sold here* attitude means the disagreement, from corporate employees, towards the transfer of corporate knowledge from inside to outside, that makes thus it available to third parties (Chesbrough, 2003), that may turn out as competitors that would take advantage from relevant corporate technologies (Lichtenthaler, Ernst, 2007). The opposite *sell-out* attitude means the positive propension

to transfer knowledge outside the corporation bounds: this may come after the good results of the pioneering active policies of *licensing*, or conditioned from pressing on R&D processes (Lichtenthaler, Ernst, 2007).

Balancing such three critical processes, as well as the often complementary corporate inside and outside issues, becomes a basic requirement in order to develop the necessary organizational capabilities to properly handle all the open innovation-related dynamics (Cassiman, Veugelers, 2006; Grant, Baden-Fuller, 2004).

1.1 Criticisms to the open innovation paradigm

If on the one hand the open innovation contrasts the closed innovation both on theoretical and empirical bases, on the other hand supporters of the closed innovation claim that aspects related to a synergic logic and a native openness towards innovation processes were already taken into account. By the way, it is well known that the closed innovation paradigm considered the presence of high levels of technology outside corporate bounds (Allen, Cohen, 1969) as a key element to give origin to a set of relationships between the corporation and its surrounding environment, potentially able to increase R&D performances. Similarly, literature about innovation emphasized the importance of such connections, since they make ideas and projects able to be actively shared. Besides, authors like Nonaka (1991) support such vision with empirical contributes, stating that the creation of new knowledge within the organization depends on its capability to recognize the tacit knowledge from its employees, and make it available to be implemented in every process, both internal and external.

2 The *upstream* logic

Many scholars proposed to rework on the concept of *openness* as for innovation studies, highlighting the issues related to the availability of knowledge to all the interested parties, with the upcoming risks of uncontrolled access. The existing approach may be therefore intended as expression of a weak logic, while an *upstream* vision would provide a stronger one.

Starting from the concept that knowledge and innovation should be shared, so that each actor can as take advantage from them as integrate them, Chesbrough points out in fact that those, even circulating among a wide number of subjects, will tend to remain confined inside such circle of people, until for instance research results remain secrets, or subjected to aggressive policies of restricted access. The upstream supporters describe

such dynamics as a weakness of the open innovation paradigm, while emphasizing the importance to make resources available and accessible (e.g. Lessig, 2004). According to this new understanding, the “new” concept of open innovation should comprise three constitutive features: (i) a voluntary recognition of knowledge from those who take part to the processes of knowledge creation; (ii) a knowledge status that becomes “open” (according to what previously stated); (iii) continuous interaction dynamics among participants. This means that, at least in theory, every subject can take part to the process of knowledge creation and sharing, so that every subject can be recognized as a participant.

The first point basically means that corporations as well as single subjects involved in any *open innovation*-related process are strongly motivated and capable to somehow “drive” the knowledge flows, which are not thus to relate to undesirable *spillovers*, or externalities. The second point refers to the main differences with the approach described by Chesbrough; to this end, the concept of *open dimension* of knowledge is the core of the *open innovation*, and means that it has to be made available to any interested subject, without discriminations (von Hippel, von Krogh, 2003). The latter point sets forth the difference between a scenario in which corporation make public and shareable their knowledge only in particular moments, to another in which such knowledge is constantly spread and shared.

2.2 The “open innovation 2.0” and the importance of the users and the ICTs

The constant evolution of the open innovation paradigm is tied to the multiple variations affecting the surrounding environment, among which has to be mentioned the need to involve as many people as possible within the innovation process, as well as the importance of support from ICTs, who play as a first rate factor of cooperation between subjects. A central role is then played by the concepts of value and shared vision: corporations change their logics, shifting from a small-period optimization of financial performances, to the pursue of a broader optimization of both internal performances and social conditions – that is, the creation of value for the social context the corporation lives in. Speaking therefore of *open innovation 2.0* means the search for a new organizational logic, based on principles such as: integrated cooperation, co-creation of shared value, innovation ecosystems implying the participation of multiple actors within the innovation processes, rapid adoption and use of technologies able to generate high performing values, thanks to which the traditional “borders” between activities fades out (Song, Cornford, 2006), and the creation of networking between innovators and the surrounding

environment becomes possible. Similarly, the existing gaps between lab researchers, R&D activities, and the final users, is overcome, in favour of an easier and more efficacious “open cage” of interactions.

The active support of technologies permits to create and perform innovation where the participation of the users is actual; on the other hand, the proper use of ICTs grants the co-evolution of knowledge and the spreading of the innovation generated after the spreading of creativity and knowledge themselves: the expected result is the transformation of the whole society, through the rising of knowledge-based organizational forms, network relations and information-based ecosystems (Malone, 1987).

Inside such processes the importance of the users increases, too. ICTs push towards the *open innovation 2.0* paradigm by providing them with more flexible approaches to the innovation, allowing therefore a greater integration between traditional and innovative services and products, and eventually shifting from an innovation decided and driven from few high qualified subjects, to an innovation born from multiple and multidisciplinary skilled actors with. Thus, users are no longer seen as passive receptors, but as active parts of the innovation process, or better a value co-creator. It's easy therefore to conclude that the more the connectivity and networking dimensions increase, the more the users will be called to act as value co-creators, with high expectations (Curley, Formica, 2013). If in the words of Baldwin & Curley (2007) innovation is the adoption of a new element that creates value for individuals and organizations that adopt it, the user himself tends to become the cornerstone of the innovation-generated values; in other words, the *user* is the most suitable subject to determine the value that an innovation is supposed to bring to its beneficiaries. The support of the technologies opens the way to an increasing of the social interactions as well between multiple experienced and motivated stakeholders, with the creation of trust bonds: this leads in turn to the creation of more shared innovative ideas and the development of manifold options of services and products deployment.

2.3 Towards an “innovation ecosystem”

Besides the centrality of the users and the key role of ICTs, the upstream logic features the concept of innovation ecosystem, as the result of a sort of spiral involving government institutions, corporation, universities and final users, aimed at co-creating innovation, improvements and structural changes, different from those a single subject could afford; of course, the more shared vision is achieved, the more efficacious the model will be. An innovation ecosystem can be therefore described as an inter-

organizational, political, economical, environmental and technological network, through which a social compound can contribute to the overall improvement of the innovation among the involved organization (Russell, Still, Huhtamaki, Yu & Rubens, 2011).

3 An empirical verification: the open innovation in the pharmaceutical sector

3.1 The introduction of the open source logic

The pharmaceutical sector is an important example of the application of the open innovation paradigm, where we witness the interplay of multiple actors, public and private, aimed at the creation of new knowledge and innovation and to the transfer of the same.

It seems only right to first see how this industry has always faced critical problems and was not able to provide a high satisfaction of the needs of the community. In fact, the processes of R&D in the pharmaceutical industry are very complex, requiring large financial investments, the provision of highly qualified human resources (which have a high cost), structures and expensive machinery, and so on, as well as being characterized by long time durations and high risk of unsatisfactory results. In this way, a firm faced with high costs incurred during all phases of research and development, it could bring to market a new product, invention or formula, not any time soon, arguing for the duration of the processes described in the first risk that these results are not positive and therefore not generating value on the market. Similarly, because of these problems, we are seeing many neglected diseases, those diseases are not common, than which pharmaceutical companies could not implement the processes and stages of R&D because, in terms of costs and risks described above with respect to such implementation, there is not a large enough market able to remunerate such investments and the risk assumed.

This sector has become increasingly focused on the sharing of information. Thus, it was decided to apply the logic implemented in the software field, the open-source⁵ concept, even in these sectors and backgrounds. In this way, it should be to affirm importance of R&D pharmaceutical industry through the application of an open-source model developed in the context of computing industries. In this context, however, the

⁵ *Open source means, in computer science, software whose authors allow and facilitate the analysis and the modifications made by other independent parties, through the use of appropriate licenses. In this case, these licenses, as described in the third chapter, provide that persons who benefit from access to the software code, must then be made available to all the possible changes and implementations carried out.*

logic of open-source does not refer to the source code of the software, but instead of open source contributors. Similarly, there are many differences between the two areas considered (scope software and biological), as regulatory mechanisms that limit the application of this logic to the development of drugs. However, in the pharmaceutical field have established important partnerships and networks composed of public and private organizations that have adopted this concept open-source, combining it with a concept of outsourcing, in order to generate a new business model based on lower costs.

Question 1: It would form a logical open innovation where pharmaceutical companies can be supported by a variety of other organizational actors with high skills and knowledge (such as universities or public research organizations), and confer outsourced to these important institutions stages and parts research and development.

The result would be a hybrid model, in which a part of the processes of pharmaceutical R&D are based on a logic open-source, while another part would be outsourced . In this way, it would be to create a model aimed at sharing and transfer of knowledge and innovation, through collaborations that would be created. For proper implementation of this model, however, high capacity and high project leadership experience in all minimum -party process R&D pharmaceuticals are required. Since these abilities are present mainly in the big pharmaceutical companies, we see how the logic of open-source rather than being a threat to conventional processes of R&D in this area, may be a way that will enhance the ability of large companies to the end to achieve those objectives will not be achieved economically from the traditional model , such as the development of drugs and treatments for neglected diseases.

Question 2: In this way, the model could be a way to turn properly in those niche markets that can not be supported, for the reasons described above, from large pharmaceutical companies.

3.2 The problems related to the application of open source to the pharmaceutical sector

After delineated the main characteristics of the logic open-source, so it is essential to understand its application to the pharmaceutical industry. In particular, as already outlined, if organizations can adopt this logic, this would confer important benefits for those projects aimed at the development of drugs for neglected diseases, for which you will hear high needs by consumers but unfortunately there will be many problems which hinder the development of the same, as described above. There are, however, significant barriers to the implementation of the approach R&D in the pharmaceutical field.

In particular, we are witnessing an economic issue, instead working in ICT and software is not present. Indeed, if in the latter logic that allows all participants to support this model through the basic means (computer hardware and Internet connection), in the pharmaceutical field, in order to discover and develop new formulas and medications will be necessary structures that will require large investments, such as specialized laboratories. The dynamics of research between the two sectors also differ in factors other than where each of these, the application logic of the open-source appears much more complex in the case of the pharmaceutical industry. In particular, in the case of software development, we do not have a phase of discovery. Once the goal is defined, programmers begin to devote to the project and create steady progress towards your goal. Conversely, the discovery of new drugs can not be generated until a certain amount of knowledge inherent in the disease object of analysis, has been accumulated. This acquisition of knowledge may require an extremely long period of time, without any possibility to know or understand from the beginning if the knowledge this is sufficient or if it takes a long period of time instead of the complex search in order to acquire the necessary knowledge, before innovation can be engendered. Unfortunately, the development of software is much simpler: it crosses few disciplines and is not subject to the complex clinical trials. For the most part, a single programmer can hold all the skills and competencies required to write a program from start to finish. By contrast, drug development requires the coordination of many highly qualified individuals who exhibit skill and expertise differences between them and non-overlapping. The knowledge in the biomedical field must be reviewed and played by actors with the same capacity before it is accepted knowledge .

This process is slow and highly expensive. Moreover, in contrast to drug developers, publishers of software are subject to regulations but not complex but mild. These do not require specific approvals from government agencies responsible for monitoring the sector, given the different impact on the health and safety of individuals in the fields of pharmaceuticals and information technology. Moreover, among the two sectors also have different risks inherent failures or errors on the part of those involved in research and development. The error generated by a software programmer rarely endangers the objectives of the project or other entities, and mistakes in this area can be easily fixed by patching (which remedy solution to a programming error), without be in need of rewriting, from the beginning, the whole program. Instead, in the case of drugs, problems or errors on the part of the subjects, may impair long period of research and development, with the consequent cost of very high financial resources.

Finally, to conclude this analysis, the two sectors follow different regimes on intellectual property. A software is protected by copyright law instruments that come automatically when the code is written, even though it was not legally registered any files. Instead, research in the field of pharmacy is protected by patent which are expensive to store and maintain legally, and for which the meeting legal standards that define innovation is much more complex.

3.3 The implementation of open innovation in the pharmaceutical sector: the case of public-private partnerships

In relation to the considerations made in the light of the problems described in the pharmaceutical industry has gone assuming a logic of open innovation, through training, as already mentioned, the partnership between public and private actors, which has allowed the development of a new and reasonable business model, which emulates the characteristics of collaborative design of open source, analyzed above.

This conception of the network then generates innovative formats from multiple types of public and private actors, responsible for the creation and sharing of knowledge and innovation in order to support research and development in the pharmaceutical industry, seeking to address the barriers and challenges that characterize these processes. In this sense, an important example is the Medicines for Malaria Venture, a non-profit entity that has an underlying type of network as described above, which is responsible for the discovery and development of new drugs against malaria and reliable. This entity presents separate projects, for which we are witnessing an open concept, where any interested party that is able to contribute with their ideas and contributions. In this way, the logic benefits from the skills and creativity of many volunteers. Subsequently, a scientific committee, made up of highly qualified and experienced individuals, analyzes and reviews the contributions made by choosing those projects with the greatest potential value, which will then be funded later.

Each project selected in this way will then be awarded and transferred to the underlying network, which will focus on the processes of R&D related. This network will consist of a large number of scientists and public and private institutions (especially universities, large pharmaceutical companies, research institutions and biotechnology).

The funds and financial resources needed to support these processes will come from public partners and philanthropists. After each step, the committee reviews the data described above and decide whether to proceed or not to support the project. As for the production of drugs developed, such entities gives the outsourced partners who can run it

at low cost, and then sell it at cost price in developing countries, and market them through specialized partners in these markets. In addition, we are seeing multiple partnerships and networks formed by organizational actors both public and private, that share a common profile and logic. First, these are mainly focused on neglected diseases. Second, they operate as a virtual pharmaceutical companies, with a small staff of human resources, which captures the ideas from the outside (which, as already described, may be brought by any interested party), shall examine them and submit to the control of expert committees, and then transfer the processes of R&D related to the network of public and private institutions. Similarly, these partnerships are able to operate on the basis of financial budgets not substantial.

This makes things such partnership arrangements to fund research in areas that could not be financed, viably, from the traditional model of R&D in the pharmaceutical sector, as already described. From the considerations made, it is clear how such a fundamental factor underlying logic of these partnerships, networks and open innovation, is represented by the open sourcing. In particular, according to this conception, the model underlying these networks should allow all stakeholders to participate and contribute. These volunteers then will give ideas and contributions, will review the contributions of other individuals, can implement changes and progress in certain items, and then make them public, discuss with other individuals, and so on. Over time, the best ideas and contributions will be able to gain more authority in the general environment and science.

The reference of this work is to study “*Analysis of the regional pharmaceutical policy*” was conducted in 9 Italian regions (Umbria, Sicily, Campania, Veneto, Lombardy, Puglia, Emilia Romagna, Tuscany, Lazio), and 45 interviews were conducted with the interested parties. The methodological novelty of the study lies in the fact that typically in each region has been collected the testimony of the Assessor or the Chief of the assessor of the policy maker of the drug, the regional manager SIFO, DG ASL and AO and their managers of the drug, allowing you to see the different perceptions on the issues under study and analyze the same time as they are mediated by the needs of regional policy. Among the most significant aspects emerged from the research, we can cite the great diversity of opinion on the effectiveness of the instruments of governance of the pharmaceutical industry, which seems more related to the accession to the choices made by individual regions as part of their federal autonomy, rather than on the basis of considerations of evidence of policies; low confidence in the instruments of economic governance (such as partnerships) and a great deal of attention to the appropriateness, however, declined differently in different contexts; the major concern for the Government

of innovation, but also a lack of confidence in the objective assessment tools, such as HTA (Health Technology Assessment); awareness that the pharmaceutical sector, albeit with some shortcomings on the side of hospital expenditure, is subject to more thorough and careful monitoring and control.

To analyze the regional pharmaceutical policies we have to reason on 2 levels: (i) a more objective one, linked to the numbers and results; (ii) a more specific if not subjective, that is the analysis of what is happening in the regions not so much on the past than in the future.

The regions agree that pharmaceutical expenditure have effective monitoring systems work best, while all the regions are struggling on the control of specialist and medical devices: we focus on the pharmaceutical industry, more controllable, and lacks the ability to act on other sectors. The pharmaceutical industry is important in terms of appropriateness, as if to signify that it would be possible to further rationalization. It requires the use of tools Health technology assessment (HTA) for a greater rationalization of performance and appropriate medication management. The partnerships become the organizational form most appropriate to achieve these objectives.

The concept of open source outlined has many advantages and benefits for research and development in the pharmaceutical field, result even more effective for the purpose of promoting innovation than the traditional alliances that are made in a few actors such as biotechnology and pharmaceutical companies. In fact, the network based on the open-source logic are formed by a larger number of weak ties (flexible relationships), whereas the traditional alliances are based on the strength of the connections between the partners. These weak ties generate a greater number of innovative ideas, since there is a flexible multiple relationships between a multitude of diverse organizational actors and volunteers, thus allowing a greater discussion, argument and debate of these; whereas strong ties tend to reinforce existing logics and therefore are not thesis mainly to the formation of innovative ideas (DeBresson, 1991).

Over this conceptualization, are listed below, the benefits and advantages that partnerships and networks of public-private partnerships have, compared to traditional logic of the R&D sector:

- *agility*: this logic makes it easier to finish the projects which do not appear promising. In fact, the management of individual projects will not have to haggle with the supporters of specific projects, to save them, could cause delays or increased costs;

- *creativity*: these partnerships enable multi-stakeholder experts and specialists, regardless of geographic location (thanks to the development of ICTs), to contribute with their own ideas. In this way, you can harness the creativity, skills, abilities and different conceptions of thought of a very large number of parties involved. In this way, this number appears much greater than the number of specialists generally available within organizations of research using a methodology of traditional R&D;
- *focus*: these networks focus on one or a few targets, namely prevention and treatment of a few diseases;
- *lower availability of resources*: such partnerships require fewer resources of facilities and resources, compared to those required pharmaceutical companies to carry out R&D traditional processes. In fact, by exploiting the knowledge, skills and resources of the network, it allows organizations involved in such networks, though small in size (and therefore with a lower endowment of resources), to implement processes more effective than those of large companies with logical research and development traditional;
- *speed*: these partnerships are characterized by rapid decision-making processes, thanks in part to the fact that they do not have to meet specific requirements or obligations;
- *cost advantages*: such partnerships, as already outlined, will be able to operate on the basis of reduced budgets. In fact, these entities will be composed of a few subjects, reduced overhead and will not need expensive infrastructure. These entities will rely instead on the capacity of the partners of the network, which will be priced capacity, the market, at a marginal cost instead of the full one. In addition, these entities will give outsource those activities and expensive compared to what we are seeing cost benefits under this policy, such as the production of drugs and sought their dissemination in countries in the developing world. Finally, in addition to receiving donations from different subjects, these partnerships will focus on neglected diseases by big companies, for which the costs will be lower.

3.4 Issues and criticisms of partnerships and open source in the pharmaceutical sector

The logic introduced in the present paper has to deal with a certain number of potential issues, that may jeopardize both benefits and results. In particular:

- *funding*: even if such partnerships have collected sufficient funds, it may determine the problems when more projects will be in a clinical development slow and expensive. In this way, the funds raised will be deployed on these projects, leading to a possible lack of financial resources for some of these;
- *sustainability*: some of the projects covered by such partnership, come from the same companies that have shelved because of insufficient commercial prospects. To continue to operate effectively and efficiently, these networks must therefore integrate its portfolio of projects. Moreover, given the complexity of the areas treated, there are high risks in some areas of science, the set of shared contributions may be too low in order to make the necessary processes and research and development in order to generate appropriate solutions;
- *availability of qualified human resources*: a large proportion of qualified individuals and industry experts reside within the pharmaceutical industry, which has a strong culture of ownership. To employees is constantly asked to give their intellectual achievements to the organizations they work for, even those results produced in their own time. However, two possible factors could change this situation, by giving qualified human resources to the network based on the open-source model. Many individuals highly skilled and knowledgeable in this field are close to retirement and then exit from these organizations, who might be interested the opportunity to use their skills for purposes very valuable and positive for the community, such as those of such partnerships. In addition, drug companies could be persuaded to loosen its restrictions on the involvement of its employees in such activities, since often the role internal to an organization of a subject is not in conflict with the role it could take in such activities. In doing so, these companies may obtain a positive reputation within the company, allowing its employees to seek cures for diseases in which the companies themselves do not show interest;
- *availability of data and tools*: the lack and scarcity of data in certain areas can cause problems that reduce benefits and limit the activities of R&D processes according to the logic of open-source. In addition, in specific scientific fields in order to work on projects, tools are needed or not, which may be highly expensive. However, developments in computer science, along with the public dissemination of computer software, has also allowed the volunteers to have access to tools, previously accessible only by companies in the sector;

- *intellectual leadership*: the connection of competent individuals does not guarantee the production of value. In this case, you need a strong leadership and guidance for the various actors and individuals who participate and contribute. For processes of pharmaceutical R&D focused on the open-source logic, the presence of a subgroup of highly qualified innovative contributors that can be addressed positively and grant contributions, as well as support them with their own ideas, it can act as a catalyst. Without leadership, the contributions of individuals may prove to be superficial and low.

4 Conclusions

The analysis conducted shows that the open innovation has generated fundamental changes discernible in a new organizational logic, a new business philosophy, which distinguishes firms and behaviors of the same with regard to the activities of knowledge and innovation itself.

Obviously the open innovation, as evolving paradigm, has been subject to important theoretical developments, discernible, to name only a few, in the upstream theories that have expanded the logic of *openness* (compared with the traditional open innovation paradigm) in creating an *open innovation 2.0* paradigm.

The pharmaceutical sector is a clear example of the application of a logic inherent in open innovation processes innovation. It can be seen as elements are present in this area of complexity of innovative processes that determine the need to adopt logical openness. In fact, we focus primarily on the acquisition and exploitation of knowledge and skills to other external parties, we are not seeing a focus on internal resources and ideas. The users then share their experiences, knowledge and ideas. In this way, it assists the passage for the user, as outlined more times, by a simple role of the recipient, subject to one of proactive, that will be involved in a significant way in innovative processes. In this way, the systems and the environment created assume a logic centered about the user. Obviously, to get these phenomena and advantages, you will have to enable the active involvement of those users.

In this sense, the logic analyzed in this area, featuring as well web 2.0, ICTs, policies strongly of open public-private partnerships (in pharmaceuticals), are able to generate a high level of active participation by users. They play an important role in public and private entities, such as hospitals, clinics and healthcare organizations (in the case of the health care sector), as well as universities and research and development in the case of the

pharmaceutical industry, through the formation of networks implemented by the partnership public-private partnerships with them.

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